Understanding the Experience of Instructional Design with Course Management Systems in Higher Education

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ABSTRACT

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This study takes a qualitative approach to investigate the design and development of online learning environments in various contexts. It employs a multiple case study strategy and Activity Theory as a research framework. The thick descriptions of three cases suggest that:

First, while dealing with ill-structured problems, the instructional designers articulated solution ideas early in the process without conducting a thorough analysis and defining problems. They tended to adhere to the early solutions and to explore alternatives within their original plans. The early solutions addressed some key issues of online teaching and learning. They were used to guide the design and the development while being revised.

Second, although the Course Management Systems facilitated constructivist learning to various extents, their capacity of creating an intuitive learning experience was weak. Such weakness resulted in additional work for the designers. To create an effective online learning environment, the designers needed to have the knowledge and skills for the pedagogical use of technologies. Such knowledge and skills help them link pedagogy with technology while envisioning the course delivery and generating early solutions. Therefore, current CMSs were considered a tool for experienced designers. As a design tool, they acted as a shared workplace to construct shared objects and understanding in

collaborative instructional design.

Third, in addition to the use of CMS, online delivery policies and the choice of a course development model (how to collaborate with faculty) shaped the design decision-making. By using a CMS, the designers may unconsciously take a technology-driven approach in their design, the impact of which requires more exploration.

Fourth, Activity Theory is a valuable framework to examine the complexity of instructional design in a systematic manner. Although the framework is far from perfect and too sophisticated for a novice, it contains various tools to map the activity of instructional design and illustrate the transformation of an online learning environment. Using the principles of Activity Theory, scaffolding can be erected to understand how various tools and rules mediate the design decision-making and the collaborative practice of design.

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CHAPTER ONE: INTRODUCTION

Statement of the Problem

Technological innovations, whether the invention of the printing presses in the fifteenth century or the latest information technology, act as a powerful driver for the development of education. The Course Management System (CMS) is one of those new information technologies that promise to dramatically change the conception of education. In spite of a short history, CMS has already played a critical role in higher education's technology infrastructure. Many institutes of higher education have adopted CMSs and other information technologies to supplement traditional face-to-face instruction and to provide distance learning (Bickelmeyer &Molenda, 2006; Greene, 2001; Pollack, 2003; Powell, 2006). Scholars believe that CMSs carry the potential to interoperate with instructors in "an inquiry into the nature of effective pedagogy" (Karz, 2003, p54).

Given the increasingly important role and growing presence of CMS in higher education, scholars and experts have conducted significant research about the innovation. Related literature largely addresses the potential of the technology to improve learning. Numerous studies explore the ways to marry learning theories, especially constructivist learning, with CMSs. For example, CMS tools are widely used to increase interaction between instructors and learners, introduce learners to problem solving in real contexts, or help learners reflect on what they have learned. Some research generates positive feedback. The implementation of CMSs has brought about increases in learning outcomes (e.g. in Ferrer & Ronkowski, 2004; Ronkowaski, 2006) and faculty report positive changes in their teaching approach (McGee, 2004; Morgan, 2003; Ronkowaski, 2006). However, other research argues that CMSs provide insufficient support for constructivist

learning (Mara, 2001; Shaw & Venkatesh, 2005; Vrasidas, 2004).

Along with the wide adoption of CMSs comes the increasing demand for supporting the adoption. West, Waddoups and Graham (2007) conducted interviews and surveys to investigate the experience of instructors as they used a CMS. Their findings disclose a common process of integrating a CMS in teaching, in which instructors start from experimenting with a CMS, and gradually come to a confirmation stage where they re-evaluate their experience and decide to whether keep using the technology or not. The implementation patterns they discovered provide insights on how to facilitate the adoption and diffusion of CMSs. Research finds good and accessible training is one significant factor encouraging faculty to use a CMS (Allen & Seaman, 2007; Bennett & Bennett, 2003; Morgan, 2003). In many situations, instructional designers work closely with faculty members to provide support for integrating the technology in teaching and learning (Armstrong, 2004; Bates & Poole, 2003; McGee, Carmean, & Jafari, 2005). While related literature sheds lights on the impact of CMSs on teaching and learning, few publications address the impact of CMS on the practice of instructional design (ID).

Within the limited literature that investigates the design and development with CMSs, some studies address usability issues with CMSs, and others identify users' needs for CMSs in terms of its design, development and implementation, mostly the needs of instructors and learners, to improve the technology (Ansorge & Bendus, 2003; Holloran, 2002; Morgan, 2003; Jafari, McGee, & Carmean, 2006; Seawright et al., 1999). In a study conducted by Vannoy (2008), instructional design practice was investigated to understand how designers met their design objectives within the constraints of a CMS. Vannoy (2008) used a revised version of the survey questionnaire developed by Tessmer

and Wedman (1995) to collect quantitative and qualitative data. Her findings reveal that designers complete slightly different design activities when using a CMS than they do without the technology. In her study, instructional design decisions were affected by the CMSs used, the tools embedded in the CMSs and the designers' roles in the projects. While designers reported that CMSs constrained their instructional design practice, they also admitted that the technology provided a broad range of learning opportunities. The main methodologies employed in those studies related to CMSs and instructional design were surveys, interviews and panel discussions. All of them generate valuable insights into the adoption of CMS. However, these investigations fail to provide any specific contexts or alternative scenarios regarding usage, despite the complex contexts in which CMSs are employed.

Many scholars and practitioners have pointed out that instructional design, in many situations, is a process of ill-structured problem solving (Jonassen, 2002; Nelson & Stolterman, 2003; Silber, 2007; Tessmer & Wedman, 1995). Solutions for ill-structured problems are sensitive to the contexts in which those problems occur (Jonassen, 2002; Rowland, 1993; Tessmer & Wedman, 19995; Wilson, 1995). Both instructional context and design context influence the extent to which designers' effort succeeds in bringing about desired changes in performance (Tessmer & Wedman, 1995). Solutions detached from their contexts offer little help to others who want to learn from a previous experience of problem solving.

The extant literature fails to illustrate instructional design with CMSs in various contexts. No study compares user experience and requirements across different situations where CMSs are used to enhance traditional face-to-face instruction or deliver a course

completely online. Usability tests employed in those evaluations of current CMSs often address tasks for the purpose of short-term evaluation rather than authentic and complex tasks in real contexts. It is apparent that there are more tools other than a CMS and that more factors other than the roles of instructional designers mentioned by Vannoy (2008) mediate course design and development. Although Vannoy (2008) employed open-ended questions in her survey to capture more contextual information, her findings are still hard to interpret because she was not able to link the instructional design activities with specified use scenarios in a systematic way. A broad range of work in different domains, such as psychology, anthropology, and computer science has shown that how people learn or work can only be analyzed and understood in the contexts where they learn or work. Their experience needs to be interpreted in light of their desires, the actions they take to fulfill their desires, and the affordances of the contexts. Research findings without a systematic link to a specified use scenario are hard to interpret, therefore their value is limited. Wedman and Tessmer (1993) have called for in-depth interviews and observations to determine the decision-making factors and principles which drive the practice of instructional design.

The ignorance of context in existing literature reflects our limited understanding of the nature of instructional design. When designers deal with "wicked" problems, their solutions are situated – that means instructional design models are context-sensitive. Instructional design is a "holistic and organic process anchored in the project context rather than an abstract model" (Tessmer & Wedman, 1995, p42) and may not always conform with those traditional instructional design models such as the well-known ADDIE model, which unfolds in a linear manner (e.g. Rowland, 1992; Tesmmer &

Wedman, 1995; Silber, 2007). As the context-sensitive perspective has become widely accepted, new models such as the Layers of Necessity Model (Tessmer & Wedman, 1990) and the Rapid Prototyping (e.g. Tripp & Bichelmeyer, 1990), have been proposed to improve our practice. However, "there is not a sufficient research base to support any [Instructional Design] model in diverse settings" (Jonassen, 2002, p117). In the twenty first century, the design context has been largely changed because of the implementation of CMSs as a design and development tool, as well as a delivery system. We have a lot of questions to ask: How do we use a CMS to design online learning experience? Has the innovation changed the way we design? What are the difficulties designers encounter while they use the technology and how can we overcome those difficulties? In current literature, answers for these questions are weak; as a result, there is a need for investigating instructional design mediated by a CMS in a real context. Such research will, without doubt, make contributions to related literature and deepen our understanding of the complex nature of instructional design.

To deepen our understanding of such situated design activities, we need to look for new methodologies – methodologies unlike the de-contextualized surveys, interviews and observations that have been used in the current literature. We need to work on a proper methodology to collect contextual information and systematically investigate the context-sensitive practice of instructional design. In addition, given that the majority of existing empirical studies which examine what it is instructional designers actually do have occurred within the framework of instructional system design (Dicks, Garzotto, Hedberg, & Zeng, 2005), it is time to study the practice from another angle and to use another tool. Findings obtained by applying a new methodology, when consistent with

current understanding, are more persuasive; when bringing new insights, will open a new window for our exploration.

Purpose of the Study

This study takes a qualitative approach to investigate the instructional design practice mediated by CMSs for three purposes:

- To reveal how CMSs impact the instructional design for online learning as well as the practice of instructional design.
- To increase our understanding of the nature of instructional design.
- To explore a methodology to systematically examine the complexity of instructional design.

Reeves and Reeves (1997) believe that the "pedagogical philosophy" underlying the teaching and learning process in Web-based instruction can range from a strict instructivist approach to a radical constructivist one, depending on how those Web-based instruction tools are used. User experience in real contexts is the basis of any design and development. The thick description about how a CMS is used in course design and development will be valuable to those who are looking for ways to improve the technology and facilitate the adoption of CMSs in higher education. Carrying on the mission of discovering the nature of design, the findings of this study hopefully will be helpful for improving our performance as instructional designers as well as, for teaching instructional design. In the fields related to design, including instructional design and human-computer interaction design, Activity Theory has been implemented to analyze complex human activities and uncover the mediation of contextual elements such as tools, rules and division of labor within the activities (Engeström, 1987, 2000; Jonassen, 1999,

2000; Kaptelinin, 1996; Nardi 1996a, b). Therefore, in addition to casting light on the nature of instructional design, the study will concern the implication and value of using Activity Theory as a framework to deepen our understanding. As a result, the general questions addressed in this dissertation are:

- What methodology should we use to get a helpful understanding of the instructional design experience with Course Management Systems in the context of higher education?
- What do faculty members or instructional designers experience when they use a CMS in the instructional design process?

CHAPTER TWO: LITERATURE REVIEW

Technology and Instructional Design

Current Technology of Course Management

What is a CMS

Course Management Systems (CMS) originate from the intention to help instructors with less technical skills to develop a Web presence without knowledge of computer programming languages and to provide online delivery. A CMS is a web-based interactive software program and database used to support teaching and learning in face-to-face and distance courses (Morgan, 2003). Most CMS, such as WebCT, Blackboard, Moodle and LearningSpace, include tools for course content organization and presentation, synchronous and asynchronous communication, student assessment tools, grade book tools, and functions to manage class materials and activities.

There are other technologies related to CMS such as knowledge management systems, content management systems, learning management systems, and learning content management systems, which have similar features to a CMS, as well as their own specialties (Rothwell et al., 2006). These systems are all represented in the general ideas of a CMS. Boettcher (2000) states that the development of CMSs has undergone four waves: During the first three waves, CMSs have evolved from a technology that makes our habitual processes of teaching and learning more efficient to an administrative and delivery infrastructure at the enterprise level. The fourth wave is underway and the demand for open standards and open sources has become the main force driving the recent development.

While scholars call CMSs "the inevitable future of education", they warn of a "new set of uncertainties" about how to teach with them (Foreman & Widmayer, 2000). Instructors face not only challenges of acquiring new technical skills required for integrating CMSs in their teaching process, but also challenges of using CMSs to achieve pedagogical effectiveness and efficiency (Collis & Van der Wende, 2002; Mioduser & Nachmaias, 2001; Morgan, 2003). In the literature, the challenges are partially attributed to the limitations of current CMSs.

Limitations Regarding Design Issues

Current CMSs lack proper pedagogical affordance. The pedagogical affordances of existing tools provide insufficient support to faculty who lack pedagogical knowledge and skills related to online teaching. The default templates and settings embedded in current CMSs are inflexible and limiting. They provide limited cues about how to use the tools in a pedagogically sound way. Many faculty members just put content online and reduce instruction to a simplistic standard model (Shaw & Venkatesh, 2005; Vrasidas, 2004). Scholars also criticize CMSs for not offering the tools that engage students in constructivist learning, such as cognitive tools for meaningful learning, tools accommodating multiple forms of knowledge presentation, and tools for authentic assessments (Mara, 2001; Vrasidas, 2004). However, researchers notice that a sort of "accidental pedagogy" happens because the use of a CMS helps faculty rethink and restructure the teaching and learning process (Morgan, 2003). Carmean and Haefner (2003) expect that the tools in next-generation CMSs could have "better instructional design built in" and provide explicit pedagogical affordances – for example, "a rich control panel" and "a design area that offers options, links, and best practices" (p12).

Current CMSs ignore student needs. Current CMSs emerged from an effort to support faculty with less technical skills, but students' requirements are largely ignored. Carmean and Haefner (2003) point out that learner needs should be treated as equally important with the needs of the faculty, since they represent another main group of CMS users. Research has found that students have different requirements of CMS for developing and accessing resources than their teachers (Holloran, 2002). The ignorance of students' needs limits the capability of CMC to support deep and meaningful learning. Learners need to have "integrated access via CMS to their materials, readings, mail lists, instructors, and storage areas" to achieve their learning goals (Carmean & Haefner, 2003, p12).

Content management limitations. Other important limitations to consider are related to content management in a CMS. Comparing CMSs with a similar innovation mainly used in industrial settings – Learning Content Management Systems, Shaw and Venkatesh (2005) offer the following critiques: 1) the template-oriented design actually hinders real innovations in content creation; 2) content conversion process is too complex and limits content portability; 3) the capability to share and reuse content across subject fields, different users and different languages is underdeveloped; 4) CMSs do not support distributed publishing processes that enhance the practice of team-based course development in higher education; 5) most CMSs do not conform to any open standards, therefore switching platforms means high cost and integrating a CMS with other information applications on campus seems extremely difficult. In addition, there is an increasing demand to integrate library systems into the current CMSs. The central idea embedded in these critiques is the expectation of a flexible and versatile CMS based on

an open-standards model. A CMS weak at content management takes the risk of building a "content silo" that prevents an extensive adoption of the innovation.

Limitations Related to Developments Issues

Major requirements related to the development of CMS are usability issues. The users often complain that CMSs are hard to use and the learning curves are long (Carmean & Haefner, 2003; Halloran, 2002; Morgan, 2003; Searwright et al., 1999). Current developers advertise that CMSs help faculty with minimal technical skill employ appropriate methods to manage their own web courses. However, under certain educational conditions, the claims of developers are not supported. Faculty need more assistance than the tools and help offered in those CMSs. Research shows that poor user experience is one of the reasons that faculty turn their back on the use of CMS (Morgan, 2003).

Limitations Related to Implementation Issues

These limitations are largely related to deficient technical and administrative support for adopting a CMS. Not every institution of higher education makes the decision to adopt a CMS with a careful plan at the enterprise level. Faculty and students, as the main users, find that they lack access to the innovation, lack support and training needed for planning online instruction, lack time to plan, design and develop an online course, lack incentives and compensation to motivate to teach online, and lack appropriate intellectual property agreements to maintain their control on the content they create (Bates & Poole, 2003; Berge, 1998; Mckenzie et al., 2000 cited by Vrasidas, 2001; Morgan, 2003). Because of limitations of implementation, faculty members in colleges and universities tend to ignore the great insights into learning and remain unfamiliar with

theories that drive the best learning environments (Karz, 2003; Merrill, 2002; Reeves, 2002). They might not be able to use those tools in a pedagogically sound way for a given learning task without extensive training and careful planning.

Efforts to Automate Instructional Design

Automated Instructional Design (AID) Tools

We expect more of CMSs, more embedded instructional support anchored in various learning and instructional theories (Karz, 2003). Carmean and Haefner (2003) anticipate that the tools in the next-generation CMSs could have "better instructional design built in" and provide explicit pedagogical affordances – for example, "a rich control panel" and "a design area that offers options, links, and best practices" (p12). To some extent, the theories of learning and instruction have already been integrated in automated instructional design tools to assist instructional designers and others in creating instruction that promotes learning. Kasowitz (1999) has identified five types of automated instructional design tools and systems although the categories somewhat overlapped with each other.

Expert ID systems contain a domain-specific knowledge-base and perform analysis and decision-making for ID designers. Some of the systems focus on specific tasks; others have more general applications such as ID Expert, an intelligent computer-based multimedia interactive instructional development and delivery system. Based on the Instructional Transaction Theory, ID Expert assists designers in creating transaction by presenting a set of decision-making steps involving instructional components, formatting, resources, and instruction parameters, and so forth (Merill, 1997).

Advisory systems provide a critique of instructional solutions given a set of

desired outcomes and system goals. But, given the complexity of the concept and lack of supportive technologies, such systems remain a desirable long term goal (Spector & Ohrazda, 2004).

Information and knowledge management systems borrow some components and capabilities from other ID systems and development and make them interoperable. A good example may be MOT, a knowledge-based modeling tool for assisting in identifying and structuring the content of instruction.

EPSSs of ID provide "just-in-time" performance support to instructional designers. One of the examples is Designer's Edge, a tool that leads designers through all of the instructional activities in the ISD model and places emphasis on the production phase. It includes support for scripts, storyboard, and other production needs of computer-based instruction.

Authoring tools usually support the development phase of instructional design rather than the planning stage. Therefore, they require a considerable amount of front-end analysis and design, such as selecting content and determining goals. Authoring tools simplify the programming process and consist of a set of basic instructional function building blocks that assist in creating effective and visually-appealing instruction (Merrill, 1997). Today, many authoring environments have been built specifically to host or support online courses, including those tools embedded in CMSs.

Failure of AID Tools and Current Trend

For whatever reasons, AID tools that support the planning and evaluation of instructional design are not as widely used by practitioners as authoring tools (Kasowitz, 1999) and the reasons are not clearly documented in the literature. Gayeski (1988, 1991,

cited in Richey, Klein & Nelson, 2004) attributes the failure to the difficulty of representing ID expertise as decision algorithms that can be executed by a computer. She also speculates that such systems may need to be customized to the design procedures and practice of a particular environment.

Merrill (1997) criticizes authoring tools for their complexity and relatively long learning curves if their users want to take full advantage of their features. In addition, those tools are most likely "by design, instructional design theory neutral" (Merrill, 1997, p52). This requires their users have a thorough understanding of instructional design theories and models, and design every instructional strategy from scratch using those "design-neutral" build-in functions. Templates, models or widgets embedded in some of the authoring tools provide limited instructional support, since most of them are "structure oriented" rather than "learning oriented". They focus on "how interaction works, not on what learning outcomes the interaction enables (p.52)". Only a capable designer can create qualified instruction by appropriately combining those authoring system functions. Unfortunately, the authoring tools embedded in most of the CMSs still suffer from those weaknesses mentioned by Merrill (1997).

Merrill (2002) calls for "technology-based instructional tools that empower teachers to use their creativity to implement technology-based instructional experiences for their students that incorporate basic principles of learning and instruction" (p.15). He conceives such tools to consist of a library of easy to use templates that include a variety of different ways to teach different types of instructional outcomes and guidance for assisting teachers to select appropriate templates regarding their instructional goals (Merrill, 2002). To respond to Merrill's appeal, in recent developments, a group of

scholars and practitioners bring up the idea of "learning design" to increase the quality and variety of teaching and learning within e-learning.

Learning design emphasizes the richness of interaction between instructor, learner, resources and environment rather than focusing on content-oriented learning objects. Koper (2006) defines "learning design" as the description of the teaching-learning process in a unit of learning (e.g. a course or any other designed learning event). It specifies various learning activities and their sequence that are carefully and deliberately designed to promote more effective learning. For the purpose of sharing and reuse, the IMS Learning Design Specification (Kopper, 2006) is developed to represent the design of units of learning in a semantic, formal and machine interpretable way. The specification introduces concepts such as roles, activities, activity structures, environment, resources and methods to construct a conceptual model of a teaching and learning process. One significant achievement related is the development of Learning Activity Management System (LAMS) in Australia (Dalziel, 2003). Representing the most comprehensive implementation of the concept of learning design (Britian, 2004), this web-based open source software supports the creation, management, and delivery of a sequence of learning activities. Comparing with its commercial peers, it allows more flexible and dynamic creation and ongoing alteration of e-learning designs. Current research issues related to learning design are: a) the use of ontologies and semantic web principles, and tools related to learning design; b) the use of learning design patterns; c) the development of learning design authoring and content management systems, and d) the development of learning design players, including the issues how to use the integrated set of learning design tools in a variety of settings (Koper, 2006).

The development of LAMS aligns with the possible approaches that Spector and Ohrazda (2004) anticipate for the future of the automation: The first is the object-oriented approach with case-based advising; and the second is the creation of electronic databases that are easily accessible and reusable. However, for the next generation of CMSs to avoid the failure of previous AID tools, the integration of instructional design affordance into CMSs needs to start with the understanding of the complex nature of design.

The Complex Nature of Instructional Design

Instructional Design Theories and Models

Reigeluth (1999) distinguishes two different but closely related concepts: instructional design theories and instructional design processes (or instructional system design models – ISD models). Instructional design theories are design-oriented, providing means to attain given goals for learning or development (Reigeulth, 1999). They identify instructional methods as well as the situations in which those methods should and should not be used. Although the instructional methods cannot guarantee the desired learning outcomes, they increase the probabilities that the desired results will occur. Besides, these methods are componential. They can be broken into more detailed component methods at different levels and performed in many different ways. For example, problem-based learning consists of many small methods, such as presenting the problem, and the scenario in which it occurs, forming teams, providing support for the teams' efforts, reflecting on the results of efforts, and so forth. An instructional design theory is easier to apply if it describes methods on a relatively detailed level (Reigeluth, 1999).

In contrary, the ISD models describe the systematic processes that instructors follow in order to create instructional materials and environments. Gustafson and Branch

(2002) found that the instructional design process contains five core elements: analysis, design, development, implementation, and evaluation (ADDIE). They pointed out that, although the authors of the ISD models may "slice and dice" the components in many different ways and use different terminologies, all components are present in all the ISD models, such as the well-known Dick and Carey Model (1990). The ADDIE activities are not completed in a linear, step-by-step, but in an iterative and self-correcting manner.

What Instructional Designers Actually Do

The perspective of Gustafson and Branch (2002) represents the mainstream in the field of instructional design. However, not everyone agrees that the ADDIE model reflects the practice of expert designers in the field. Many scholars who have conducted empirical studies, investigating what instructional designers actually do in real contexts, find reality conflicts with the familiar process models. There are twelve studies located in the literature that pertain to the purpose of this study. Among these studies, four studies used the –think-aloud protocol technique to uncover the design decision-making process; two were qualitative interview design studies; and the rest were surveys (Details see Table 2.1 on p.23). The findings of these empirical studies suggest the following:

First, the process of instructional design is an iterated process of ill-structured problem-solving (Kerr, 1983; Kirschner, Carr, Merrienboer & Sloep, 2002; Le Maistre, 1998; Pieters & Bergman, 1995; Perez, Johnson & Emery, 1995; Rowland, 1992). Instructional designers, novices or experts, use the ISD models selectively. Not all activities are completed in a sequence as they are prescribed in the ISD models and to the same degree of precision (Allen, 1996; Kirschner et al., 2002; Vannoy, 2008; Wedman &Tessmer, 1993; Winer & Vasquez-Abad, 1995). The deviation from the ISD models is

related to practical, moment-to-moment contexts (Perez et al., 1995; Pieter & Bergman, 1995).

Second, expert designers spend more time in extensive front-end analysis (Le Maistre, 1998; Perez et al., 1995; Visscher-Voerman & Gustafson, 2004). Such analysis sometimes is integrated with the design activities (Visscher-Voerman & Gustafson, 2004) and takes into account a wide range of systemic factors (Le Maistre, 1998; Rowland, 1992).

Third, through analysis, expert designers tend to construct a clear understanding of design problems and consider a variety of solution possibilities (Ertmeret al., 2008; Le Maistre, 1998; Perez et al., 1995; Rowland, 1992). They may narrow down design problems by highlighting key challenges (Ertmer et al., 2008). Some generate solution ideas very early in the process but delay working out the details, pending a more complete understanding of the problem (Rowland, 1992). Others prefer exploring alternatives within a given solution setting specified in their project plan, rather than generating alternative solutions (Visscher-Voerman & Gustafson, 2004).

Fourth, expert designers rely on a rich and well-organized knowledge base that usually includes a variety of knowledge and previous experience (Ertmer et al., 2008; Kirschner et al., 2002; Le Maistre, 1998; Perez et al., 1995; Rowland, 1992). They use ID principles or models in an apt or heuristic manner (Ertmer et al., 2008; Perez et al., 1995; Rowland, 1992).

Fifth, to some expert designers, design, development and formative evaluation activities are interwoven, and the function and the format of instruction co-evolve (Visscher-Voerman & Gustafson, 2004). They not only conduct traditional microdesign

activities, but also activities fitting within the "technical role of an editor (Allen, 1996; Tessmer &Wedman 1993; Winer & Winer & Vasquez-Abad, 1995; Vannoy, 2008; Visscher-Voerman & Gustafson, 2004).

The results of empirical studies that investigate what instructional designers actually do reflect the complex nature of design. As an activity of ill-structured problem solving, instructional design is based not on a procedure or a process but on the understanding of a set of principles and a way of thinking (Jonassen, 2004; Silber, 2007). It shares similar thinking processes with those designers in other fields employed (Rowland, 1992; Tessmer & Wedman 1995; Silber, 2007). In his book "How Designers Think", Lawson (2004), a design guru in the field of architecture who has spent years in studying the nature of design, has found the idea that design activities occur in order or are identifiable separate events seem very "questionable". More likely, design is a process in which problem and solution emerge together. His "map" of the design process (see Figure 2.1) shows "the negotiation between problems and solutions with each seen as a reflection of the other" (2004, p48).

> The activities of analysis, synthesis, and evaluation are certainly involved in this negotiation but the map does not indicate any starting and finishing points or the direction of flow from one activity to another. However, this map should not be read too literally since any visually understandable diagram is probably far too much of a simplification of what is clearly a highly complex mental process. (Lawson, 2004, p.48-49)

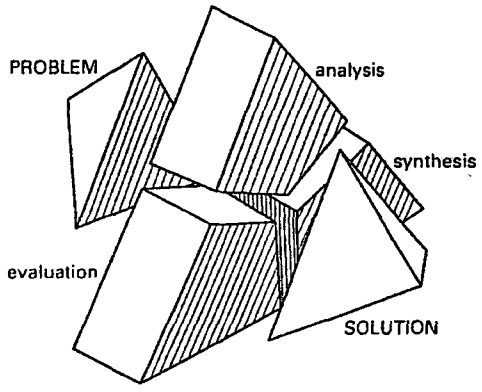


Figure 2.1 The map of design process (Lawson, 2004,Figure 3.7, p 49)

Across disciplines, empirical studies investigating the nature of design have shown some similar results. First, experts tend to employ the strategy of "analysis through synthesis". They learn about the problems through attempts to create solutions rather than through deliberate and separate study of a problem itself. Design problems are so complex that they are rarely fully described at the start of the design (Ertman et al., 2008; Lawson, 2004). It is common to find that elements of solution rather than problems begin to emerge at very early stages as designers initially focus their attention on critical aspects of the problem and move quickly towards some ideas of solution (Lawson, 2004; Rowland, 1992; Tessmer & Wedman 1995; Visscher-Voerman & Gustafson, 2004). Such solutions envisioned at early stages sometimes are called "primary generators" (Lawson, 2004) or "project plans" (Visscher-Voerman & Gustafson, 2004). They evolve towards an integrated response to a whole series of issues. Strategies designers adopt to find an integrated solution are more heuristic than theoretical in the reality.

Second, design problems are often multi-dimensional and highly interactive (Jonassen 2002; Lawson, 2004). Lawson (2004) points out that design problems are built up of constraints that can be structured in terms of the generators of problems, their

domain of concern and their function. Various stakeholders including designers themselves (generators) impose constraints upon design solutions. These constraints result largely from required or desired relationships between various elements. Some are internal and form the basis of the problems; while others are external and relate the designed objects to their context (domain of constraints). Different constraints have different purposes (functions) that ensure the designed object or system performs functions demanded. Each design field has a specific model of the function of constraints. For example, in architecture, there are radical constraints dealing with the primary purpose of the designed object or system; practical ones addressing the reality of producing, making or building in the design; formal constraints related to the visual organization of the object; and symbolic ones defining the symbolic meaning of the design.

In the field of instructional design, the multi-dimensional nature of design problems is manifested through the emphasis on the context of learning and instructional design (Tessmer & Richey, 1997; Tessmer & Wedman, 1995). Tessmer and Wedman (1995) summarize two types of context that impact the success of an instructional design effort: the instructional context and the design context. The instructional context contains physical, organizational and psycho-social variables that surround the instruction and learner, and impact on the effectiveness of instruction and learning; whereas the design context consists of resources and constraints that affect the design effort in a particular project – how much ID "investment" can be committed to and where the "investment" is made. These factors may be time, money, designer expertise, client values, available technologies, and organizational culture.

As a CMS is used as a design, development and delivery tool, the context of instruction and learning has been dramatically changed. It is important to know whether the employment of the technology has brought changes to the instructional design processes – whether the use of a CMS has interactions with the other contextual factors, how we define design problems to reflect the contextual changes, and what strategies we use to find effective solutions. However, we will not be able to know the answers unless we investigate the practice of instructional design in real contexts.

Table 2.1: Review of empirical studies on what instructional designers actually do

Researcher	Purposes	Methods	Findings
Kerr (1983)	To examine: • Whether novices have multiple solutions for a given design problem; • How they winnow the alternative solutions; • What constraints they encountered in design; • How they know when a design is done.	Interview after accomplishing design tasks - 26 novice designers (Graduate students)	• Most (69%) novice designers selected from more than one possible design solution. Decisions were undesirably made at early stage. • Novices seemed not to have good ways of representing the problems to themselves, and were not aware of their own ways of making decisions. Some (38%) winnowed alternatives based on their own experience and others (35%) based on student needs. • Novices accepted constraints as being fixed and rigid rather than being susceptible to influence and change. Many constraints had to do with the feasibility of the solutions chosen. The most common constraint mentioned by novice designers was the difficulty in specifying objectives/outcomes (35%). • There was obviously not a clearly presented finish to their work. 54% determined a stopping point in the design process when all objectives were dealt with.
Rowland (1992)	To investigate what happens during instructional design and the differences between expert and novice designers	Think-aloud design task - 8 novice and expert designers	Expert designers: • Interpreted a problem as ill-defined and considered a variety of problem and solution possibilities. • Generated solutions very early in the process but delayed working out the details, pending a more complete understanding of the problem. • Used instructional design principles as heuristics for deriving a solution or evaluating solution ideas. Global (a wide range of systemic factors) rather than local factors were considered in selection and evaluation. • Proceeded situated actions that were taken in response to moment-to-moment conditions rather than as predetermined steps.

Wedman & Tessmer (1993)	To determine: • Whether instructional designers follow the prescriptive design models (e.g. the Dick and Carey model, 1990) • What makes them to use the models selectively	Survey - 73 designers / developers	• Instructional designers used the ID model selectively - Not all activities were completed in a sequence as they are prescribed in the ID models and to the same degree of precision. • Main reasons for excluding an activity were: decisions already made/ not enough time/ considered unnecessary. • Nearly one-third of the designers ignored task analysis as it was considered unnecessary. • Nearly half of the designers did not assess the learner's entry skills or learning style as it was considered unnecessary. • Pilot testing was used as a method of quality control.
Winer & Vasquez-Abad (1995)	To determine amount of selective use of ID activities	Survey replicating Wedman and Tessmer,1993) - 66 designers / developers	Similar results as those in Tessmer & Wedman (1993). In addition: • The selection of instructional strategies and media were the most important aspects of ISD. • There was a parallel between the steps seen as most necessary and those performed most frequently.
Perez, Johnson & Emery (1995)	To identify differences in novice and design experts	Think-aloud design task - 5 expert and 3 novice designers	Novices and experts used divergent design models. Experts: • Spent more time in front-end-analysis or planning and consider a wider range of factors in combinations with one and another. • Interpreted the design problem while novices identified it. • Were more apt to use more design principles and relied on a variety of knowledge sources. • Conducted an integrating, reiterating and cyclic design process that required creativity as well as logic.
Pieters & Bergman (1995)	To determine which activities are practiced by designers and the amount of prescriptions and intuition used	Survey - 35 graduate students of instructional design	• Deviations and discrepancies of the general ISD model occurred and they were related to the practical context of working. • Design followed an iterative process and designers had less time than needed for prototype design and evaluation. • Designers should realize in advance how open intended users or other stakeholders are to a variety of potential solutions.

Allen (1996)	To investigate which activities are practiced by designers	Survey – 99 (instructional designers or people with similar responsibilities)	Frequent activities included traditional design activities and some fit the "technical role of an editor". They were: • Determining instructional strategies. • Designing goals and objectives and writing learning outcomes. • Designing layout and appearance of materials. • Project managing the development materials and checking copyright issues and identifying learning materials. • Designing assessment items. • Editing and proof reading.
Le Maistre (1998)	To identify differences between novice and expert designers while they are involved in a revision of instruction.	Think-aloud design task – 2 subjects (1 expert and 1 less expert designer)	Expert designers: • Had a rich, well organized knowledge base and excellent self-monitoring skills. • Performed extensive front-end analysis, search the problem space rapidly and efficiently and present problems at a deep level. Their problem-solving processes are iterative.
Kirschner et al. (2002)	To determine the priority of design strategies of expert designers and their actual approaches to design	A qualitative study – 21 experts (group discussion, using an Action-Object sheet to record the design processes)	Designers • Designed in an iterative fashion highly solution-driven, context-sensitive solutions. • Made a very selective choice of ID-model prescriptions. • Emphasized the importance of communication with stakeholders and users. • Greatly differed in expert performance and were influenced by their theoretical background.

Visscher-Voerman & Gustafson (2004)	To investigate what design strategies expert designers use in various contexts practice	Interview – 24 expert designers	Analysis: • Most designers conducted a restricted analysis and some conducted more thorough analysis after the approval of project plan. • Analysis resulted in a specification of a potential solution rather than a specification of the problem. • Analysis sometimes was integrated with other design activities. • Project plans were mostly formulated at the start of project rather than at the end of the analysis. Design and Development • Rather than generating alternative solutions, designers explored alternatives within a given solution specified in project plan. • Designers used different strategies in the development of function and format of their product and most of them let the function and format co-evolve. • Designers were responsible for microdesign activities. • Usually design and development activities were interwoven and the choice of medium or format of the solution had usually been made before a project starts. Implementation • Designers paid attention to the upcoming implementation but were occasionally involved in it. The levels of their involvement vary with respect to the degree to which they feel personally responsible for the implementation Evaluation • Formative evaluation is interwoven with design activities rather than conducted in a distinct phase. • Systematic and formal formative evaluations were rare. • Evaluations were used not only to check the quality of the product but also to sharpen the design specifications.

Ertmer et al. (2008)	To determine how expert instructional designers synthesize ill-structure problem situations	Survey, think-aloud design task and interview -7 experts	• Experts constructed a clear understanding of design problems and narrowed down the problem space by highlighting key design challenges. But not everyone synthesized the challenges into a clear concise statement. • Experts used an amalgam of knowledge and previous experience in their analysis of design problems. • Experts used mental models of instructional design to guide their design in a heuristic manner. However, the models they used varied. • Experts arrived at similar conclusions in a similar design situation (Transferring face-to-face workshops into online environments).
Vannoy (2008)	To investigate how designers use CMSs – How a CMS limits the pedagogical choices and which design decisions are predetermined by a CMS, tools within a CMS and the role of designers	Survey – 87 designers (used the instrument of Tessmer & Wedman, 1993) Open-ended questions – 61 designers	• A CMS appeared to have an impact on instructional design decisions and was not always considered negatively limiting. Designers viewed the CMS as a tool providing more opportunities to meet learning objectives in a variety of ways. • Instructional design decisions within a CMS seemed to align well with learning objectives. • Designers completed different instructional design activities when using a CMS than they do without the specification. The most often chosen one was writing learning objectives. • Incompatibility with CMS was the least frequently given reason for excluding an activity. • Designers had "workaround" options that adapted a CMS to meet specific objectives. • Instructional design decisions were affected by the designer roles in the project.

Supporting Collaborative and Distributed Instructional Design

Collaborative and Distributed Design for Online Delivery

The current efforts and means to support the adoption and diffusion of CMS in higher education indicate the distributed and collaborative nature of the instructional design process that is mediated by the technology. The collaborative or teamwork approach is not new for course development and delivery. However, it was restricted initially to distance education as an important means of controlling workload and quality (Bates & Poole, 2003). As teaching and learning rely more and more on computer and networking technologies, the collaboration among both co-located and distributed instructional design personnel becomes increasingly one of the key elements for success. In the literature, there are two main reasons contributing to the emergence of such collaboration:

First, the design of an online course requires multiple knowledge and resources that are beyond individual efforts (Kang, 2001; Philips, 2001). It involves multiple roles and multiple perspectives. Quite often, faculty members need corresponding scaffolding to use the technologies in a pedagogically sound way (Salter, Richards & Carey, 2004). Whether a part of the team or working alone, the instructor involved needs to expand his or her roles in the design process and bear multiple responsibilities (Hawkes & Coldeway, 2002; Merrienboer & Martens, 2002; Spector & Edmonds, 2002).

Second, there are increasing opportunities for collaborating with other campus units, with other higher educational institutions and organizations to create collaborative programs, courses, and other knowledge resources (Eseryl & Ganeasan, 2001; Merrienboer & Martens, 2002; Price, et al., 1996)

Case studies about the design process of online delivery in higher education reveal some common features of the collaboration among faculty members, graduate assistants, instructional designers, librarians, multimedia developers, computer programmers and so forth. Such collaborative and distributed process requires:

- The establishment of clear roles and responsibilities of the team members and all the stakeholders (Luck, 2001; Youngman, 2000; Yu, 2000).
- Project management to achieve effective parallel working (Koumi, 1992).
- Continuous and effective communication (Eseryl & Ganeasan, 2001; Hawkes & Coldeway, 2002; Kang, 2000; Philips, 2001, Spector & Edmonds, 2002).
- A shared design space for managing design activities and sharing files for rapid revision process (Eseryl & Ganeasan, 2001; Spector & Edmonds, 2002; Yongman, 2000).
- Rapid prototyping to help faculty members understand capabilities of various web technologies and making the development as efficient as possible (Luck, 2001; Youngman, 2002).

As we discussed before, more recent views of instructional design challenge the traditional ISD models by emphasizing the nature of the work as a design activity marked with all the characteristics of design work – a more creative, iterative and collaborative process for problem solving. To better support the collaborative design process, we need to go further to investigate a broader literature of computer supported collaborative/ cooperative design (CSCD).

Computer Supported Collaborative/ Cooperative Design

In many situations, design is a collaborative/cooperative effort involving multiple

roles and perspectives. Emphases on different dimensions of design lead to different ways of supporting the process (Schmidt, 1998). The development of computer supported collaborative/ cooperative design originally mirrored the move to impose greater formalization on group decision-making tasks with decision-support systems. More recent and successful development has focused on the idea of a shared information space that supports asynchronous rather than synchronous interactions (Geisler & Rogers, 2000).

Collaborating to construct shared understanding and shared objects. Design is often a collaborative process in which the team members go beyond the simple coordination of individual work to engage in joint activities that co-construct shared understanding and shared objects (Katzenbach & Smith, 1993, cited in Geisler & Rogers, 2000). These objects shape, structure, and coordinate the collaborative efforts and are viewed as a means of collaboration (Geisler & Rogers, 2000; Larsson, 2003; Lauche, 2005). They may appear to "talk back" to designers in a stepwise style, invoking issues, criteria, and responses (Gedenryd, 1998 cited by Larsson, 2003; Schon, 1983). They also serve as "boundary objects" that allow multiple perspectives to interact on common ground (Geisler &Rogers, 2000). The construction of shared understanding requires the interweaving of public space of a project with the private space of individual work where disciplinary tools are used. It exhibits a trajectory from the private to the public space, and then back to the private to start another cycle of collaboration. Some topics repeated in recent CSCD literature to support the construction of shared understanding and shared objects are summarized below:

- Interweaving the public work space with the private space and support the

transition between the two (Geisler & Rogers, 2000; Scott, Grant, & Mandryk, 2003).

- Facilitating interpersonal and meta-communicative interactions to facilitate the construction of shared meaning and increase group awareness for effective cooperation; (Arias et al., 2000; Geisler & Rogers, 2000; Lang, et al., 2002; Scott et al., 2003).
- Providing team members with means to manipulate and modify common "virtual objects" (Geisler & Rogers, 2000), and supporting fluid transitions between activities and simultaneous user actions (Scott et al., 2003).
- Coordinating multiple design-relevant applications to support multidisciplinary interactions, and moving to "open systems" that are adaptable to dynamic problem contexts (Arias et al., 2000; Geisler & Rogers, 2000, Scott et al., 2003).

Cooperating by articulating the design process. Design can also be a cooperative process in which multiple actors who are interdependent to with one and another are involved, and the changes of the state of individual work change the state of work of others and the state of work of the whole project. Cooperative design is inherently distributed: distributed in time, space, and among "semi-autonomous" team members who work in different circumstances, have different perspectives and goals, and use different strategies and heuristics (Schmidt, 1998). One overriding problem faced by designers in ill-structured problem-solving is "the overwhelming complexity of handling the myriads of capricious and shifting interdependencies between distributed activities in an orderly and timely fashion" (Schmidt, 1998, p.6). Therefore, the substantial potential

benefits of CSCD lie in supporting the design process – managing the overwhelming coordination problem, rather than supporting the retention of design rationale or designers' knowledge as previous efforts did. The latter contains unsolved conceptual issues - the indeterminate influence of motives and reasons on design activities, and the limited capability for a computer system to capture such influence (Schmidt, 1998). To deal with confusion and disorder brought about by the distributed nature of design, individual and yet interdependent design activities must be coordinated, scheduled, aligned, meshed and integrated, and so forth – in short, they should be "articulated". Therefore, designers need computer applications to assist them in:

- Managing task interdependencies through: (a) facilitating mutual awareness among team members - utilizing signals, signs, and cures that indicate the state of the field of work and the state of the cooperative work arrangement; and (b) offering coordination mechanisms – making task interdependencies tractable by using "coordinative artifacts" and implicit or explicit protocols which regulate how the artifacts are to be used (Schmidt, 1998, 2000).
- Managing common information spaces to keep track of the field of work by creating appropriate indexes that allows "an individual to assign a publicly visible and permanent pointer to each item so as to enable other individuals to locate the items relatively easily and reliably" (Schmidt, 1998, p12).

The "shared information space" in which shared understanding and objects are constructed and the effort to articulate the design process have been shown to have importance in many recent CSCD studies. These ideas have been applied to the field of instructional design, for example in Spector's DocuShare system (2002). Gustafson (2002)

declares that the more an ID tool facilitates the ID collaboration, the more desirable it becomes. However, whether these ideas are applicable in the field of instructional design and how to apply them is still a question that requires answers from empirical studies of instructional design. Regarding the role of CMSs in supporting teaching and learning in higher education, we may ask two questions: when designing and delivering web-based instruction through a CMS, 1) which phases or activities of instructional design need support; 2) which elements of such support could potentially be provided by a CMS or to what extent could a CMS provide support. These are the questions that could be answered after we have a relatively thorough understanding of instructional design experience with CMSs.

Activity Theory and Instructional Design

Activity Theory

Knowledge and learning are neither solely a property of the individual nor of the environment. They are the product of the reciprocal interaction between the learner's cognitive processes and aspects of the external environment (Greeno, 1988; Pea, 1993; Perkins, 1993; Salomon, 1993). Our "mind" never works alone in the practice of cognition and "the intelligences revealed through these practices are distributed – across minds, persons, and the symbolic and physical environments, both natural and artificial." The social and physical environment puts up "mediating structures" to organize and constrain human activities (Pea, 1993, p.47-48). When we use a CMS for instructional design, the technology is a component of such structures by which our design experience is mediated. The understanding of our experience with a CMS and the role of the technology in the design process should be obtained through examining a unit of analysis

that includes instructional design personnel, the CMS and other artifacts.

Activity Theory is a framework close to the distributed cognition approach, except that it emphasizes the importance of motive and consciousness –individuals and artifacts are "unambiguously asymmetrical". The focus of analysis is the cognitive process of an individual situated in a social, cultural, historical, and artifactual world (Halverson, 2002) and artifacts are mediators of human thoughts and behaviors (Nardi, 1996). The theory has its roots in various disciplines, such as the classical German philosophy of Kant and Hegel, the dialectic materialism of Marx and Engels, and the Soviet cultural-historical psychology of Vygotsky, Leontiev and Luria (Kuutti, 1996). Vygotsky highlights the social and cultural aspects of the human mind. Human mental function is the product of mediated activities in which individuals both socially and culturally interact with the environment using tools (Vygosky, cited in Engeström, 1987, 1999; Nadi, 1996). Later, Leontiev (1978 cited in Engeström, 1987) expands Vygotsky's work by proposing the "theory of Activity" in which he distinguishes between "collective activity" and "individual action". The distinction introduces the notion of "hierarchical level of activity" and the "division of labor" as a vital historical process behind the development of mind. Inspired by the work of Vygotsky and Leontiev, Engeström (1987) develops an expanded version of the model of human activity – the Activity System. The model reflects both the collaborative and collective nature of human activity and the significance of individuals who engage in carrying out an activity. It focuses on the interaction of human activity and consciousness within its relevant environmental context and analyzes units consisting of three components: *Subject, Object* and *Community*, with three mediators, namely, *Tools, Rules* and *Division of Labors*.

Engeström's Activity System (also referred to as the "Activity Triangle model") has been accepted in many fields. One of the most powerful uses of the model is as "a lens, map, or orienting device to structure the analysis of complex sociocultural learning and performance context" (Barab, Evans, & Baek, 2004, p207). The model has been employed to study human activities that are mediated by artifacts within a cultural-historical context, such as human-computer interaction (HCI) (Kuutti, 1996; Nardi, 1996b; Kaptelinin, 1996; Kaptelinin, Nardi & Macaulay, 1999), instructional design (Jonassen, 1999; Jonassen, 2000), and collaborative work and learning environments (Engeström, 2000, Barab, Barnett et al., 2002, cited by Barab et al., 2004; Harlverson, 2002). For the purpose of this study, Activity Theory, especially Engeström's model, will be used as a theoretical framework to analyze and understand instructional design experience with CMS in the context of teaching and learning in higher education.

There are several basic principles of Activity Theory (Engeström, 1987; Kaptelinin, 1996; Kaptelinin, et al., 1999). They are as described below:

Principle I: Unit of Consciousness and Activity

Activity Theory defines consciousness as the phenomenon that unifies attention, intention, memory, reasoning and speech rather than a set of discrete disembodied acts. It is manifested in practice – you are what you do. And what you do is firmly and inextricably embedded within the social matrix of which everyone is an organic part (Vygotsky, 1978, cited by Jonassen, 1999; Nardi, 1996). How people learn and work cannot be analyzed and understood outside the context in which these activities occur. A minimal meaningful context for the human interaction with the world consists of internal and external elements and must be included in the basic unit of analysis – conscious

activity. The internal context refers to specific objectives and goals; the external context involves artifacts, other people, and specific settings (Nardi, 1996). Engeström (1987, 1999) uses a triangle to organize and depict the components of an activity system (Figure 2.2). In the literature reviewed here, each component is defined as follows.

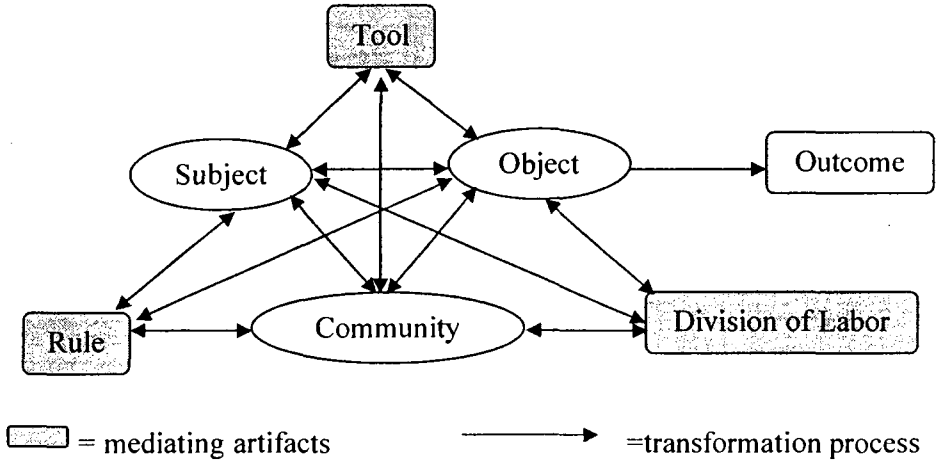


Figure 2.2 The Activity System (Engeström, 1987)

Subject. The subject is the individual or a group of actors that engage in the activity.

Object. The object refers to the "raw material" or "problem space" at which the activity is directed (Center of Activity Theory and Development Work Research). Objects could be physical, mental, or symbolic artifacts produced by the system. They are acted on by the participants of the activity and undergo changes in the process of being transformed into outcomes.

Tool. Tools can be anything used by the subject in the process of transforming objects into outcomes, including both material tools and tools for thinking.

Community. The community consists of the individuals and subgroups that focus

some of their efforts on the object. Within the activity system, the community functions to distribute cognitive responsibility among participants and artifacts.

Division of labor. The division of labor refers to explicit and implicit organization of a community as related to the transformation process of the object into the outcome.

Rules. The rules cover both explicit and implicit norms, conventions, and social relations within a community that constrain activity.

The interacting components of an activity system are organized into four subsystems. They are enumerated in the following table (Table 2.2):

Table 2.2: The subsystems of an activity

Subsystems	Relevant components
Production subsystem	Subject, Tool, and Object
Distribution subsystem	Object, community, and Division of labor
Exchange subsystem	Subject, Community, and Rule
Consumption subsystem	Subject, Community, and Object

Activities interweave with each other in a social context, and therefore are influenced by other activities and other changes in the environment. When the balance among the elements of activities is upset because of the external influence, contradictions emerge within activities, between activities or surrounding activities. Contradictions manifest themselves as misfits, disturbances, problems, breakdowns and clashes. They are considered the sources of development of activities. Bodker (1995) describes two types of contradiction that are used to study artifacts-in-use: breakdowns and focus shifts. A breakdown occurs in the use process when work is interrupted by something, whereas a focus shift is a change of focus or object of the actions or activity that is more deliberate

than those caused by breakdowns. Sometimes, breakdowns cause focus shifts when a use situation becomes the object of our learning activity.

Principle II: Object-orientedness

All activities are object-oriented. Every activity is directed towards something that objectively exists in the world. The object of an activity determines the horizon of possible goals and actions (Center of Activity Theory and Development Work Research). The transformation of objects to outcomes indicates the process in which the participants try to accomplish their goals. The motive of an activity is reflected through the object of the activity and activities are distinguished from one other according to their objects.

Principle III: Hierarchical Structural of Activity

Interactions between human beings and the world are organized into a functional hierarchy containing three levels: activities, actions and operations (Table 2.3). An activity consists of a chain of actions and it is undertaken to fulfill motives (top-level objectives). Actions are goal-directed processes to fulfill objects and can only be understood within the context of an activity. Actions are related to each other by the same object and motive, and implemented through a series of operations, well-defined unconscious routines that adjust actions to current conditions. This is not a fixed hierarchy. The relationships between activity, action and operation are dynamic, and movements are possible in both up and down directions. The activity level is the intentional level that focuses on conscious needs, values and desires; while the action level is the functional level that uses planning and problem solving to fulfill the activities (Jonassen, 2000). Therefore, the point of interest to researchers and practitioners may be at the action level, where the transformation process can be represented and understood.

However, the idea of activity helps us go beyond the immediate operations and actions to analyze the use of the tools in terms of the more comprehensive, distributed and contextualized system (Barab, et al., 2004). Focusing exclusively on the level of actions makes it difficult to understand the sociocultural and motivational basis of goal formation and problem finding (Engeström, 1999).

Table 2.3: The hierarchy of an activity

Level	Oriented towards	Carried out by
Activity	Motive	Community
⇧ ⇩	⇩ ⇧	
Action	Immediate, defined goal	Individual or Group
⇧ ⇩	⇧ ⇩	
Operation	Conditions	Routinized Human or Machine

Principle IV: Internalization and Externalization

Mental processes are derived from external actions through the course of internalization. The constant transformation between external and internal is the very basis of human cognition and activity. Social by its nature, internalization refers to the range of actions that can be performed by a person in cooperation with others - the so-called "zone of proximal development". The opposite process of internalization, the process during which mental processes manifest themselves in external actions performed by a person, is called externalization. Activity Theory emphasizes that the internal mental processes cannot be understood if they are analyzed separately from external activities. There are no boundaries between the internalization and externalization process.

In the field of HCI, internalization provides the means for people to interact with

reality without real objects (such as mental simulation, imaging, considering alternative plans, etc.). It helps identify optimal actions before actually performing an action externally. On the contrary, externalization takes place when one actually carries out a plan of an activity. It is often necessary when an internal activity needs to be repaired or scaled, or when collaboration between several people requires their activities to be performed externally in order to be coordinated.

Principle V: Mediation

Activity is usually mediated by one or more artifacts. Tools shape the way people interact with reality, and at the same time, reflect the problem-solving experience of other people. Such experience is accumulated in the structural properties of tools (shape, size, material, etc.), as well as the knowledge of how to use the tool. The use of tools is "an evolutionary accumulation and transmission of social knowledge, which influences the nature of not only external behavior but also the mental functioning of individuals" (Kaptelinin et al., 1999, p32). The systemic model based on the conceptualization by Engeström (1987) contains three mutual relationships between subject, object and community, each mediated by various artifacts (e.g. instruments, signs, procedures, machines, methods, laws, forms of work organization). The relationship between subject and object is mediated by tools; the relationship between subject and community is mediated by rules; and the relationship between object and community is mediated by the division of labor. This mediation is essential to the ways in which we can understand those artifacts and is emphasized in analyzing how people use (or will use) a computer technology.

Principle VI: Development

Activities are historically developed phenomena. They should be understood in the context of development, grasping the changes and evolution of the context over time. The development of collective activity systems exhibits itself in expansive cycles that lead to the emergence of new activity structures. An expansive cycle begins with an almost exclusive emphasis on internalization that endeavors to socialize and train the novices to become competent members of the activity as it is routinely carried out. As the activity develops, the disruptions and contradictions become more and more demanding. Internalization takes the form of critical self-reflection and externalization, as a search for solutions increases. Externalization reaches its peak when a new model for the activity is designed and implemented. The establishment of a new model starts another cycle of internalization (Engeström, 1999a).

In the field of HCI, "historical" also means that artifacts-in-use are under continuous reconstruction (Bodker, 1996). Their use changes through the influence of other artifacts and through learning – the use changes because of the drive of contradictions. The idea of development suggests that a historical analysis of the development - how tools are used over time, is often needed in order to understand an activity.

The Activity of Instructional Design Mediated by CMS

The practice of instructional design mediated by a CMS can only be understood in the environment in which a CMS is used to help instructors and learners achieve their teaching or learning tasks. As discussed before, such information about the design practice in real contexts is largely ignored in current literature. The CMS use scenarios

are complicated. A CMS could be homegrown or a commercial product; it could be used in synchronous and asynchronous online learning settings; it could be employed at different levels of integration of technology into classroom. Here, we use Engeström's (1987) model as a tool to grasp essential information to better characterize the usage within various scenarios.

Subject

Various types of subject, such as instructors, instructional designers, students, technical support staff, and administrative staff, are involved in activities mediated by CMS. In most situations, instructors or instructional designers make the majority of decisions in the process of instructional design and delivery. Therefore, to investigate the instructional design mediated by a CMS, the subject should involve instructors or instructional designers. Literature shows computer knowledge and skills, and prior experience with CMS, influence the integration of CMS in teaching and learning (Morgan 2003; Rick, 2006). Instructors usually are motivated to use a CMS for different reasons (Morgan, 2003):

- Solving a pedagogical problems or challenges (facilitating interaction with or among students, using gradebooks and assessment tools, providing additional course materials, etc.).
- Training availability.
- Peer recommendations.
- Departmental or administrative pressure.
- Student requests.
- Increasing distance education offers, etc.

Tools

First of all, tools used in the system involve CMSs (a CMS could be homemade, commercial, or open-source). They also involve other material tools used for various instructional purposes. One type of these tools could be those technologies implemented in classroom settings (Wozney et al., 2001, see Table 2.4).

Table 2.4: Instructional tools

Function Category	Examples
Instructional	drill, practice, tutorials, remediation
Communicative	e-mail, instant messaging, computer conferencing, LCD projector
Organizational	data base, spreadsheets, record keeping, lesson plans
Analytical/Programming	statistics, charting, graphing, drafting, robotics
Recreational	Games
Expansive	simulations, experiments, exploratory environments, brainstorming
Creative	desktop publishing, digital video, digital camera, scanners, graphics
Expressive	word processing, on-line journal
Evaluative	assignments, portfolio, testing
Informative	Internet, CD-ROM

The other type refers to those that support the instructional design process, such as workshops, presentations, or guidelines about how to use a CMS. When these tools (especially those not contained in CMSs) are used for teaching and learning, they play the mediated role together with CMS, and the way they mediate is likely to influence or be influenced by that of CMSs. Less tangible tools or intangible tools may be tools of thinking - instructional/learning models or methods, such as anchored instruction, case-

based reasoning, problem-solving learning, or instructional design techniques, like needs assessment and task analysis methods (Jonassen, 2000).

Object

When a CMS is involved, the object of an activity system usually is a course website in the CMS. Depending on the level of CMS integration, the course website could be used for providing online experience to various extents. The focal system suggests an ongoing process. During this process, instructors or instructional designers act on various artifacts. These artifacts can be instructional goals; learning objectives set up for given learning tasks, specific learners and learning environments; instructional decisions including decisions about selecting appropriate assessments, instructional strategies, and media, and locating relevant resources that could be used in the design. The artifacts can also be worksheets, course websites, PowerPoint presentations, or multimedia documents, etc. The object is transformed during the activity process into outcomes – online teaching and learning experience.

Community

In this activity system, depending on how the subject is defined, the community may involve students, instructional designers, teaching assistants, technical support staff, faculty who adopt CMSs, and administrators.

Division of labor

There are many different ways in which a course can be developed. The model chosen for the course design and development depends on the scale and complexity of the course and the centrality of the use of technology. Different choices reveal different ways that the instructional labor is divided among the community. Bates and Poole (2003)

describes four models: the Lone Ranger Approach, the Boutique Course Development, the Collegial Materials Development, and the Project Management Model.

The Lone Ranger Approach - This is the most common model of course development. Instructors work on their own or with the help of a part-time graduate student and some equipment or software. However, Bates and Poole (2003) strongly recommend that instructors seek specialist help and support, when they work with technology.

Boutique Course Development - In this model, an instructor approaches an instructional support unit for professional assistance on an individual, one-on-one basis from an instructional designer or technical support person. This model is useful in helping individual instructors start using technology in a systematic and professional way.

Collegial Materials Development - Several academics who teach common subjects work *collaboratively* to develop online or multimedia educational materials (they may come from the different departments or even different institutes). They share ideas, develop or share materials, and provide critical feedback to one another.

Project Management - When instructional projects become complex because more types of media or instructional strategies are employed, or the scope is expensive, course development needs to take a project management approach which involves a team of individuals, each contributing different skills.

Faculty members believe that peer recommendation is a significant factor influencing their adoption and use of technology, but they rate student requests as a minor factor driving their adoption (Morgan, 2003). Being interested in the mediated role of CMS in teaching and learning, we need to pay attention to those who exert their

impact on instructional decision making related to how to use CMSs pedagogically, and who use CMSs to provide instructional support (division of labor), such as instructional designers.

Rules

Different communities negotiate different rules and customs that regulate the activities of the system in terms of personal needs and inherently guide their actions or activities (Jonassen, 2000). To some degree, rules suggest which types of tools may be used in the activities and how tools may be used to mediate the process. In this case, different levels of Web integration (Harmon & Jones, 1999; Bonk, Cummings, Hara, Fischler & Lee, 2000) may indicate different rules mediating the use of tools. Harmon and Jones (1999) suggest five levels of the use of the Web in class, which represent a continuum from basic occasional use to advanced continual use. These levels differ from each other in terms of various factors, such as distance, stability of materials, need for multimedia, need for student tracking, number of students, amount of interaction, social pressure, need for offline reference, infrastructure, comfort level and access. The five levels are:

Level 1- Information Web use – Providing relatively stable info that typically is administrative – syllabus, course schedule, contact info (not course content). Learners access for reference purpose and review it on a frequent basis. The website is easy to develop and needs little daily maintenance.

Level 2 - Supplemental Web use: Providing course content information, such as course notes and handouts. Information is not critical to the course and learners do not access the site on a daily basis. The website is slightly difficult to manage.

Level 3-Essential Web use: Providing most of the course content online. Classes still meet face-to-face, but students cannot be productive members of the class without regular web access. The website is difficult for an instructor to manage.

Level 4- Communal Web use: Employing various online tools in instruction and learning. Classes meet both face-to-face and online. Ideally, learners generate much of course content. Both instructors and students need to have effective computer skills.

Level 5- Immersive Web use (no face to face meeting): All of the course content and course interactions occur online. Instructional strategies combine both constructivist and traditional approaches. Both instructors and students must have a high level of technical expertise and sophisticated learning strategies.

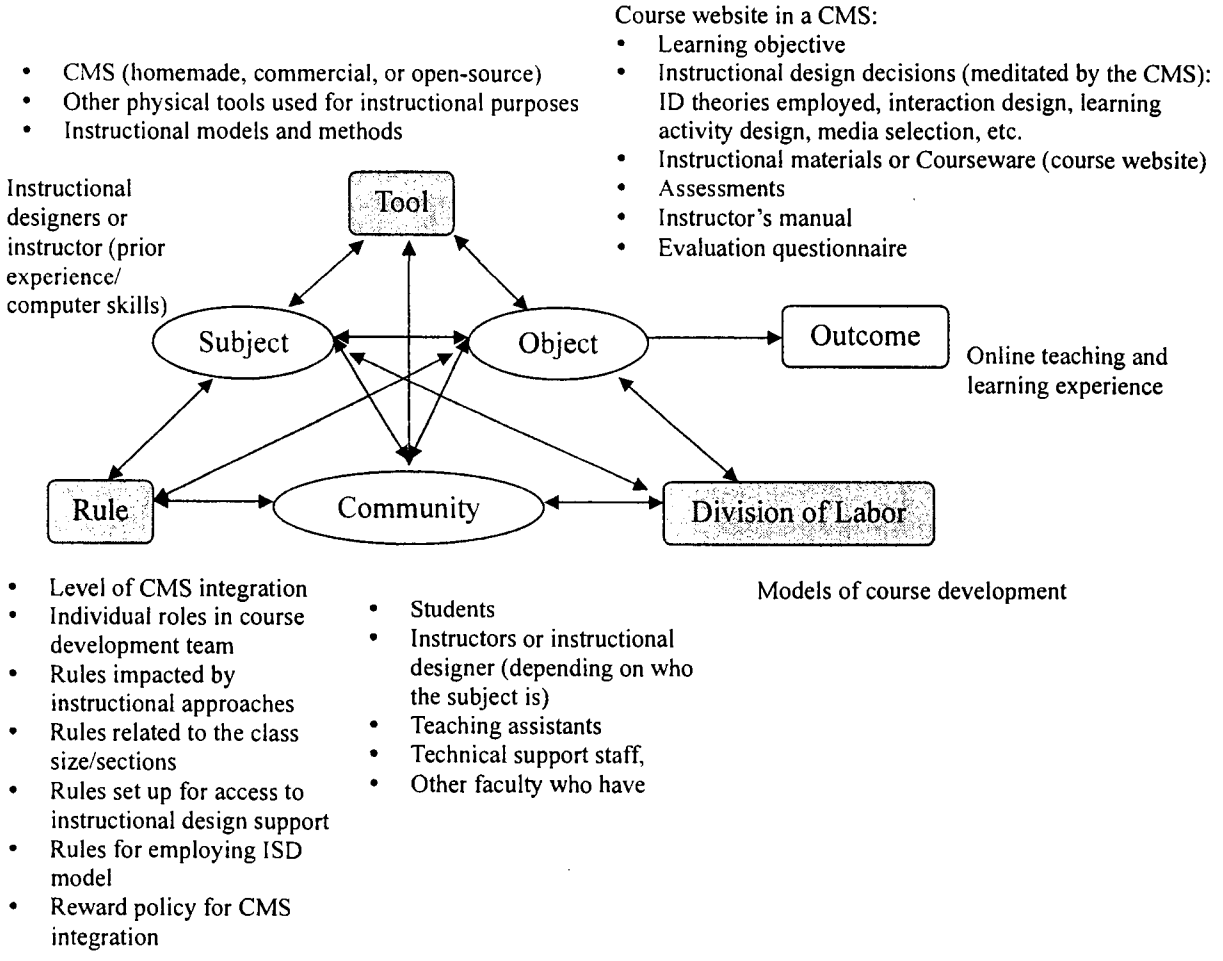
University of Central Florida labels the use scenarios of CMS as: W course (delivered entirely over the Web, no regular class meetings), M course (some face-to-face instruction is replaced with Web instruction so that on-campus time is reduced), E course (delivered entirely in face-to-face mode, but with Web enhancements).

The organization of the community may also exert influence on the negotiated rules. The choices of course development model mentioned above indicate the ways the community is organized and individual roles in the activity. Instructors may be more willing to take a constructivist approach to teach and evaluate, or provide multimedia materials when they have ready access to instructional designers and technical support staff. And the acceptance of constructivist approaches means employing constructivist tools in the activity system and "authentic" learning assessments other than multiple-choice tests (Mara, 2001; Reeves, 2002). In addition, rules for teaching and learning may vary in terms of the size of classes. For example, constructivist models and methods may

be hard to implement in large classes, and when classes have more than one section, additional rules for sharing information across sections may be important. Literature also shows that reward policies and administrative requirements for integrating technology in classroom influence the use of CMS (Morgan, 2003). However, since the focus of this study is the mediating role of CMS, such administrative policies will not be the central interest.

The summary of the analysis of the activity system mediated by a CMS is presented in Figure 2.3.

Figure 2.3: The activity of instructional design for online learning



CHAPTER THREE: METHODOLOGY

Case Study and Activity Theory

Qualitative research is useful for exploring and understanding a central phenomenon (Creswell, 2001), obtaining an in-depth understanding of the meaning and the definition of the situation presented by informants, rather than producing a quantitative measurement of their behaviors or characteristics (Wainwright, 1997, p.1). This study explores the instructional design experience mediated by a CMS in a context over which the investigator had no control. It aims to reveal the mediating role of a CMS by analyzing and interpreting detailed descriptions of the behaviors and opinions of instructors and instructional designers involved. Therefore, the methodological framework adopted for this study is based on a qualitative research paradigm.

Taken further, Yin (2002) suggests that the case study strategy is considered when one "investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p13). Researchers "generally do case studies for one of three purposes: to provide detailed descriptions of a phenomenon, to develop possible explanations of it, or to evaluate the phenomenon" (Gall, Borg & Gall, 1996). Through illuminating a set of instructional decision-making process mediated by a CMS, the study seeks answers for questions such as why these decisions are taken, how they are implemented in the activity systems we study, and with what results. All these questions are the major foci of case studies (Yin, 2002). Given the nature of the research questions, this study adopts a descriptive qualitative case study strategy as the major research method, producing rich description of the phenomenon of interest and the real-life context in which it occurs.

In this case study, Activity Theory acts as a research framework to structure the analysis of the mediated practice of instructional design. The framework was used to:

- Break down the main research questions into sub-questions through analyzing the mediating role of a CMS.
- Define the unit of analysis in case study design.
- Help generate the observation protocol and interview questions for data collection.
- Provide coding schema for data analysis.
- Organize data analysis to understand the practice of instructional design mediated by a CMS.

Relining Research Questions

When we analyze how people use (or will use) tools in terms of Activity Theory, the principle of mediation is highly emphasized. The subsystem that is most relevant to our purpose is the Production subsystem. We are interested in how this subsystem operates during the instructional process when it interacts with other subsystems at the same time, and how a CMS functioning as a tool in this system mediates the activity of instructional design. Systemically combining the principle of mediation with the other four principles (see the literature review), Kaptelinin et al. (1999) propose that the use of a target tool should be studied from four perspectives. The four perspectives helped break down the secondary research questions as follows:

Means and Ends. From this perspective, the analysis should focus on the extent to which a tool facilitates and constrains the achievements of users' goals and the impact of the tool on provoking or resolving conflicts between different goals.

Sub-question 1- In a given situation, to what extent does a CMS facilitate and constrain the attainment of instructional goals?

Social and Physical Aspects of the Environment. The use of tools is considered in the context in which they are used – how they integrate with requirements, other tools, resources, and social rules of the environment.

Sub-question 2 - How are the characteristics of a CMS consistent with the nature of the social and physical environment in which it is used by instructors/instructional designers?

Learning, Cognition and Articulation. This perspective concerns the internal and external components of an activity and the support for the mutual transformation with the tools studied.

Sub-question 3 - How can the instructional design activities mediated by a CMS be externalized and supported by human beings and external artifacts involved in the activity, including a CMS?

Development. Development refers to the developmental transformation of the foregoing components as a whole.

Sub-question 4 -Are there any changes to the ways of instructional design because of the implementation of the CMS?

Case Study Design

Multiple-case Design

Yin (2002) differentiates four types of case study design in terms of the number of cases involved and the number of units of analysis in each case. They are: single-case (holistic) design, single-case (embedded) design, multiple-case (holistic) design, and

multiple-case (embedded) design. A study using multiple-case designs is often considered more convincing and robust. Therefore, this study takes the multiple-case (holistic) design approach, studying more than one case, with each case focusing on only one unit of analysis (involving only one type of subjects – instructional designers). Since a multiple-case study requires extensive resources and time, this study chose three cases to meet its research purpose. The researcher wants to reveal cross-case patterns and make literal as well as theoretical replications across cases (looking for similar as well as contrasting results across cases).

The *unit of analysis* of a case study defines "what the 'case' was" (Yin, 2003). In this study, the model of Activity System (Engeström, 1987) and related principles set up the boundary of the cases. The *unit of analysis* was defined based on the following understanding of Activity Theory:

First, the object of an activity distinguishes one activity form another. It determines the horizon of possible goals and actions (Center of Activity Theory and Development Work Research). There is only one object of an activity, no matter how many motives are involved (Kaptelinin, 2005).

Second, the unit of analysis of Activity Theory is defined as "object-oriented, collective, and culturally mediated human activity, or activity system. Minimum elements of this system include the object, subject, mediating artifacts (signs and tools), rules, community and the division of labor (Engeström & Miettinen, 1999, p9). "

Third, the trajectory of an activity system moves through an expansive cycle and leads to the emergence of a new activity structure (Engeström, 1999).

According to the purpose of the study, the unit of analysis for this case study is

the instructional design process in which a designer uses a CMS to design, develop and deliver online learning in a collaborative manner. When a case is related to an event or a process, specific time boundaries are needed to define the beginning and end of the case. The beginning points of the units are the time when the designers were assigned to the targeted projects in Case One and Two, and the instructor started to design his own course in Case Three. According to the systematic instructional design models (e.g. ADDIE) and the expansive cycle of an activity, the end points of the units are the time when the designers or the instructors had received feedback from the users after the first delivery of the redesigned courses. At that moment, new activity structures or the needs for new structures started emerging.

The Development of Theory

The development of theory in the research design phase and before the data collection is one point of difference between case studies and related methods such as ethnography and "grounded theory", which deliberately avoid specifying any theoretical propositions at the outset of an inquiry. The goal is to have a sufficient blueprint for the ensuing case studies, providing guidance in determining what data to collect and the strategies for analyzing data. For a descriptive case study, a "theory" is illustrated in a statement addressing:

- The purpose of the descriptive effort.
- The full but realistic range of topics that contribute to a complete description of what is to be studied.
- The likely topic(s) essential to the description (Yin, 2002, p30).

This study uses Activity Theory as a tool to explore the mediated practice of

instructional design to examine: (a) the mediating role of a CMS and, (b) the distribution of cognitive intelligence ID, in various contexts. It was assumed that:

- The mediating role of a CMS is to some extent context-based, depending on who uses it, how it is used (rules and division of labor) and what other tools are involved. The requirements for a CMS vary across contexts in which it is employed.
- The cognitive intelligence of instructional design distributes among human and machines. The instructor needs more support than technical training.
- New ideas of instructional design may be generated because of the use of CMS as design, development and delivery system.

Qualitative investigation is a process of "continually shifting back and forth between deductive and inductive modes of thinking" (Merrian, 1998, p.192). The propositions proposed at the beginning of the study were modified and solidified[1] along with the iterative data collection and analysis.

The Selection of Cases

A major intention of this study is to investigate the influence of context on the performance of instructional design. Three cases were deliberately selected because they offered some similar as well as contrasting situations which may, as Stake (1995) suggests, maximize what we can learn. The selected cases all took place in higher educational institutions in Canada. Two CMSs and a similar system were used as a design and development tool, as well as a delivery system. However, the levels of CMS

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[1] One of the reasons to modify the propositions is that the main participants in three cases shifted from instructors to designers.

integration and the pattern of division of labor varied across the three cases. When selecting cases to study the mediated instructional design practice, the researcher took two common issues into account:

First, the practice could be an individual or a collective practice, depending on the course development model (Bates & Poole, 2003) that was followed. Therefore, the mediation of a CMS could vary from one model to another.

Second, the majority of faculty members use a CMS to enhance face-to-face classes (e.g. Morgan, 2003; Bates & Poole, 2003). Mostly, their levels of CMS integration are at the lower end (Information Web use, Supplemental Web use and Essential Web use, according to Harmon and Jones, 1999). The design and development of a blended learning or online learning course may provide more information to understand the mediating role of a CMS.

Hence, the cases selected for this study are:

Case One - The designer, who described herself as a pragmatic constructivist, was assigned to work with an instructor to turn a face-to-face course into a blended learning course. The class had regular size (about 35 students). The instructor had few experiences with CMSs and no clear intention to take a constructivist approach in the design. The responsibility for maintaining the course was transferred to the instructor after the project.

Case Two- The designer worked closely with the course team that included a professor, two tutors, and other development staff to integrate online learning components into a traditional distance education course that has more than one hundred students registering to the course on a continuous base. The university owns the course and is responsible for its delivery and maintenance.

Case Three- The instructor, who is an expert in educational technology, transformed his own face-to-face course into an online version with an incentive of applying constructivist learning strategies in the online environment. He collaborated with his students and engaged them in the design process. The course had more than eighty students.

Data Collection

Yin (2002) claims that the case study inquiry "relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result" (p.14). In addition, Nardi (1996) summarizes the methodological implications of Activity Theory that provide guidance for data collection and analysis. There are four guidelines:

- A research time frame long enough to cover the processes of formation so that we can understand user's objects, especially the changes of objects overtime.
- Attention to broad patterns of activity rather than decontexturalized episodic fragments.
- The use of various data collection techniques such as interviews, observation, historical materials.
- An obligation to understand things from user's perspectives.

Data Collection Methods

With the above mentioned guidance in mind, the researcher used an interview method as the major *data collection method*, combining this with observation, and reviewing relevant documents. *Interview* is one of the most important sources of case study data. Rubin and Rubin (1995) view interviews as a means to obtain thick descriptions from cultural environments, creating a basis for interpretation and for

planning change. Instead of interviewing and surveying a wider number of people, as has been done in previous research (e.g. Searwright et al., 1999; Holloran, 2002; Morgan, 2003; Ansorge & Bendus, 2003), the researcher focused on the subjects selected and conducted a series of semi-structured interviews on different stages in the instructional design process. The purpose was to obtain in-depth descriptions of the whole instructional design process in context, reflected through the lens of Activity Theory, to reveal the mediating role of a CMS. *Direct observations* were used to obtain additional information about the topic being studied. *Relevant documents* such as design documents and other relevant historical materials, as well as those objects produced during the instructional design process, were also studied to increase the credibility and accuracy of the investigation.

Participants in this study, include instructional designers who had experience with, and were working with, a CMS in three universities in Canada. The original plan was to interview instructors who design and develop an online learning environment on their own or with the support of designers. Because of access issues and the worry that novices to CMSs may not be able to provide rich information in terms of using the technology, the researcher shifted the focus to the practices of experienced designers. The data were collected from three course redesign projects that ran between July 2006 and May 2007.

Prior to commencing the main study, ethics approval was obtained from the ethics committee at Concordia University. Participants received a letter explaining the goal and the purpose of the study and a consent form to sign for their participation. They agreed to be audio taped in the interviews and observations. Participants are not referred to by their

full name in this dissertation. Having obtained the permission to conduct the research and received the consent forms signed by the participants, the investigator conducted the study in three phases:

Data Collection Procedures

Phase I – observing design meetings and reviewing related documents in Case One. The researcher started with observing design meetings in Case One and collecting relevant documents. The observation covered almost the whole process. There were seven meetings (each lasted about two hours) observed and audio taped. The data were then analyzed to identify main collective actions in the instructional processes which would be addressed in the following interviews.

Phase II – interviewing the designer and the instructor in Case One. Based on the analysis of the data from phase I, the researcher conducted two one-and- half hour interviews with the instructional designer: The first one took place after the major course design/development had been done and before the first class was delivered; the second one was conducted in the middle of the semester after the designer got some student feedback from a course evaluation survey. The third interview with the instructor (about one hour) was conducted at the end of the semester to understand the activity from another perspective. The researcher also had informal conversations with the designer during and after the project to clarify confusing information and follow up with the course revision. During the interviews, screenshots and related design documents were collected and reviewed. The interviews, combined with observation and document reviews[2], reflected the current instructional design experience and attentions was put to

[2] See Appendix A for the list of documents reviewed for this study.

broad patterns of activity rather than decontextualized episodic fragments.

Phase III - looking for cross-case patterns. To generalize the results from Case One, the researcher collected data from two other course design/development projects at other Canadian universities: cases Two and Three. The major data collection method was still interview, supplemented with relevant document review (design documents and course websites). The interviewee in Case Two was an instructional designer; and in Case Three, an instructor who redesigned his own course and moved it into an online environment.

Table 3.1: Data collection methods and participants

Phase	Case	Methods/ Participants		Purpose
Phase I (July, – Sept. 2006)	Case One	Non-Participant Observations	Seven observations of the design meetings	• Identifying major design processes and sub-processes that would be addressed in the following interviews. • Looking for answers for the research questions at the target action level.
		Document Review	Design/ development documents	
Phase II (Oct. – Dec. 2006)	Case One	Interviews	Three interviews (2 with the designer and I with the instructor)	Looking for answers for the research questions at the target action level.
		Document Review	• Design/ development documents • Course website (including learning materials) • Home-made WeBCT training documents	

Phase III (April – May 2007)	Case Two	Interviews	Two interviews with the designer	Looking for cross-case patterns and contrasting results for predictable reasons.
		Document Review	• Design documents • Course website (including learning materials)	
	Case Three	Interviews	One interview with the instructor (who acted as designer)	
		Document Review	Course website (including learning materials)	

Instruments

Activity Theory does not provide ready-made solutions that can be directly applied to specific problems (Kaptelinin et al., 1999). To facilitate the application of the framework, Kaptelinin et al., (1999) introduce an analytical tool – the Activity Checklist. It helps researchers and designers ask meaningful questions while they seek for solutions. The checklist has two versions: One for design and the other for evaluation purposes. "Both versions are used as organized sets of items covering the contextual factors that can potentially influence the use of a computer technology in real-life settings (Kaptelinin et al., 1999, p32)." In this study, to understand the mediating role of a CMS, the researcher used the checklist as a reference to develop the observation protocol and interview questions. According to Activity Theory, the concept of the action level of an activity is the central research interest (Engeström, 2000). Interview questions were generated to reveal the interactions among the components within the activities of interests at the action level. (An activity consists of three hierarchical levels: activity,

actions, and operations and actions may contain many levels of sub-actions).

In qualitative research, the data collection and analysis are interconnected behaviors. Researchers need to collect and analyze data to determine what questions to ask in an emerging design (Creswell, 2001). Therefore, the predesigned questions were adjusted based on the topics emerging from the preliminary data analysis and specific case scenarios (See Appendix B for the observation protocol and interview questions). The data collection stopped when the researcher found there were enough data to cover the lifecycles of the activities studied and reveal the relationships among the components of the activity systems.

Data Analysis

Data analysis in most qualitative research is an analytic inductive process. The procedures involve look for patterns, links and relationships that help researchers make meaning from the data (Savenye & Robinson, 2004). The main analytic strategy used in this process was "developing a descriptive framework" as suggested by Yin (2002, p111), while, the main technique used to support the analytic strategy was cross-case analysis – individual cases were examined for cross-case pattern to achieve a literal, as well as theoretical replication across cases. The preliminary propositions developed for the study led the analysis, helping the investigator focus on certain data and ignore others.

Transcribing Audio Data to Texts

Audio data from interviews and observation were first transcribed to texts for further analysis. One of the main purposes of Phase I in which the researcher observed seven design meetings was to identify major design processes and sub-processes that would be addressed in the following interviews. Given the large amount of data collected

from observations in Case One, the researcher decided not to transcribe the data word by word, but to chunk them into meaningful themes (sub-process or tasks) and summarize the key points of each piece of the conversations. Conversations that had nothing to do with the study, such as greetings and conversation about other projects, were ignored. The data were analyzed to identify main instructional processes and sub-processes, as well as the main components of the activities of interest which would be addressed in the following interviews. All audio recordings from interviews were transcribed word by word to answer the research questions. The researcher only went back to transcribe parts of the observation data word by word as they were necessary to support the findings from the interviews during the data coding stage.

Data Coding

The transcribed data were then imported into HyperResearch, a tool for qualitative data analysis, and analyzed using the technique of microanalysis suggested by Strauss and Corbin (1990). The process began with *open coding* in which data in interviews were scanned line by line to generate initial themes. Simultaneously, the axial coding techniques were used and codes were generated to map the components of the target activity systems. According to the principle of development in Activity Theory, the data analysis focused on tracking the transformation of objects in main actions and sub-actions. Interactions among the components of target activities were examined for their impact on the transforming process. The analysis of transformation and the related interactions within the target activities reveal the course design and development processes in real contexts. The same set of codes was used to code the three cases in order to find cross case patterns (see Appendix C for the coding protocol).

Special attention was paid to conditions and consequences of contradictions – the source of development. By asking the questions on the checklist recommended by Bødker (1995, p.167) during data analysis, the researcher was able to locate focus shifts and breakdowns during the instructional design process. The comparison between the original goals of the actions and the real object that was worked on tells whether there were contradictions emerging. Besides, mapping the activity system manifests the causes of the contradictions and how they are solved. (See Appendix E for the checklist for HCI analysis through focus shifts and breakdowns.)

Based on the in-depth analysis, the researcher developed a descriptive framework recommended by Yin (2003). The framework was used as a storyline to synthesize and present case analysis, and reveal the complex nature of instructional design. Within each case report, the researcher provides data from extensive interviews and other documents, showing the sources of the findings. Across cases, major categories regarding the mediated instructional design practice were covered in a replicative design - the framework was also used to compare and contrast data from all three cases to identify cross-case patterns. The preliminary propositions, therefore, were refined and fleshed out within individual cases and across cases to bring more insights into an instructional design practice mediated by a CMS.

Reliability and Validity of the Study

Lincoln and Guba (1985, cited by Syvenye & Robinson, 2004) point out that the quality of naturalistic research rests in trustworthiness of the study and its findings. Many researchers agree that the meaning of "validity" and "generalization" used in qualitative research is somewhat different from that in quantitative studies. Validity in qualitative

research concerns that whether the accounts accurately describe specific events and situations (descriptive validity) or reflect the perspectives of the individuals included in the accounts (interpretive validity). It also concerns whether the accounts appropriately characterize some phenomenon (theoretical validity) and whether the theory developed in a particular situation or population explicate a same process in different situations –how the certain process, in different situations, can lead to different results (generalization) (Maxwell, 1992). Yin (2002) further explains the "generalization" in case studies through distinguishing "analytic generalization" from "statistical generalization". The analytic generalization is achieved through multiple-case study design, a replication logic (literal or theoretical) other than the sampling logic embedded in statistical generalization.

Yin (2002) believes that four tests are commonly used to establish the quality of any empirical social research: reliability, construct validity, internal validity and external validity, are relevant to case studies, too. He identifies several tactics for dealing with these tests. The following table (Table 3.2) lists the tactics that are recommended by Yin and have been used in the study (This is a modified version of the table presented by Yin, 2002, p.34).

Table 3.2: Reliability and validity strategies

	Case Study Tactics	Research Phase
Validity	• Use replication logic in multiple-case studies: Three different scenarios were purposefully chosen and studied.	Research design
	• Use multiple sources of evidence (triangulation): To enhance the validity of the study, the researcher collected data from interviews, observations and other relevant documents.	Data collection
	• Establish chains of evidence: The researcher conducted the research in a way that allows the readers to follow	Data collection

	the derivation of any evidence, ranging from initial research questions to ultimate case study conclusions. The dissertation documents the investigation procedure in details so that readers can track the research steps in either direction – from conclusion back to initial research questions or vice versa.	
	• Have informants review draft data analysis to clarify misunderstanding and confusions: Three cases were reviewed by the informants, and they all expressed that the cases reflected what they had done and thought.	Data analysis
Reliability	• Use case study protocol: Generating a case study protocol that contains instruments, procedures as well as general rules for data collection. It kept the researcher targeted on the subject of the study and helped anticipate potential problems.	Data collection
	• Develop case study database: Creating an evidentiary database for the raw data that is separate from the case study report and includes notes, documents, tabular materials and narratives so that it is available for independent inspection.	Data collection
	• Randomly selected sample data were coded by a second coder. See the values of CR and k in Table 3.5.	Data analysis

To increase the reliability of the study, a second coder was invited to code sample data to see if they could identify the same categories of analysis in a reliable and consistent manner. Given the large amount of data, having all the data recoded was not a feasible strategy. Therefore, the researcher randomly selected some samples from the transcripts of two data sources: observations and interviews. The total number of lines in these transcripts was calculated separately and divided into units of 28 lines to generate usable samples. Each unit was given a number as identification. To make the recoding procedure manageable, the researcher decided to select 5% of the data from interview and 4% from observations. The random selection was carried out by an online random

sampling applet (http://www.dougshaw.com/sampling/). In total, five units from interview transcripts and two units from observation transcripts were selected.

The second coder was a Ph.D student who majors in instructional design. She was provided with data samples, the coding protocol (see Appendix C) and some coding examples from the researcher. Given that the data were collected in observations and semi-structured interviews over which the researcher had no or little control and were about complicated activities, it could be hard for the coders to locate meaningful transcripts out of context (only 4-5% data were selected). To facilitate the recoding, the researcher highlighted meaningful texts in each sample so that the second coder could map the transcripts with the codes in the coding protocol (see Samples in Appendix D).

The inter-rater reliability was measured by calculating the coefficient of reliability (CR) (Holsti, 1969) and the Cohen's kappa (k) (Cohen, 1960).

$CR = 2m / (n_1 + n_2)$

Where: m= the number of coding decisions upon which the two codes agree

n1= the number of coding decisions made by rater 1

n2= the number of coding decisions made by rater 2

$k = (F_O - F_C) / (N - F_C)$

Where: N = the total number of judgments made by each coder

F_O = the total number of judgments on which the coders agree

F_C = the total number of judgments for which agreement is expected by chance

The Cohen's kappa was calculated by SPSS. The codes were numbered (see Appendix C). Number 0 was applied in the situation where one rater was not able to apply a code. In SPSS, a kappa calculation cannot be computed on a non-symmetric table.

For example, the researcher used Code 24 in Case One, but not the second rater. To make the table symmetric, the researcher removed the unbalanced codes while retaining the information from every coding. The researcher first determined which values were not used by both raters; then changed each instance of these codes to some other value that was not the value chosen by the second rater before running the procedure in SPSS. Data collected from observations and interviews in Case One were treated as data in one unit of analysis, since the same coding protocol applied to data from both interviews and observations. The inter-rater reliabilities are report in the following table (Table 3.5).

Table 3.3: Radom sampling for data recoding

Data Source	% Selected	Total Number of Lines	Settings of Random Sampling Applet	Numbers Randomly Selected by the Applet
Interview	5%	2803	The set is from 1 to 100. The set of size: 5. Do not allow repeats.	8, 23, 35, 62, 84
Observation	4%	1451	The set is from 1 to 52. The set of size: 2. Do not allow repeats.	25, 42

Table 3.4: Sampling data and their sources

	Case One	Case Two	Case Three
Codes Applied	24	11	5
Decisions made by Rater 1	78	31	8
Decisions made by Rater 2	71	30	7
CR	.859	.918	.93
k	.7793	.795	.852

[3] In Case One, k for interview data was .806 and k for observation data was .797.

Table 3.5: Inter-rater reliability

Unit No.	Interview	Unit No.	Observation
No. 8	Case Two	No. 25	Observation Three in Case One
No. 23	Case Two	No. 42	Observation Six in Case One
No. 35	Case Three		
No. 62	Case One		
No. 84	Case One		

The values of the coefficient of reliability (CR) were higher than those of kappa (k) in which chance agreements were taken into account and corrected statistically. The values of kappa were between .779 and .852, suggesting strength of agreement at a "Substantial" level or higher (Landis & Koch, 1977). Although the recoding procedure was not applied to the whole data set, the reliability and validity of the study was enhanced by employing various research tactics recommended by Yin (2003), such as multiple case study design, data triangulation, informant review and keeping a case study protocol (See Table 3.2 for a summary).

The Role of the Researcher

In qualitative research, the researchers are themselves major instruments. The way they act in the case studies has implications for the meaning of the case and the important issues that will be developed, but no clear guidance is available for making such choices (Stake, 1995). In this study, the researcher acts as an interpreter, the agent of new interpretation, new knowledge, and new illusion. As Stake (1995) describes, as an interpreter, the researcher sometimes points out what to believe and facilitates readers' understandings that exceed the comprehension of the researcher. By using the methods and tools provided by Activity Theory, the researcher analyzes three activities of

instructional design through a systemic perspective and highlights the impact of internal and external contexts – tools, rules, division of labor, and motives and goals – on the design decision making process.

Limitation of the Study

Because of lack of resources and access to research sites, as well as time constrains, the study comprised only three cases (Interviews in Case Two were conducted from remote, using a web tool – Skype). According to Yin (2002), to pursue two different patterns of theoretical replications, four to six cases are needed. The first limitation of this study may be attributed to the deficient theoretical replication due to the limited number of cases selected. It influences the generalization of the study's results.

Additionally, the study was conducted by one investigator. Louisy (1997) points out "no social activity is value free" (p201). There is always a chance that the data interpretation is colored by bias, especially when there is only one person involved in observation, interview and data analysis as is the case in this study. As an instructional designer who has worked with different CMSs, the researcher could interpret the data based on her own experience rather than the data collected. Although the draft data analyses were reviewed by informants for confirmation, the potential of bias to influence the study still exists, and may exert a negative impact on the reliability of the study.

Lack of resources and access to the research sites and time constraints brought other limitations to the study, such as lack of opportunity to make full use of Activity Theory to investigate the details of human-computer interaction over time. In addition, the investigator's lack of extensive qualitative research experience also made the task more challenging.

CHAPTER FOUR: CASE STUDIES

Case One

Context – The Activity System of Instructional Design

In summer 2006, the *Center for Continuing Education* (Cont Ed) at a Canadian university launched a pilot project to develop blended learning courses and deliver them in the fall semester. The major course design and development initiative lasted for about six months and aimed to utilize advanced educational technologies to:

- Offer learning flexibility to their learners, who primarily who are professionals.
- Provide online learning experience to the professionals who would encounter online training in their own working environment (*Motives*).

To enhance the quality of the course, the center of Cont Ed chose to collaborate with the *Instructional Multimedia Center* (IMS)[4] at the university (*Division of Labor*).

IMS provides two major consulting services addressing technology-based teaching and learning issues: *Teaching Technology Services* and *Courseware Production.* The team of Teaching Technology Services consists of a group of instructional designers/ trainers. They offer workshops and one-on-one consultation to faculty members, helping them with the implementation of new technologies both inside and outside the classroom (*Rule, Division of Labor*). The Courseware Production team, which consists of audio, video and graphics experts, is responsible for designing, developing and producing electronic materials for interactive teaching and learning. The design and development of

[4] Due to an organizational change, IMS has been renamed Content & Collaboration Solutions.

a blended learning environment for professional learners was a collaborative process in which the instructor worked closely with an instructional designer from IMS and other team members.

The pilot project started off with four courses. However, only one, which is studied here, succeeded in running as a blended learning course in fall 2006; the others were still taught in the classroom with some support via technology. The teachers of those three courses could not come to terms with the amount of work to prepare a blended learning course. Furthermore, they did not have enough knowledge and skills to understand the concept and practice of online learning. In their point of view, online learning amounted to loading PDF files on the course websites.

The only successful course was a required course for a certificate program related to Human Resources Management. It had been offered face-to-face for many years. The Center of Cont Ed wanted to convert it into a blended learning course that was going to be delivered through WebCT Vista, version 3 (WebCT Vista), the CMS supported in the university (*Tool, Rule*). Usually, there are about 30-35 adult students registering for the course each term. The students are mostly professionals who work and have other responsibilities, and their levels of computer skills vary. Given that the project was only launched in summer 2006, the students who had registered for the fall semester would not know that the course would be a blended learning course until their first class (*Rule*).

The course design and development – the activity system studied began with a kick-off meeting in which an instructional designer was introduced to the instructor. It ended after the designer and the instructor collected feedback from the students to revise the course design. The process of revision exhibited the need for a new activity structure

to solve the problems emerging during the first delivery of the course, the instructor wanted to have support outside the current activity system.

The project started with a team that included a project manager, who is the director of E-Learning & IT Resources at the Center of Cont Ed, the instructor, and an instructional designer from IMS. The instructor (*Community*), the main support actor in this study, volunteered to participate in the project. He is one of those instructors "who always does a good job but want to do it even better" and was looking for new ideas concerning teaching and learning - "I used to lecture a lot. Now I don't lecture a lot. That is why I am coming to this [project]... to have some balance." (*Motives*) (Observation, July 10, 2006). However, he volunteered only on condition he would get solid support for using technologies. Although he had used WebCT Campus Edition before, his experience with a CMS was mainly about uploading course notes to support his face-to-face instruction. With respect to using a CMS to offer blended learning experience, he was completely naïve. At the beginning of the project, the instructor was quite skeptical of the effectiveness of online learning, since his experience told him that "most students want structure. They want lectures" (*Rule*) (Observation, July 10, 2006).

Fortunately, the instructional designer (*Subject*), the leading actor in this study, was an experienced designer, who not only had studied as a distance learner, but also had used more than one CMS to design and develop online learning environments. Her experience as a learner as well as a designer told her that online learning "actually works better in some ways, since everyone can make contribution". "If the activity is well prepared for them (students), in fact, they do learn more." Well designed learning activities force students "to be active" and "force them to really participate, much more

than in a classroom." She sees herself as a "pragmatic constructivist" rather than a radical one, who prefers designing learning environments with constructivist learning activities embedded, as well as "enough structure" to guide students' learning (*Rule*) (Observation, July 10, 2006).

The practice of the instructional designer is the focus of the case study. To facilitate the analysis of instructional design experience that is mediated by a CMS, let we look into the case through the lens of Activity Theory and focus on:

- The design/development process driven by goals at various levels.
- The mediation of tools and rules in the design and development of a blended learning course.
- The distribution of labor for a collaborative design/ development process.
- Contradictions in the activity system of instructional design.
- Transformation of the activity system: what had been changed and what had been learned overtime.

Process of Learning Design – Goal-driven Actions

The activity of instructional design contained a chain of actions inherent in the collaborative process. The actions consisted of sub-actions and involved interactions among the components of the design activity. Major actions in this project were:

- Analyzing learning context and proposing rough desing.
- Envisioning course delivery and designing a "Learning Path".
- Refining the "Learning Path" and prototyping a course website.
- Developing the course website in a collaborative manner.
- Providing learner support and on-the-fly adaptation.

- Reflecting and revising course design.

Analyzing Learning Context and Proposing Rough Design

The designer analyzed the blended learning context together with the instructor and motivated him by assuring him of the effectiveness of online learning, and at the same time, preparing him with required knowledge and skills (*Goal*).

In the first meeting, the designer and the instructor had a discussion (*Tool*) about the curriculum, the characteristics of students, and the major instructional strategies used in classroom, e. g. role-play, case study, and group discussion. The designer described the "rough vision" of the course design (*Object*) - how technologies help "simulate" in-class interactions in an online environment, and reassured the instructor that online learning could be as effective as the face-to-face modality. Given the nature of the project, the rough vision also included decisions to keep existing learning objectives and replace in-class presentations with their online versions. The online presentations would be recorded by Camtasia, a screen-recording software application.

During the second and third meetings, the designer provided the instructor with training (*Tool*) on using WebCT Vista and Camtasia, the tool that would be used for narrating his PowerPoint lectures. The focus was on how to use technologies to realize the "rough vision" of the course design. The customized training helped the instructor to acquire the knowledge and skills he needed for not only preparing but also teaching the blended learning course (*Object, Division of labor*).

Envisioning Course Delivery and Designing "Learning Path"

The course development model used at the beginning of the project was the Boutique Course Development (Bates & Poole, 2003), in which the instructor approaches

an instructional support unit for professional assistance on an individual, one-on-one basis provided by an instructional designer or technical support person (*Division of Labor*). First, as the designer had asked for during their first meeting, the instructor drafted the lesson plans that described the learning content, learning activities, and assignments (*Object, Division of Labor*). Then, the designer designed a course map (*Object*) based on the course plan and presented it to the instructor at their fourth meeting. The following analysis focuses on the sub-action in which the course map was produced to generate answers for the two research questions.

Based on the previous discussion, the designer proposed to:

- Design a blended course whose main learning strategy would be online group discussion in which students would work with different class members on different authentic problems.
- Design the course in a way so that the task of development and maintenance could be easily transferred to the instructor who was expected to become autonomous once the pilot project ended (*Goals*).

To help the instructor visualize her design, the designer created a Course Map (*Object*) in Inspiration, a visual thinking tool (*Tool*). The map gave the instructor an idea about the overall structure of his course website in WebCT Vista and how the major instructional strategy, group discussions, would be implemented in the CMS. It was more than a sitemap of a course website, illustrating the content on each webpage, WebCT learning tools employed, and navigational structure. Standalone tools or tools within the CMS, which would be used to produce each unit of course contents were labeled in the graphic Course Map as well (See Appendix F). The designer discussed the map with the

instructor and had the revised map approved by him at the end of the stage (*Division of Labor*).

Refining "Learning Path" and Prototyping Course Website

There was a prototyping phase during which the designer refined her idea of "learning path" and realized the overall design in WebCT Vista. The two major goals set up by the designer guided the iterative process of design and development. It was at this stage that WebCT Vista started acting as a tool for instructional design.

Between the meetings, the instructor and the designer had several email exchanges (*Tool*). The designer sent some examples of learning objectives, assessment rubrics and other suggestion to the instructor (*Tool)*, helping him to modify his course design. The instructor therefore revised his learning objectives and lesson plans, reduced the number of assignments to a manageable workload, and created new assignment rubrics (*Object, Division of labor*).

In the meantime, the designer turned the Course Map (*Tool*) into a real course shell in WebCT Vista (*Object*). She fleshed out her design with a "learning path" in WebCT Vista – a structure that presents course content, learning tools, and navigation within the course website. Various CMS tools and features were used to implement the "learning path" and the group discussion strategy, for example: the "Learning Module" feature, the Presentation tool, the Discussion and the Sign-up Sheet (*Tool, Division of Labor*). In the following two meetings, the designer presented the Course Shell (*Tool*) and explained her design to the instructor in order to achieve his approval. After long discussion and negotiation, the design was approved to guide the course development in the following stages *(Division of Labor*).

Developing Course Website in a Collaborative Manner

A course secretary at the Center of Cont Ed was called in at the last minute to provide developmental support – building the course website (*Object*) according to the course design (*Tool*). The collaboration pattern shifted slightly from the model of Boutique Course Development to the model of Project Management in which a team is involved in the design and development process, each member contributing different skills (Bates & Poole, 2003) (*Division of Labor).*

The change of collaboration required more coordination among the team members. The designer produced a development map to guide the course secretary (*Object, Division of Labor*). Compared with the course map developed before, the development map (*Tool*) had more details and illustrated the real structure of the course website in WebCT Vista rather than a design concept. It manifested the "learning path" in Inspiration format and contained some development instructions, such as instructions for selecting the right WebCT tools and setting up configurations in each tool according to the course design (e.g. configuring group assignments and creating private group discussion areas) (See Appendix G). Because of his late participation in the project and the lack of knowledge of WebCT features which allow the customization of instructional delivery, the course secretary was not able to carry out all the developmental instructions given by the designer. As a result, the designer took over the technical setup that was closely related to her design from the developer (*Division of Labor*).

Providing Learner Support and On-the-fly Adaptation

Before the course was delivered, the designer prepared support materials (*Object, Division of Labor*). These materials included:

- Collaborating on Online Discussion Assignments – a guide introducing students to group discussion assignments.
- Online Discussions – some helpful hints of online discussion.
- Customized online tutorials for some of WebCT tools.

To guide the learning process in the cyberspace, the instructor recorded a Course Tour in Camtasia (*Tool*), whose script was prepared by the designer. This video tour (*Object*) gives a brief overview about the course and the "learning path". The designer also helped the instructor design the first two face-to-face classes that introduced the course and provided necessary technical training to students in the first two classes (*Object, Division of Labor*).

Only the module for the first week was available at the beginning of the term. The remaining modules were progressively added and the whole course was available by the third week of the course. Because of the delay in development and technical issues, some on-the-fly adaptation was done: for example, retesting the Sign-up Sheet feature in WebCT Vista, and redesigning the second in-class section (The first class designed to introduce the blended learning environment failed due to a system crash).

Reflecting and Revising Course Design

In the winter of 2007, after the first delivery of the blended course, the designer and the instructor revised the course together based on the instructor's teaching experience and the feedback they got from the students (*Division of Labor*). The Center of Cont Ed and the IMS had agreed that the instructor would not be responsible for the course website development (*Rule*); therefore, the designer took over the control of the development in the revision (*Division of Labor*).

The major changes aimed to increase the online interaction between learners and the instructor, and modify the navigation structure to improve user experience (*Goals*). The designer set up two more forums: one for ice-break activities and other for the instructor to communicate with her to get some pedagogical and technical support (*Object*). She modified navigation based on user feedback - making some learning tools and content more apparent to learners and easy to be accessed, and using CourseGenie[5] (*Tool*) to transform all the Word documents into HTML format (*Object*). Not satisfied with the organization of files in WebCT File Manager that was created by the team of three, the designer restructured the WebCT File Manager to make it more organized and accessible (*Object*). During the revision, the instructor reflected his experience of teaching and design from multiple dimensions, rethinking the effectiveness of his teaching online and face-to-face, and the readiness of the university to offer blended learning courses. He pushed the center of Cont Ed to come up with a solution for the technical problems that he and his students had encountered in the fall semester (Details will be discussed later).

The design and development of an online environment for blended learning was not a linear process. The main actions described here were identified with the purpose of having an emphasis on the performance of the leading actor, the designer. The chart below presents sub-actions in the main actions discussed above. There were actually two sets of sub-action in which the team aimed to:

- Design and prototype the online environment (Prototyping was also part of the development.).

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[5] CourseGenie is now called Wimba Create.

- Develop the online environment in collaboration.

As we can see in the chart (Figure 4.1), the way the designer designed and prototyped was consistent with what has been documented in the literature. The designer came up with a brief solution during the first meeting with the instructor. This brief solution, labeled the "primary generator" by Lawson (2004), was generated based on a quick analysis of the best practices in face-to-face instruction, the technical skills of the instructor and learners, and the potential of the delivery system, WebCT Vista. Although it was only a very rough picture, this early solution was able to provide some direction to the development. In the second meeting, the designer started to provide training sessions to equip the instructor with the skills for development and online teaching. Almost at the same time, the instructor began working on revising his lesson plans and assessment. The brief solution evolved overtime and became mature after the prototype was approved by the instructor (See Figure 4.1, 4.2).

Figure 4.1: The iterative process of instructional design

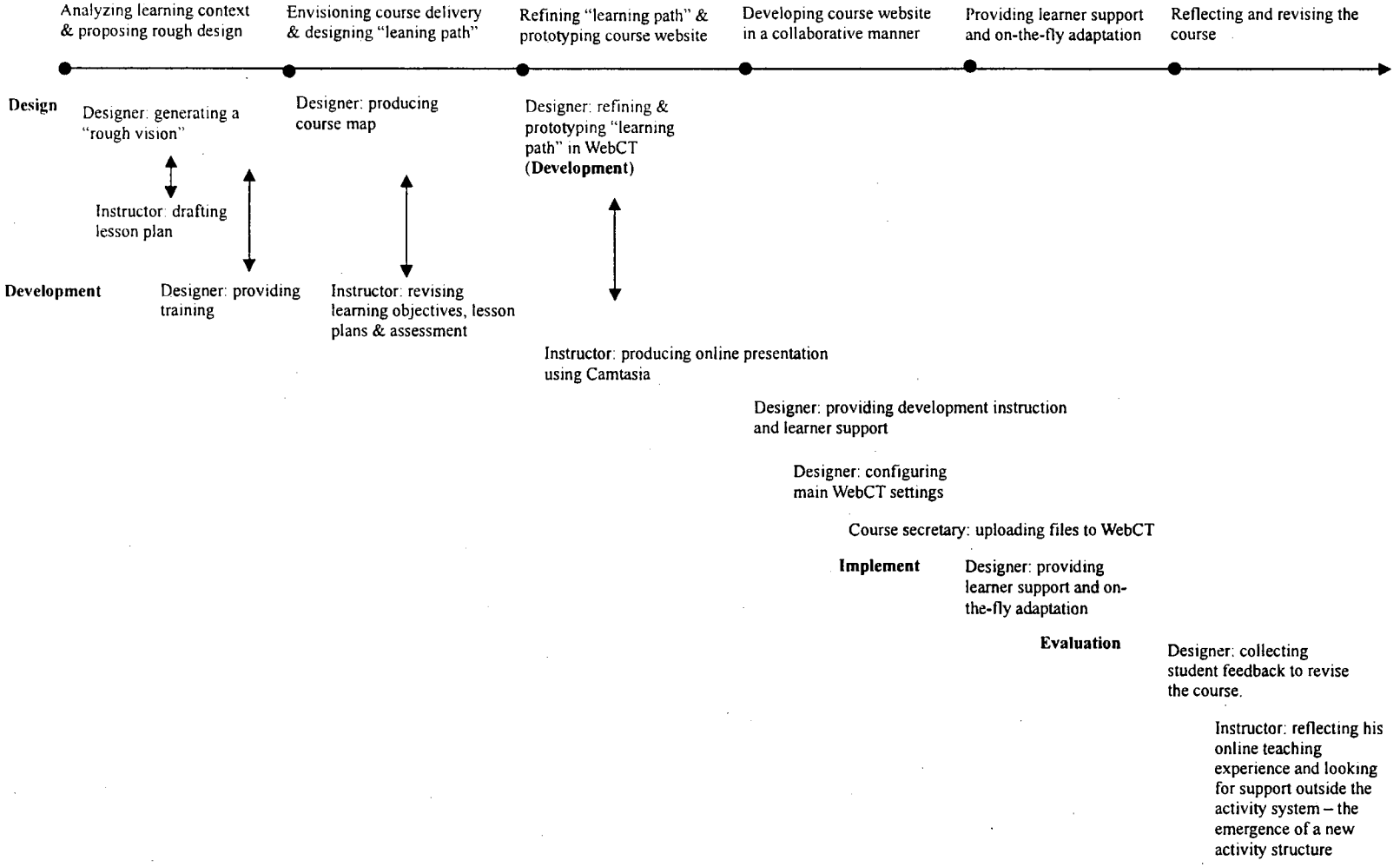
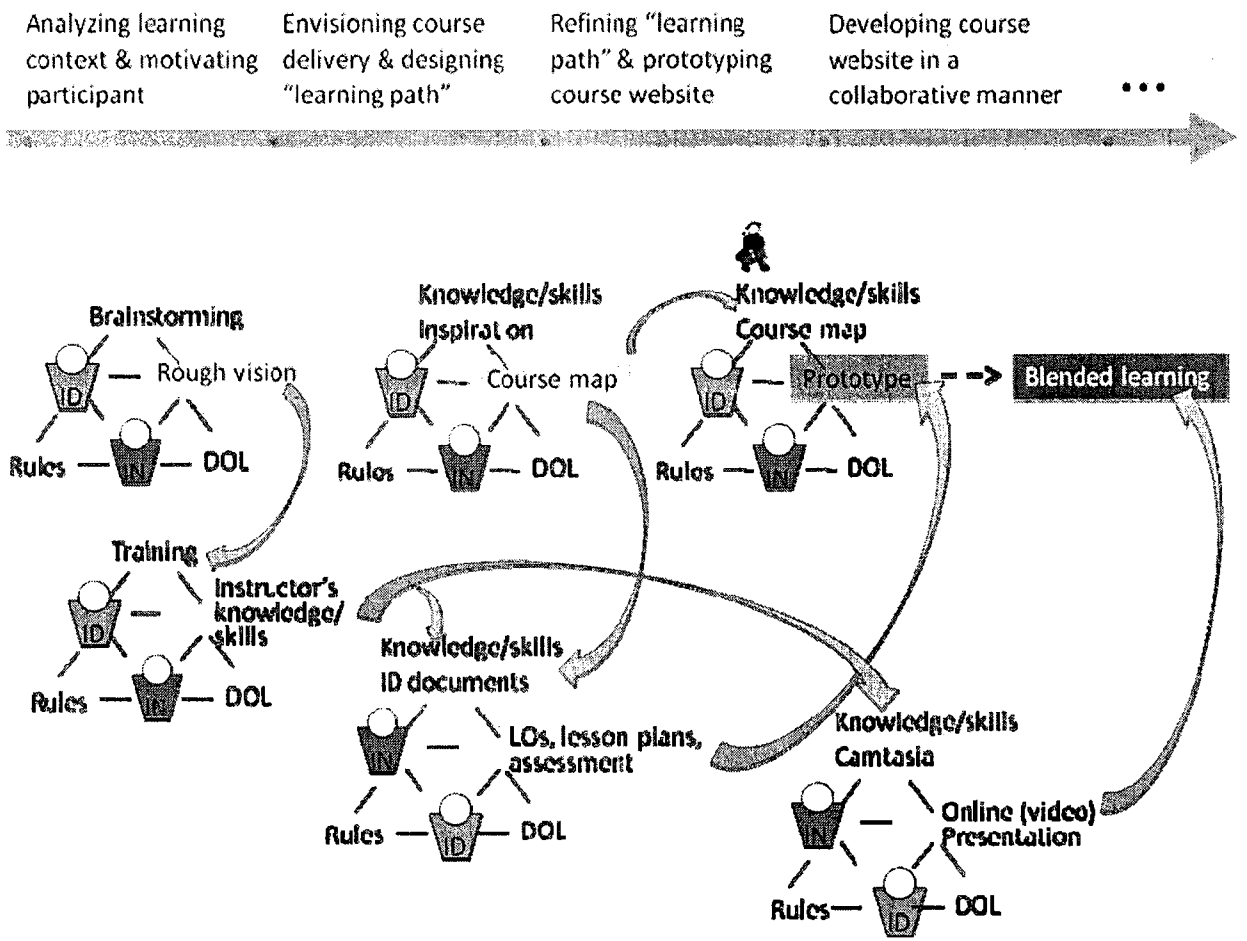


Figure 4.2: The iterative design process through the lens of Activity Theory



The iterative process observed had many similarities to the learning design process described by Britain (2004). In the analysis stage, the description of the "rough vision" of the course design proposed by the designer was an equivalent to the "narrative description of learning and teaching scenario" (Britain, 2004). The Course Map and the prototype in the CMS were more detailed visual or concrete presentations of the narrative description. These two artifacts created in the design process illustrated the learning workflow in the course. As mentioned above, in the later stages of the design and development, learning materials and learning tools were assigned to that learning workflow, and the learning activities became more specified as the roles and their responsibilities of learners were defined. The analysis of this case shows that the concept and practice of learning design is more general rather than specific to Learning Activity Management Systems (LMASs), just as other scholars, such as Britain (2004), believe.

Table 4.1: Comparison with Brittain's (2004) learning design process

Process in this Case	Learning Design Process
• Learning objectives were not changed for course redesign.	• Define Learning Objectives
• Analyzing learning context and proposing rough desing.	• Develop narrative description of learning and teaching scenario
• Envisioning course delivery and designing a "learning path". • Refining "learning path" and prototyping course website • Developing course website in a collaborative manner	• Create learning activity workflow from Narrative description • Assign resources, tools and people to activities • Running (real-time)
• Providing learner support and on-the-fly adaptation	• Learner support and on-the-fly adaptation
• Reflecting and revising course design	• Reflecting (including sharing outputs for peer reflection)

CMS as a Tool of Design/Development/ Delivery

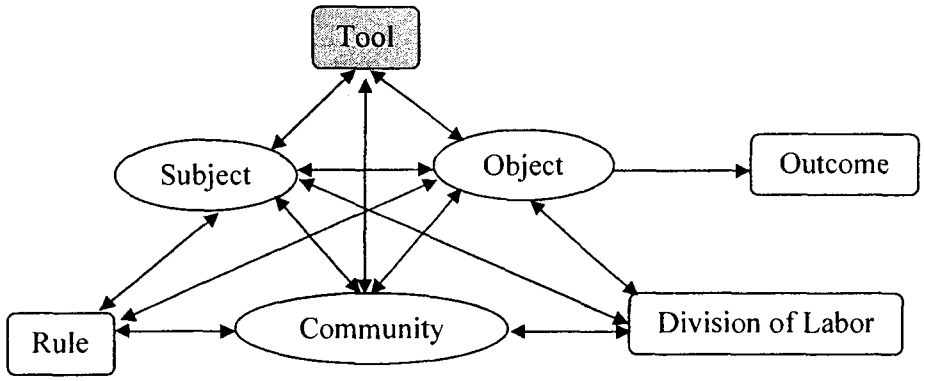


Figure 4.3 Tools mediate the activity

Activity Theory proposes that the interaction between human beings and the world is mediated by the tools that are used in the activity system. The analysis above reveals that material and non-material tools had been employed in designing and developing a blended learning course. Some tools were generated within the activity system because of the incessant movement between the nodes of the activity. Just as Engeström (1998) pointed out, some objects, such as the "rough version", which initially appeared as object were soon transformed into outcomes, and then turned into instruments.

The focus of this section is on the mediating role of the WebCT Vista in designing and developing online learning environments. The mediation of other important non-material tools, the training activities and discussions on the pedagogical use of CMS and the required knowledge and skills will be discussed in the sections, "Division of Labor and Distributed Expertise" (Page 102) and "Rules, Objects and the Mediation of Tools" (Page 116).

This case highlights the impact of the CMS -WebCT Vista version 3, on course design and development:

- Realizing learning design for blended learning
- Assisting collaborative design and development
- A tool-driven approach of course design

Table 4.2: Material and non-materials tools mediated the activity in Case One

Usage	Material Tools	Non-material Tools
Communication	Emails	Weekly meetings
Design/ Development	• Camtasia • CourseGenie • Inspiration • Microsoft Word • Course Map • Samples of Learning objectives and assessment rubrics • References about online learning • Development map • WebCT Vista, version 3	• Brainstorming • Previous instructional strategies • Trainings and discussions on the pedagogical use of CMS and online teaching • Knowledge of/ skills for/ experience of designing and developing online environments (in general and with WebCT Vista Version 3) • The design and development strategies generated during the process (e.g. the rough vision of the course).

Realizing Learning Design for Blended Learning

As Britain discussed in her paper (2004), the first idea of learning design is that learners learn better when actively involved in doing something (i.e., when they are engaged in a learning activity). In the case study, both the designer and the instructor were very much concerned with how to engage learners in learning and help them learn more effectively. The design was apparently activity-centered, with a wide range of learning activities, group learning activities as well as individual one: for example,

- Individual learning activities: Pre- and post- tests, readings, online lectures, exams and other individual assignments such as term paper and final exam.
- Group learning activities: Graded and non-graded group discussion about real scenarios, as well as knowledge building and sharing.

Course website (Object): The CMS became a critical tool to produce objects of the activity of instructional design when the designer started prototyping the course website and realizing her learning design. After hours of discussion and negotiation, the prototype evolved into a more formal course website. It contained five components in which the designer presented content and used WebCT learning tools to create a blended learning environment (Image 4.1):

- *Syllabus, Schedule & Assignment Information*
- *Course Tour*: A short video produced in Camtasia to introduce the course website and the blended learning process to students.
- *Weekly Modules*: The core of the course consisting of pre/post tests, a sign-up sheet and access to the Discussion, as well as learning modules (Image 4.2).
- *Complementary Materials*: Weekly course notes and learning support materials such as "Collaborating in Online Discussion Assignment" and "Discussion: Tips and Procedure, detailed instructions for participating in the group discussion assignment (See Appendix H).
- General Interest Links

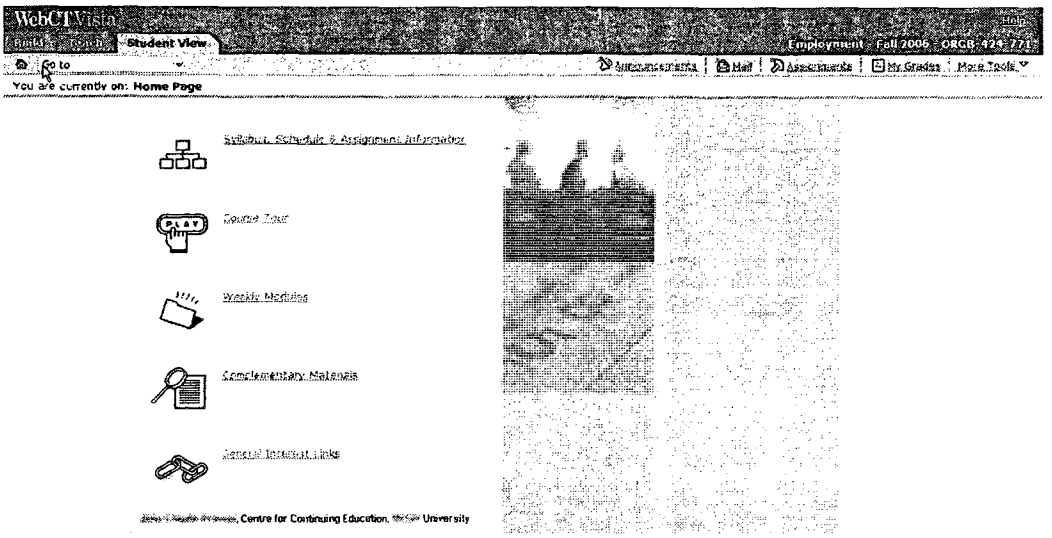


Figure 4.4 Five components of the online environment in Case One

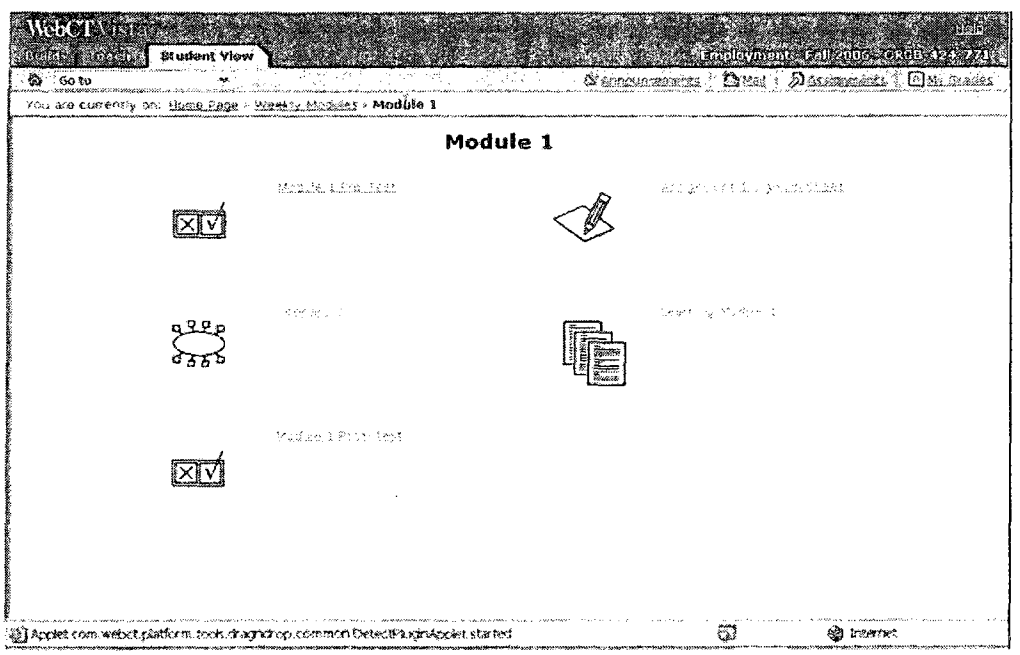


Figure 4.5: A weekly module in Case One

The learning path. The second idea of learning design is to sequence or structure learning activities carefully and deliberately in a "learning workflow" to promote more effective learning (Britain, 2004). To orchestrate various types of activities, the designer

used the "Learning Module" feature (Image 4.3) in WebCT Vista to create the "learning path". It was a relatively linear path whose structure indicated the "logic of instruction" of the instructor, and, as the designer emphasized, provided some learning guidance and prevent students from getting lost in the cyberspace.

The linear navigation structure on the left side of the screen (Image 4.3) represented the learning sequence. Each module began with an "introduction to topic" and "learning objectives". Students would be directed to readings on and off line, before they were directed to view online lectures. They would subsequently participate in group discussions, using a role-play scenario to complete a total of four assignments. Students would also be provided with pre- and post-tests within each module, indicators for students to ascertain their readiness to proceed to the next module.

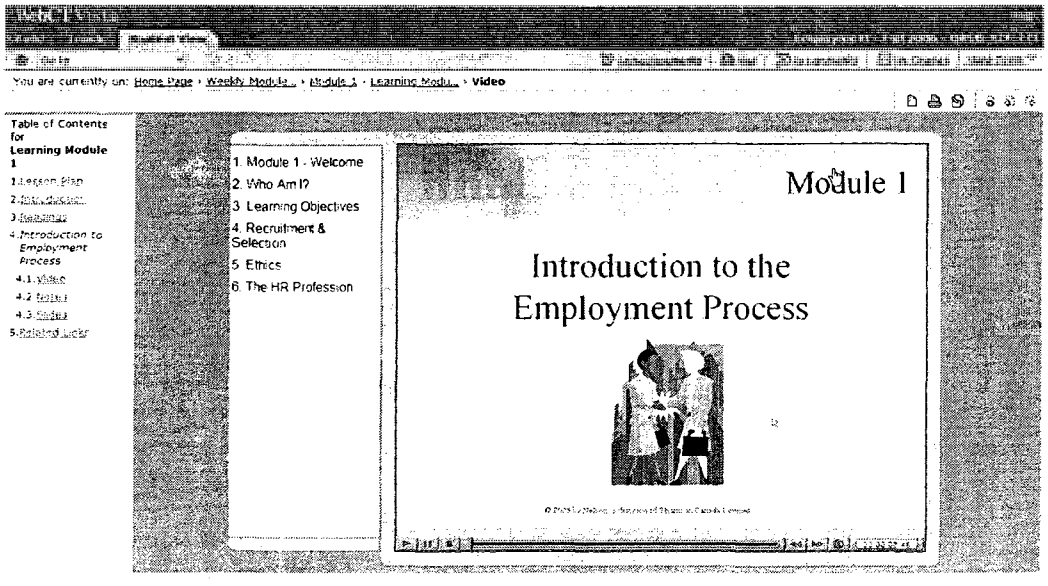


Figure 4.6: An example of learning path in a weekly module in Case One

As a "pragmatic constructivist" and an experienced designer who knows the risk of becoming lost in the cyberspace, the designer emphasized: "I would like students to

follow a certain structure. I would like to recommend that we do a learning module with at least a list, the order they need to do things." The designer told the researcher, "...we were hoping that students will follow it (the learning path). They might not but, at least, we provide an instruction for them" (Interview, Sept. 12, 2006). The learning path suggested a learning workflow at the course module level. The design of the group discussion, on the other hand, indicated a workflow at the learning activity level.

Scenario-based group discussion. At the learning activity level, the learning workflow asked students to sign up for a case study scenario, take different roles to discuss with their peers in the designated discussion boards, and submit the result of the discussion, the syntheses of case studies to the instructor, while in the meantime, publish their syntheses to the rest of the class. There could be two parallel workflows in the same module if students would have interests in other non-graded scenarios. They could ask the instructor to open a discussion board for them and determine whether they want to hand in their learning results for feedback or not.

WebCT Vista helped the designer to implement this main instructional strategy. She used three WebCT features to create an online case study environment: the Sign-up Sheet, Discussion Forum, and Assignment feature. To simulate real work environments, the designer insisted students sign up for working groups based on their interests in the topic, rather than the group members (learners tend to like work with their friends). The pedagogical reason behind this was that they will have to work with different people as in the real world of work. The sign-up sheets were set up in such a way that students would only see the topic descriptions rather than the names of group members (Image 4.4). The group remains anonymous until the process of signing up for a topic was complete.

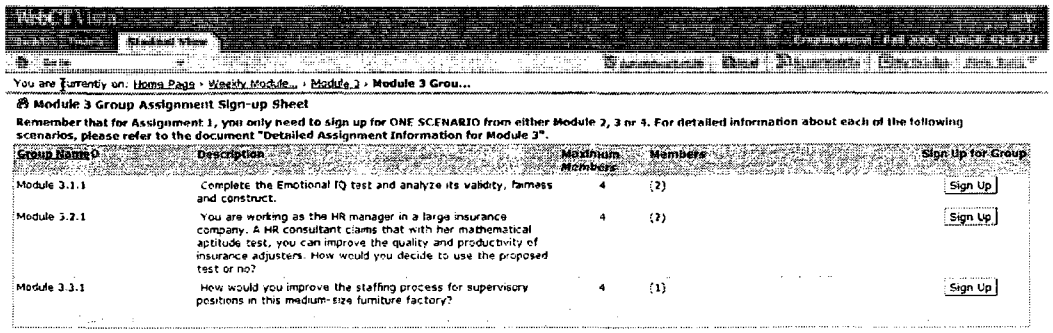


Figure 4.7 A Sign-up Sheet in Case One

The Sign-up Sheet, Discussion and Assignment were set up in such a way that when students sign up for a scenario, they automatically sign up for the private discussion board designated for the scenario for which they have signed up (Image 4.5). The sign-up sheets were also set up to make a linkage to the Assignment Dropbox where students only see the scenarios for which they have signed up (Image 4.6). When the instructor marks the assignments, the grade he gives to the group automatically goes under the name of each group member.

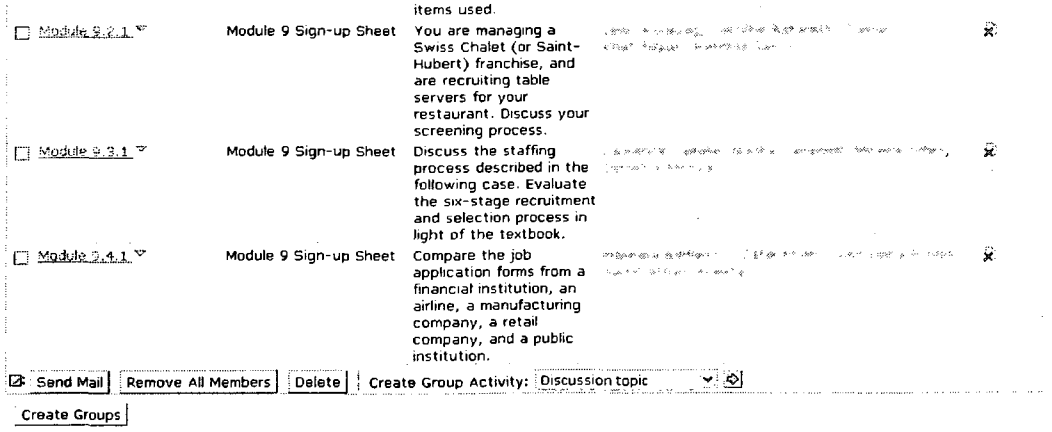


Figure 4.8: An example of the private discussion forum in Case One

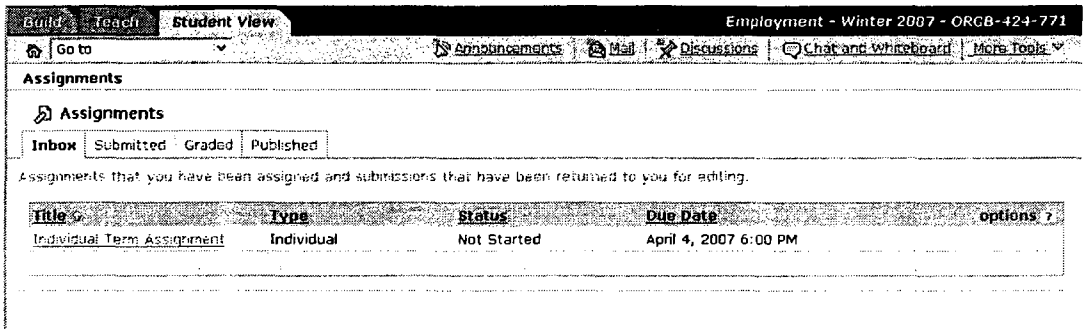


Figure 4.9: The Assignment Dropbox in Case One

This setup automated certain learning management tasks to reduce the workload of the instructor. However, it did not manifest the learning workflow to the students. The access to WebCT tools involved in this assignment were scattered throughout the course website and were separated from the assignment information. Therefore, this workflow at the course level was not intuitive compared with the one at the module level (the linear navigation in Learning Module). To help students proceed from one step to another, the designer created two learning support materials - "Collaborating on Online Discussion Assignments" and "Discussion: Tips and Procedure" to define the workflow (See Appendix H). The files included:

- Pedagogical value of participating in the assignments and expected learning outcomes.
- Detailed steps for completing the assignments.
- Detailed guidelines for using the discussion tool to keep the conversation flowing and organized.
- Different roles and responsibilities of group member.
- Instructions on using the WebCT learning tools involved in the assignments.

The workflow was also demonstrated in the video, Course Tour to provide more

visual guidance.

In the evaluation in the fall semester, some students complained that the procedure for signing up, completing, submitting and publishing assignments was confusing (too many steps). However, only one or two students admitted that they had viewed the Course Tour which was accessible from the Homepage. It seems that the workflow described in the Word document, even though it was clearly defined, was not very apparent to some students. The interface of learning activities that involve more than one learning tool and multiple steps in WebCT Vista needs improvement. Designers may need to explore more effective methods to reveal the workflow and create a more intuitive learning environment.

Assisting Collaborative Design and Development

A rich environment for experienced designers. The CMS was not used as a design tool for analyzing learning context, creating learning objectives or supporting the selection of instructional as well as assessment strategies (though its functionality shaped the selection). Its role as an instructional design tool was relatively weak compared with its ancestor, certain Automated Instructional Design (AID) tools described in the literature review. Although WebCT Vista provides some tools for design, such as Wizard for Organizer Page and Syllabus, such support focuses more on the procedural rather the pedagogical use of tool. In this project, the designer did not use any of embedded design tools for instructional design.

What the designer relied on to make decisions, such as generating the "rough vision", was her knowledge concerning the pedagogical potential and limitations of WebCT Vista and the best practice of teaching and learning in online environments

(*Tool*). Such type of knowledge was not embedded in the CMS she used as scaffoldings for design. Instead, the designer provided the required support for the pedagogical use of technology. The detailed discussions regarding how the designer used her knowledge and skills are presented in the following sections – "Tool-driven Approach Course Design" and "Distribution of Labor and Distributed Expertise" (Page 102).

The designer attributed the added value of a CMS to the useful CMS tools available to organize learning activities, features such as Announcement, Discussion, Emails and Quiz. "I don't have the [computer] programming skills to create these tools. So they are good" (Interview, Sept. 12, 2006) However, the pedagogical affordances embedded in the system were neither sufficient nor apparent enough to help novices use the system in a pedagogically sound way. Later data analysis will show that, to help the instructor understand her design, the designer opened long conversations with him about the pedagogical use of WebCT features. Those conversations reveal her decision-making process in which she selected instructional strategies and media based on her analysis of the learning context and her understanding of the capability of the CMS. Also, there was evidence that the lack of design affordance prevented novices from using the CMS effectively: some faculty members came to IMS for support because they did not know how to organize learning content in the CMS and how to give clear guidance for learning. The course secretary who had no knowledge of teaching and instructional design was not able to carry out the designer's instructions. (This issue will be discussed in the section entitled "Contradiction in the Activity System of Instructional Design" (Page 119).

The designer commented on the CMS she used that WebCT Vista is a tool for experienced designers rather than novices. "I think an inexperienced person can just go,

click here and edit them. For a very small course, I think it would work. Who will produce the better course? I think it will be the experienced designer", especially when the design becomes complicated, "it is more for the experienced designers, definitely". She preferred viewing the CMS as a rich environment with all the tools for experienced designers, rather than a tool minimizing the investment of pedagogical expertise by providing design support.

A shared workspace for collaborative design/development. The collaborative design is an argumentation process in which shared understanding and shared objects are created within multidisciplinary groups. The process exhibits a trajectory from the private space of individual work to the public space of a project, and then back to the private to start another cycle of collaboration (Geisler & Rogers 2000). Starting from the prototype phase, the CMS had served as a public space as well as a private space for the argumentations among the members. From the design perspective, the system was used to:

- Demonstrate the course design to build a shared understanding.
- Provide a virtual collaborative workspace to build a shared object.
- Organize and store course documents.

The conversation for building shared understanding went very smoothly at the prototyping phase when the designer showed the prototype of the course website to the instructor, discussing and negotiating with him to achieve a consensus. The prototype presented her design in a more visual manner that allowed the instructor to envision the delivery and ask questions about the course design as well as issues related to teaching and learning in an online environment. A shared understanding was achieved during their discussion. The shared object, the course website, was co-created as the designer

modified the prototype according to the shared understanding. Helping the instructor visualize the course design motivated the instructor and moved the project forward: "He liked that idea. It was just to get things moving, get him to see it visually"(Interview, Sept. 12, 2006).The productive conversations and the smooth transition from the public space to the private space of the designer were due to two major reasons:

- The designer and the instructor had a shared understanding of effective teaching and learning (*Rule)*. They had agreed upon the major instructional strategies – group discussion about real scenarios.
- The designer who knew the CMS well was responsible for all the development work. She built and later modified the prototype (*Distribution of Labor*).

However, in a later phase, for various reasons, the collaboration became less productive and the transition became less smooth when the course secretary joined the team to provide developmental support. He was not able to follow the designer's instructions. In another situation (Conversation, March, 2007), the designer complained about the disorganized documents in WebCT File Manager where all the course files were stored. The reason was that, in the fall semester, all three team members were uploading files to the system. Thus, the file storage in WebCT, as the designer described, was "...so messy. You can hardly find any file you are looking for." These two issues will be discussed in the following section, "Contradiction of in the Activity System of Instructional Design" (p. 119). It seemed that effective collaborations in this virtual workspace require participants to have a shared understanding of the pedagogical use of the system.

A Tool-driven Approach to Course Design

A tool-driven approach. The decision to deliver the blended learning course in a CMS had significant impact on its design and development (*Rule*). The above analysis shows that WebCT Vista had not been used as a design tool in the first two phases during which the designer and the instructor strategically planned the course. However, the functionality of the technology – the options for instruction and instructional design within WebCT Vista (*Tool*) - set up a stage for their performance, either facilitating or constraining the design.

In the interview, the designer admitted that she tended to think first what tools were available in a CMS and how to use or adapt them to suit her design within the system (*Rule*).

> It is that when I was thinking about how to set it up, I was so programmed to think about what was available and how I was going to fit it...
>
> I guess, when I talk to people, I try to get out from them how I'm going to [in WebCT]... I know the system...I am so used to thinking: "Okay, there are the options, so how can I fit it in?"... I never think: "Oh, I would like to present it like this and this. Okay how can I do it in WebCT?" I do the other way around. I am like a programmer to say "these are my options". (Interview, Sept. 12, 2006)

Her expression suggests a tool-driven approach that is different from the prescribed procedures in those well-known instructional system models in which instructional strategies are usually developed before media are selected and the selection of instructional strategies is mainly based on defined learning tasks. However, the designer in this case described another way of designing. She first scanned her

knowledge base to see what potential the technology offers or what instructional strategies are realizable in WebCT and then selected the one that was suitable for the learning tasks defined by the instructor. The designer claimed that the tool-driven approach was a consequence of using a CMS as delivery technology, and having worked with a number of such systems. "I always use a LMS[6]; and therefore I approach [design] differently" (Interview, Sept. 12, 2006).

The tendency of taking this tool-driven approach showed up as early as she designed the course map to make suggestions on instructional strategies:

> That [the design] was also already in my head, thinking: what our options are. I'm not going to propose something that we can't do. So the course map is based on what I had known about WebCT. Will it be able to show or display, as I said, in a way that he can edit? (Interview, Sept. 12, 2006)

She reflected in the interview that the tool-driven approach actually limited her exploration on other design and development ideas.

> I would like students to follow a certain structure. I would recommend that we do a learning module with at least a list, the order they need to do things. Would I have done it this way if I didn't have WebCT? Maybe not. But this is what the system offers me. So I'm already thinking 'Okay, we start with a learning module, and put them in the organizer page'. You know what I mean? I don't...[I think in this way] instead of starting thinking other ideas. (Interview, Sept. 12, 2006)

In this study, the interest in the tool-driven approach was not subverted since the

---

[6] In the university, WebCT is called learning management system (LMS) rather than CMS as it appears in the literature.

learning tools in WebCT Vista seemed compatible with the chosen instructional strategies. The designer thought that the major strategy, namely, group discussion, "fitted" very well in WebCT Vista – "it [group discussion] lent itself good to this kind of learning" (Interview, Oct. 17, 2006). In fact, her design of group discussion was inspired by one of WebCT features – the Sign-up Sheet. The tool helped her to achieve two instructional goals: offering learner-control over learning content and simulating the problem solving processes in real contexts.

> Let them have control over the subject, let them even choose which module they're going to work in. I think it's a good pedagogical idea, because I think it's good for the students to have some control on what they are learning. But the tool was there to help me to achieve this. (Interview, Oct. 17, 2006)
>
> And the goal was also that students will be able to work in different groups, with different members of the class. [They are] not always in the same group, not know who they are going to work with [before they have signed up]. The goal behind that was that, in the real life situation, you don't know who you have to work with...That was why the Sign-up Sheet came up. (Interview, Oct. 17, 2006)

In both situations, the designer admitted that if WebCT Vista had not had those features, she would not have made those decisions. However, she still thought the use of a CMS set up constraints on her design: "I do strongly believe that the tools available to me influence to a degree what we can do." However, experienced designers could overcome those constraints if they know the CMS they use well: "She or he can find workarounds. You have to know it very well: what its potential is and how you can take a tool that is maybe called something, but can be used for something else" (Interview, Oct.

17, 2006).

Technology as a vehicle of learning. Through driven by the capabilities of available technologies used for design, development and delivery (e.g. WebCT Vista), the focus of course design was not to implement advanced technologies. Learning, rather than the use of technologies remained the central issue. The most important criteria that the designer used to select media for course production (*Rule*) were:

- How well the tools support learning.
- Whether the instructor and students can handle these tools.

During a discussion about selecting tools for students to present their synthesis of case study, the designer explained:

> It does not matter whether it is a Wiki, discussion [forums, or] in the classroom. It [the design of case study] is all the same... The synthesis is a summary of everything, right? Can this be done in the classroom? Absolutely. Can this be done in the discussion board? Yeah. Can this be done in a Wiki? Sure. Could this be done that they had to create a flash movie? Sure. Basically we could choose every kind of delivery for what the students give back to us. We choose what we choose based on the confident level [of the instructor]. Even if he was more high-tech, the students might not be high-tech, otherwise they could have made Camtasia-based PowerPoint sides with voice narration. It is not the goal of the course for them to use all these technologies. The goal of the course is to learn how to deal with human resource issues. So why should we make [it] so complicated for the students to do their work? (Interview, Oct. 17, 2006)

To the designer, media were still a vehicle of learning in the design and

development of online learning environments (*Rule*). The instructional strategies of blended learning may be the same as those used in the face-to-face context. However, they are delivered differently, using various technologies that are available to designers. Therefore, the same instructional strategies may bring different learning experience from what students experience in a classroom and even different from what they may experience in another delivery system. For example, the designer described how she might use Moodle, version 1.4 to implement the same instructional strategies, the scenario-based group discussion:

> Moodle does not have any capacity for students to sign up. So I would not have done that. For Moodle [version 1.4], there is another problem: you put students in groups and they have stay in that same group. They can't rotate (students work with different class members on different authentic topics)...I really do think that, especially for the subject matter of this course, it is important that they rotate... Moodle has a wiki. Maybe I would have figured it out something with wiki; maybe I will set up a wiki to let them sign up for assignment...I might decide to put them in the groups myself (manually) and randomly...I might use wiki for them to make web-based presentation that is supposed to be text-based. I might have thought of it differently, using images and designing a webpage... using wiki to show your synthesis. (Interview, Oct.17, 2006)

Viewing technology as a vehicle for learning, the designer stated her attitude toward the pedagogical use of technology. The designer emphasized in the interview how to leverage the power of available technologies to make the learning activities more interactive and attractive to learners.

I guess motivation is my faith. Things here, the design of post tests, e.g. "go to page 175 in your textbook to answer the questions", which I think, pedagogically make sense. But I don't think students are going to do them... So I think if we build it more interactively, we might be able to attract a little bit more interests on the part of the students. That, I would like to continue to develop. (Interview, Oct 17, 2006)

Distribution of Labor and Distributed Expertise

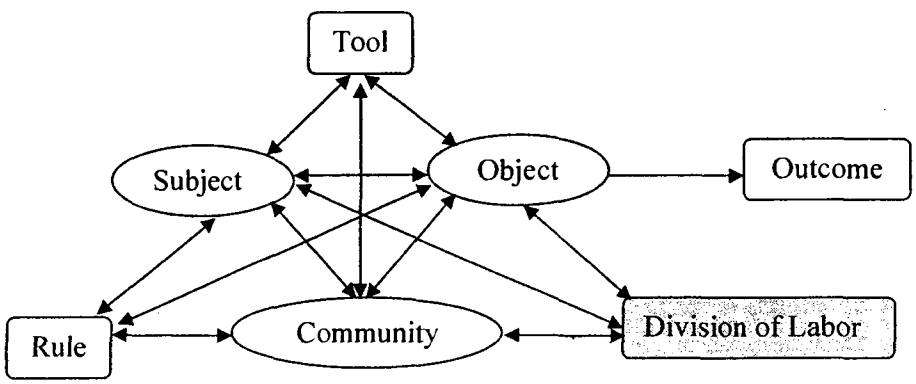


Figure 4.10: Division of labor within the activity

Shared Responsibilities within the Team

The major development model employed in designing the blended learning environment was the Boutique Course Development model (Bates & Poole, 2003) in which the instructor received assistance on a one-on-one basis from the instructional designer. The designer met with the instructor on a weekly basis for the first delivery of the course and bi-weekly during the second delivery of the course to offer one-on-one consultation and training. The instructor acted mainly as a subject matter expert (SME) to provide or produce learning content. Assisted by the designer, he also made some

important decisions regarding the course design. However, the service that the instructor had received in this project was not typical. According to the policies in IMS, long term support is only offered to a few projects per year because they are labor intensive projects.

The pattern of division of labor shifted to the Project Management model: the course secretary joined the team at the later stage to provide development support, and the audio/video experts from Course Production of IMS, as well as librarians were occasionally called upon to provide assistance. As the initiators of the project, the director of e-learning from the center of Cont Ed acted as the project manager and supervised the project by allocating resources and personnel, and negotiating with each team member and the manager of Teaching Technology Service at IMS when problems emerged.

Table 4.3: Subject and community of the activity system in Case One

Subject	Community	Other Activity Systems
Designer	Instructor	IMS as upper level system
	Course Secretary	Other section of IMS
	Director of e-learning	The center of Cont Ed
	Learners	Other teaching/ learning support units in the university

In most situations, the designer initiated the discussions and directed the course design and development. The data analysis shows that the major services that she provided included:

- Design support:
  - ✓ Analyzing learning context and learner characteristics.
  - ✓ Determining instructional strategies for blended learning.

- Production support:
  - ✓ Selecting media or technologies for course development.
  - ✓ Designing online environment – determining site structure and selecting CMS tools/features.
  - ✓ Prototyping course website in the CMS.
  - ✓ Determining development strategies to overcome the CMS limitations.
  - ✓ Preparing learning support materials.
  - ✓ Providing development support (not development strategies), such as uploading files to and organizing them in the CMS, and transforming files into HTML format.
  - ✓ Dealing with technical problems in the CMS and other technologies.
- Design and development consultancy:
  - ✓ Providing training on the pedagogical use of technologies.
  - ✓ Providing consultation on instructional design as well as online teaching and learning.
- Project management:
  - ✓ Assigning tasks to team members and managing the project progress.
  - ✓ Explaining related institutional or department policies to team members.
  - ✓ Obtaining supports from other staff and managers at IMS.

As the subject matter expert, assisted by the designer, the instructor took the following responsibilities:

- Course design:

- ✓ Determining which course modules would be taught in online environments and which in classroom.
- ✓ Planning assessment strategy (graded and non-graded assignments, pre-/post tests and exams).
- ✓ Designing the course modules that would be taught in the classroom.
- ✓ Approving the design strategies recommended by the designer and the prototype website in the CMS.

- Course production
  - ✓ Rewriting old or producing new course documents for blended learning.
  - ✓ Producing multimedia course content.
- Consulting the designer in terms of course design and development.

Conversation concerning Teaching and Learning Online

In this collaborative work unit, the designer and the instructor worked closely, discussing and negotiating the issues of pedagogy and technology (*Tool, Object*). The two major team members influenced and supported each other in the design and development process. Quite obviously, the designer wanted to capture the effective elements of face-to-face instruction – real scenario-based learning and role play in group discussion. She successfully realized the same strategies in an online learning environment and even used technologies to improve learning: more opportunities for interaction and knowledge sharing.

In many situations, the designer tried not to dominate the decision making processes and sought the instructor's approval or agreements. She asked the instructor to confirm the design of the "course map" and the website prototype that demonstrated the

"learning path". The designer explained to the researcher why she needed the approval, "It is his course. He has to like it" (Interview, Oct. 17, 2008). Instead of imposing her ideas on the instructor, she often proposed several options and let the instructor choose the one which was more suitable for the subject matter and the level of technical skills of himself and his students. For example: The designer suggested three possible ways for students to submit their assignments and for the instructor to grade their submissions and provide his feedback. She listed the pedagogical as well as technical benefits of each method. New to technologies, the instructor decided to receive assignments in Word format from the Assignment Drop Box in WebCT Vista. He also wanted to use the Comment feature in Word for feedback instead of the feedback tool in the CMS. To facilitate peer interaction, he agreed to create a mechanism in a discussion forum for students to provide feedback to their classmates.

In another situation, the designer proposed two options to configure the Sign-up Sheet in WebCT Vista: learners signing up for topics (no chance to see the name of group members before they have signed up) or signing up for whoever has signed up already. She explained to the instructor that each option had its own pedagogical value. The instructor insisted it is important that students in the course work with different people and on different topics. And he wanted to make it explicit to the students that when they sign up, sign up for content rather than friends. "If they want to interact with friends, they can always chat with friends", he told the designer (Observation, Aug. 10, 2006).

In this case study, the instructor, as the designer appraised, "went into this [project] with the right idea... He really wants to teach effectively, making sure that students get something out of it." "This was good, because that's the first important thing", she

commented. Having a positive attitude, the instructor was very active in the collaboration, asking questions, making instructional requests or ever questioning the designer's ideas. The designer considered his active participation one of the key elements that contributed to the success of the project (Interview, Oct. 17, 2008).

Rather than accepting whatever the designer proposed, the instructor had his own requirements in terms of design and development. For example, he questioned the constructivist learning strategies and wanted to make sure that "there is enough structure" when he gives students tasks and "the structure is part of the course framework" (Observation, Aug. 10, 2006). He believed that such structure would make his students, who would be professionals with low technical skills, feel more comfortable with online learning. His request matched the designer's pragmatic constructivist approach and was reflected in the design of the learning path.

While designing the assessment plan, the instructor insisted on having individual and group assignments and each type having graded and non-graded options. "Students learn better when they have more chances to practice and not to be concerned about their scores", he claimed (Observation, Aug. 10, 2006). In addition, he emphasized the importance of making the discussion topic transparent to learners before they sign in. As a result, the designer modified the course website to incorporate his requests: adding a folder with detailed information about assignments (both graded and non-graded) and designing a new interaction channel for those students who would like to try the non-graded assignments.

The instructor admitted in the interview that he was very lucky to have both pedagogical and technical support from an experienced designer. To fulfill his

responsibilities, he consulted the designer on different aspects of online course design: instructional strategies, assessment plan, document preparation, online presentation and so forth. The following are example questions he asked the designer in their meetings (Observations, July 10 – Aug. 23, 2006).

- How to design the driest, hardest and most theoretical modules?
- How to balance the workload between in-class modules and online modules?
- What information should be included in his lesson plans? And what is the difference between "learning objective" and "Introduction to Topic"?
- Can he have individual assignments as well as group assignments?
- What is a proper number of group members in blended learning environment?
- What is a reasonable distribution of grades between assignments (including online discussions) and the final exams?
- How to design the beginning of his online presentation to capture students' attention? How to chunk his online presentation slides in a systematic manner?
- How to create hyperlinks between web pages and course documents in WebCT?

Sometimes, the conversation between the designer and the instructor went beyond course design and became discussions about how to facilitate learning in a new learning environment. New to online learning and suspicious of its effectiveness, the instructor took every opportunity to know more about the difference between online learning and learning in face-to-face contexts. He was mainly concerned with three aspects:

- How to facilitate online interaction – He wanted to know:
  - ✓ Whether online learning means a different way of teaching and a different

culture in terms of speaking out problems.

- ✓ How students learn in online group discussion – the process and issues.
- ✓ How he would lead group discussions and avoid having "silence" in his online class.

- How to assess online learning – He asked:
  - ✓ Does he grade online assignments the same way he grades the paper?
  - ✓ Does online learning change his expectation of what students give to him?
  - ✓ Is there a grading tool in WebCT?
  - ✓ What is the difference between posting feedback in discussion forum and using the drop box to write his comments?
- How to monitor students' online learning experience – He looked for tools in WebCT Vista to:
  - ✓ Measure student workloads.
  - ✓ Track learning performance – He requested: "Somewhere, somehow, there should be someone to ring the bell and say, 'hey, this does not work'" (Observations, July 10 – Aug. 23, 2006).

The shared responsibilities between the designer and the instructor, and their conversations about teaching and learning reveal the pedagogical knowledge, as well as the types and the scope of pedagogical support an instructor may need in order to design learning experience and teach effectively in the cyberspace. However, most of the time, designing online learning experience means a design process that requires knowledge and skills for current educational technologies or, more accurately, the knowledge and skills for the "pedagogical use of technology", as the designer always emphasized.

Support for the Pedagogical Use of Technology

The instructional designers at IMS are responsible for offering tutorials on current educational technologies to faculty members (*Tool*). In this project, the designer provided the instructor with two special training sessions: one for WebCT Vista, version 3, and the other for Camtasia. She distinguished her training from regular technology training offered by technical staff in a conversation with the researcher. She believes that knowing how to click here and there in WebCT or other software is not enough. Faculty members need to know how to use those technologies in a pedagogically sound way - use the technologies to achieve their instructional goals. The observation data obtained from the two sections, especially the Camtasia training session, explain the meaning of the "pedagogical use of technology" (The researcher did not record the WebCT training session. Only notes were available).

After briefly introducing some basic Camtasia functions and basic operations that would be used in this project, the designer provided some design suggestions relevant to the production of online presentation using. Her suggestions included:

- Segmenting the whole lecture into several meaningful pieces and limiting the length of each piece.
- Sticking to what really needs to be highlighted, because "you don't want to overdo it, not for you but also not overdo it for them [students]" (Observation, July 10, 2006).
- Putting descriptors at the beginning of each piece, such as "This is the first part of today's lecture...This is the second part of today's lecture..." linking the online presentations with the Lesson Plan (Observation, July 10, 2006).

- Making pre-recorded online presentation more interactive, and personalizing them to be less conservative just as he did in his classroom – "One point you say 'what is the flavors in your organization?' You could say 'Take a couple of minutes to drop down what you think your flavor is.' This pause gives them the change to ... or you say ' Hit the Pause, think about it and write it down.' Let them go forward. So they actually participate in it, in what you are doing. (Observation, July 10, 2006)
- Considering creating animations in PowerPoint to pace his narration - "It helps you pace yourself as you are running through it [narrating and recording the lecture]" (Observation, July 10, 2006).
- Pacing his narration in rehearsals first before recording but pacing in a way as if it was a real recording.
- Narrating slowly when recording and leaving some space for the audio specialist to edit the Camtasia files later.

The notes from the WebCT training sessions show that, in addition to introducing new functions in WebCT Vista, version 3, the designer focused her tutorial on WebCT tools that would be used to realize the scenario-based group discussion: the Sign-up Sheet, the discussion forum and the performance tracking tools. The designer demonstrated the use of these tools in a way that the instructor and his students would use in the group discussions - walking the instructor through the steps that he and his students would experience in the future. For example, students first sign up and then go to the designated discussion group. Correspondingly, the designer first walked the instructor through the sign-up steps and then showed him how students would use the discussion forum and

how he, as the instructor, would monitor the discussion and provide his feedback. During the walk-through, she added some tips for online teaching such as how to motivate and monitor students in the discussion forums, reminded him about the issues that he or his students might encounter, and suggested strategies to handle those issues as well.

Besides these special training sessions, the designer took other opportunities to prepare the instructor for his missions. Eventually he would be the one who teaches in the cyberspace (most of the time, independently), and maintains the course website (*Rule*). While introducing the tracking tools in WebCT Vista, she talked about the use of such tools for course management:

> They [the students] should be informed in the [in-class] orientation [at the beginning of the semester] that you can see whether they are online, and who participate in the discussion and how many times...There are the strategies that you can use to see if a student falls between the planks. You can see how many messages they have read and how many they have sent...It gives you a sense. Yes, it is a lot of work. But this is one way to make sure they don't fall behind and if we can get them back. (Observation, Aug. 23, 2006)
>
> Usually students will feel not very comfortable at beginning but after 3 or 4 weeks they will be fine...You may need to follow up those who don't sign up in two weeks [after the orientation], since they might encounter the pop window problems (Some browser settings block pop windows in WebCT Vista). (Observation, Sept. 13, 2006)

Data from observations show that the training in the pedagogical use of technology provided by the designer had the following character:

- Customized training emphasized the functions of software used in the design and development of the course. They were more like job aids, providing support but not overwhelming the instructor.
- Training events were sequenced in a way to correspond with the designed teaching and learning experience.
- Training went beyond technical skills and focused on how to use technologies to meet certain instructional goals, informing the pedagogical capabilities of technologies. In this case, the titles of the training sessions could be "Use Camtasia to produce interactive online presentation" or "Scenario-based group discussion in WebCT Vista".
- Training sessions were also used to inform the overall collaborative production process and provided tips about how to use the software in a way to facilitate the collaboration. For example, using Camtasia in a way so that the recorded online presentations would be easy to edit by the audio specialist.

The idea of "pedagogical use of technology" was a highlight in the regular services of IMS. The Teaching Technology Service created an online wiki – "Instructional Scenarios Wiki" - to demonstrate "how to use WebCT Vista to do complex instructional tasks using multiple tools". Compared with WebCT Vista manuals, the wiki inspires faculty members to explore the potential of the technology and experiment with collaborative group work (http://courseware.mcgill.ca/wiki/index.php/Main_Page). In each category, designers describe the instructional scenarios, introduce the WebCT tools involved, and list the steps to set up the tools to meet the embedded instructional requirements. There are four types of instructional scenarios:

- *Content Scenarios* describe procedures such as customizing the courses, up/downloading and managing web-ready course materials, creating structured student-centered learning pathways, and selectively releasing components based on criteria.
- *Course Management Scenarios* describe procedures such as managing grades, adding members to course sections, backing up and restoring, managing group activities, viewing reports of student access, and controlling the settings to all aspects of the course.
- *Communication Scenarios* describe procedures such as creating and managing asynchronous and synchronous interactions in WebCT Vista.
- *Evaluation Scenarios* describe procedures such as building and grading online assignments and assessments (quizzes, self-tests and surveys) within WebCT Vista.

Let us consider two examples of those scenarios.

- Engage students in online role playing activities: "Engage in a role-playing activity where students are in groups, assigned a specific role. Conduct a live chat session and a separate on-line discussion moderated by the instructor where others cannot determine who they are, only the role that they are playing. This activity would need to be graded in the course." (http://courseware.mcgill.ca/wiki/index.php/Engage_students_in_online_role_playing_activities)
- Provide content based on interest: "Create self selecting groups of students so that they can choose to complete different learning modules based on their area of interest. Deliver individualized material and self-tests (so only they

can see the feedback) for each of the groups" (http://courseware.mcgill.ca/wiki/index.php/Provide_content_based_on_interest_and_completed_survey).

The designer pointed out that, in order to use the educational technologies, especially a CMS, in a pedagogically sound way, "Someone has to know the system quite well" (Interview, Oct. 17, 2006). She had found that the biggest challenge of faculty members is "how can I design an activity to go online" (Interview, Oct. 17, 2006). Therefore, they need both design and technical training to handle a blended or online course. The training focusing on the pedagogical use of technology becomes crucial for designing effective online learning environments. Contradictions related to the lack of knowledge and skills for the pedagogical use of technology will be discussed in following sections.

Rules, Objects and the Mediation of Tools

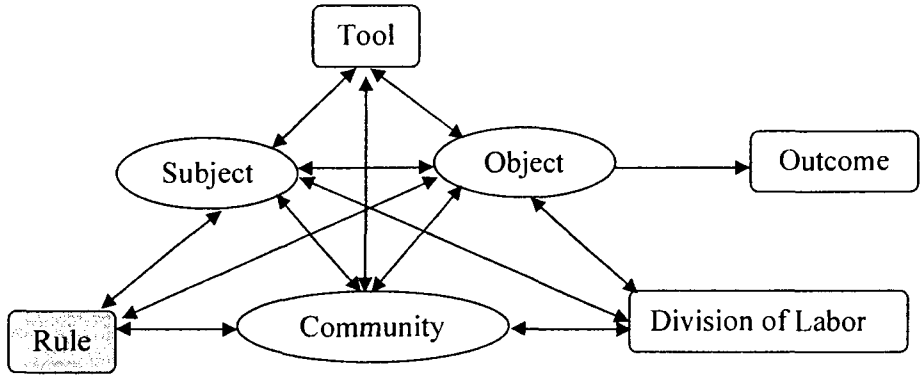


Figure 4.11: Rules mediate an activity

Rules, implicit and explicit regulations, norms and conventions constrain actions and interactions within an activity system (Engeström, 1987). The activity of

instructional design studied here interacted with a network of other activity systems, for example, the IMS, Cont Ed, and the technical support center in the university. The focal system received rules from those systems that are at higher administrative levels. These rules exerted significant influences on the design practice. Some of them are summarized below:

- WebCT Vista, version 3 is the only delivery platform supported by the university.
- Instructional designers from IMS provide one-on-one consultation and training, as well as other development support to "promote and model the most appropriate and effective use of technology in teaching and learning".
- Usually, the support from IMS fades gradually so that instructors will eventually have full control over their own courses – be responsible for maintaining and updating the content in a course website.
- There were three units in the university providing pedagogical and technical support for faculty members and students. IMS specialized in providing supports for designing and developing online learning environment. Teaching and Learning Service (TLS) provides more general support to enhance or develop teaching skills. IT Customer Services (ICS) is in charge of providing technical support to students.

As we have noticed, some rules defined the division of labor within the activity system of instructional design, determining roles and responsibilities of the team members. However, such rules of collaboration were not explicit to all team members at the beginning of the project. Therefore, these rules were renegotiated and refined within

the activity system to be compatible with the project status. The instructor was supposed to bear a larger part of the responsibilities for course development, uploading his course documents to the course website. After negotiating and revising, the project manager agreed to provide extra support, hiring the course secretary at the center of Cont Ed to do the job. The instructor mainly focused on producing course content in the course production and his maintenance tasks were reduced to modifying existing documents on the course website.

Some of these inherited rules affected the selection of software applications or WebCT tools for course production. The designer chose to use authoring tools embedded with the predetermined delivery systems to develop the courses. In addition, she deliberately used or recommended other software that may be compatible with the delivery system, such as Camtasia and CourseGeni (software that transforms Word documents into HTML format) to avoid any technical conflicts. The rules prescribing the division of labor influenced the tool selection as well. According to the policies, the instructor would be responsible for some development tasks in the project and the course maintenance after the project. To support the instructor, the designer replied on the Organizer feature in WebCT to present course content to students, though she personally preferred creating HTML pages with DreamWeaver for this task. The Organizer feature allows users to build web pages and navigation without any knowledge and skills for web design, and follows a relatively straight-forward procedure to manage course documents. The designer expected that the use of the Organizer would simplify the instructor's tasks of development and course maintenance. The modification of the site, according to her decision, would involve uploading a new file to replace the old one.

> But for this production, I decided to stay with WebCT's presentation, using the Organizer page. That's why, if you go to the homepage, I have these several Organizer pages that glue the content [modules] together... Since the idea is that [the instructor] is supposed to eventually become an autonomist, he is supposed to edit it. Doing it in Dreamweaver perhaps will be much harder for him to edit it than doing it this way. (Interview, Sept. 12, 2007)
>
> Technically you could [make hypertext and hyperlinks in WebCT], but it will require hypertext [knowledge] that he [the instructor] has not prepared to do and I don't think he has the technical skills to do that. (Interview, Oct. 17, 2006)

After the rule of collaboration had been changed, and the instructor was no longer responsible for uploading files to the course website, the designer changed her development strategy. She used CourseGeni to convert most of the course documents from Word or PDF format to HTML format. WebCT Vista allows users to edit an HTML file online. The designer thought that the conversion would make the maintenance task easier since the instructor would be able to edit the files without going through downloading and uploading steps. Besides, HTML pages would provide a better navigation of the course – the handling of Word documents varies across different Internet browsers. For example, in Firefox, one has to download a Word document before one view it. A lot of browsers today usually block pop windows. This also increases the difficulty in navigation within a WebCT course.

Rules were also generated within the focal activity system:

- The selection of instructional strategies.
- The website development in WebCT Vista.

- The process of instructional design.

The rules that reflect the assumption of learning and the role of technology and media had significant impact on the use of WebCT Vista were:

- The mutual agreement on "Programmatic Constructivist" approach.
- The tool-driven approach of instructional design.
- The perspective of technology as a vehicle for learning.

As we have analyzed, these rules determined the major instructional strategies (*Tool*), the selection of WebCT tools and features, and the structure of the course website. In terms of content presentation, the designer and the instructor had an agreement. Simple and clean layout design was favored and the important learning guidance and information were repeated in each module (*Rule*). Concerning the design process, the designer insisted on conducting a formative evaluation in the middle of the first delivery (*Rule*). Her suggestion was accepted and the course was evaluated and revised in the winter of 2007. During the revision of the course, the instructor created a document that included detailed course syllabus and schedule, and FAQs that he collected from the first delivery. The document, together with the course tour, was put online for students before their registration so that they would be aware of the new way of learning and prepare for it (*Object*). As a program coordinator, the instructor wanted the document to be a standard document as his program moves toward the blended learning direction (*Rule*).

Contradictions in the Activity System of Instructional Design

The process of designing and developing a blended learning environment in this case was not always smooth. Various contradictions arose as the designer and other team members selected media and realized the determined design in a collaborative manner.

Data analysis showed that conflicts related to the design and development arose mainly because of:

- The limitations of tools that were used for design and development.
- The unclear policy of division of labor – the roles and responsibilities.
- The lack of knowledge and skills of team members.
- The tight schedule and heavy workload.

The contradictions studied in this case had direct or indirect impact on the use of the CMS and, therefore, shaped the mediating role of a CMS in course design and development.

Limitations of CMS

The designer thought that the major instructional design strategy – the scenario-based group discussion worked - very well within WebCT Vista. But she complained that the compulsory use of WebCT Vista as the major development tool and delivery system left limited space for her creativity. When asked whether the functionality or the features of WebCT Vista had shaped her design and the creation of the course map, she confirmed:

> Absolutely! First of all what I can put on the homepage is limited in the sense that I can't design HTML homepage and then put it up...Then, there is the course tool bar. I can only choose among the tools that WebCT has. I can't see anything else. And there are only two containers that WebCT has for presenting documents. It is either Learning Module or Organizer page. There is no other way to do it. (Interview, Sept. 12, 2006)

The designer listed limitations of WebCT that had negative impact of her design

and development:

The limitations of managing group activities: To avoid the instructor creating groups manually, the designer chose to use a new feature in WebCT Vista, the Sign-up Sheet. The instructor wanted students to sign up for multiple discussion scenarios following different grading policies in one module (*Goal*). His requirement was beyond the capability of the current version of WebCT Vista. The system allows one sign-up sheet for one scenario, only. The designer could have set up two sign-up sheets in one module, one for graded and one for non-graded assignments, if time permitted. The sign-up sheets were used only for graded discussions. Students who may want to participate in those non-graded discussions could ask the instructor to open a discussion forum for them (*Object/ Focus shift*). This meant the instructor would need to create discussion groups manually. The designer thought it was a feasible solution since, based on her experience, not many students would participate in the non-graded assignments to practice.

A system bug in the Sign-up Sheet gave the designer much trouble. In her original design, for group discussions, students would need to go directly to the Sign-up sheets to read the detailed scenario description and sign up for the topics they would be interested in on the same webpage (*Goal*). Compared with reading the descriptions on separate page and then navigating to the sign-up sheets to sign up, the original design would offer students a smoother and intuitive learning experience. The system had allowed her to input long scenario descriptions to the Sign-up sheets. After that, the system did not allow to her to make any changes on the Sign-up sheets and informed her that descriptions longer than 300 characters were not allowed. She could not even delete a demo student

from the sign-up sheets. A more serious problem was that the instructor would not be able to edit the group setup.

> We have to be able to edit it, because we have to be able if Caroline decides that she wants to change the group, because she's not going to get along with her partners. Then the teacher should be able to edit the groups. (Interview, Sept.12, 2006)

The designer noticed the bug after the semester had begun and students had signed up for the first module. "We are kind of stuck in the way." She expressed her disappointment in the interview, because she had to think about on-the-fly adaptation:

> The introduction of the group discussion will be shorter [on the sign-up sheets], and then I put up detailed description in Assignment Information [folders] where they can read more details about how to do the assignment. (Interview, Sept 12, 2006)

To solve the problems that were caused by the limitations of the system and tight schedule, the designer re-structured the course website and created two new folders on the Syllabus page for detailed assignment information (Figure 4.12,Figure 4.13) (*Object/ Focus Shift*). Although the solution did not change the nature of group discussion assignments, the sign up process was not as intuitive as it had been designed.

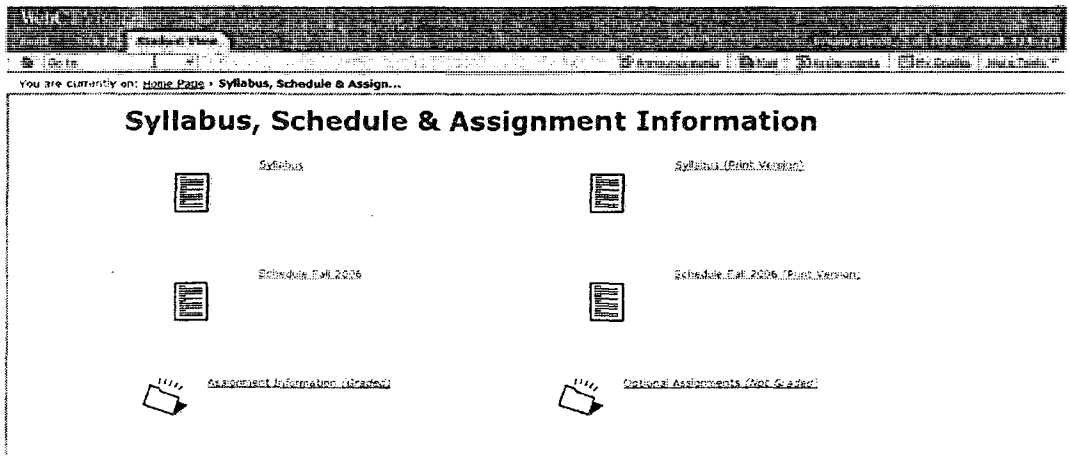


Figure 4.12 Content rearrangement caused by a system bug -1 in Case One

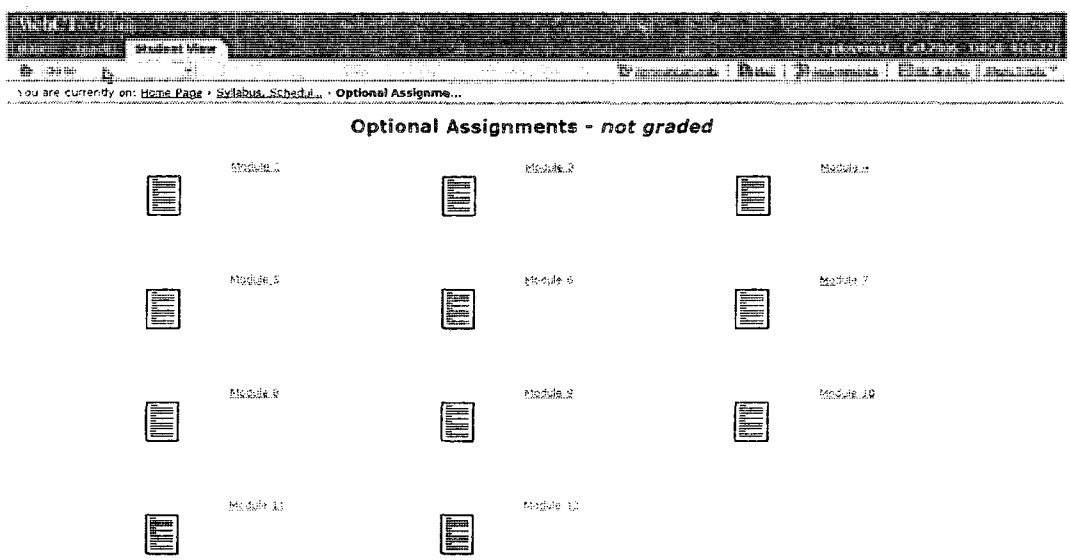


Figure 4.13 Content rearrangement caused by a system bug – 2 in Case One

Limitations of WebCT templates for presenting content and exhibiting the "learning path". To reduce the course maintenance workload on the instructor, the designer chose to use the WebCT templates – the Organizer pages - for content presentation (*Object/ Focus Shift*). Although she admitted that the Organizer pages were

not constraints in terms of presenting content and guiding students through the "learning path", the rigid layout of their design was not her preference for content presentation. "If I have the choices of designing a course in WebCT or not WebCT, I think my choice would be not [to use] WebCT and do it all the Dreamweaver, so that I could more easily lay out content in a way I want" (Interview, Sept. 12, 2006) .

According to the designer, the use of HTML rather than WebCT templates meant a different approach for presenting content: nicer content presentation, more flexible and intuitive navigation:

> You know, in different courses [that] I was building in Dreamweaver, basically, they were only one page [for accessing content]. And there is a menu within Dreamweaver that leads to different modules and all that kind of stuffs...
> I could have navigation at the side, I can have bottoms on the top; I can have a curriculum tree. (Interview, Sept. 12, 2006)
> I viewed it [an HTML page] like this. Module one, a little blurb about module one, learning objectives, click here to watch the movie, click here to see the post tests. It all sequences this way...You can make a rather long linear [design] and also include on the top links to other modules. I mean [that] from Module Five I can make a reference to Module Two and then I can click back... You cannot have that flexibility you have with hypertext [in WebCT Vista]. You could say: "Remember Module Two. What we are discussing you can link it to Module Two". (Interview, Oct. 17, 2006) (*Goal*)

The Learning Module feature and the Organizer feature are two embedded templates in WebCT Vista. The former one has a more rigid structure –allows a numeric

sequence of content. Despite the rigid format of Learning Module, the designer recognized its strength – it is easy to create linear navigations. "It's a good thing WebCT does that, because if teachers can't do hypertext, that's the way of sequencing documents. Otherwise, they won't be able to sequence the documents" (Interview, Oct. 17, 2006). A common misuse of the Organizer page feature the designer found was that instructors do not always know how to sequence content in WeBCT Vista.

> They [the instructors came to IMS for support] do what a lot of teachers do - they don't know how to do this [sequencing content]. I see this a lot in courses. They prepared those little folders, like you saw. You click on it, and the 50 icons come up...Then the students get lost. Did I look at this already? Where was that thing? Where is that file? With the learning module, at the least, you have a chance to find that document. Again because you go through each module, and you remembered it was Module Two, and you can look at all the readings of different modules. It is easier to navigate. It looks busier and there are a lot of folders and stuff. But the bottom line is that it is easy to navigate, while you cannot have a built-in navigation, which we couldn't do, because the idea is [the instructor] will be able to edit this course in the years to come. I'm not supposed to be continuing on the technical side. (Interview, Oct. 17, 2006)

The above example shows that using the feature in a pedagogically sound way requires some advanced knowledge about the WebCT Organizer feature. Other than the technical skills, the user also needs have design skills to link the technical functionalities with instructional goals – organizing and sequencing content. However, WebCT Vista has few design affordances regarding content sequencing.

> The problem of something like [WebCT] Vista, comparing with Moodle for example, the biggest difference between these two as I see, [is] the layout of Moodle is always by week, all the time. In that way, the teacher is forced to layout by week. Or if you want, you can layout by topic. Everybody is forced. It is not in WebCT. In WebCT, you can throw everything on the homepage. Moodle is much easier for someone who doesn't know about [how to sequence content in a CMS]... The person who doesn't have experience can throw all on the homepage [in WebCT Vista]. (Interview, Oct. 17, 2006)

The icon location on an Organizer page is supposed to provide students with some clue about how to navigate within the site. Unfortunately in many situations, the clues delivered by the icon location are not explicit enough, especially to those students who are new to online learning. The students get lost in a learning environment whose learning workflow is not clearly presented. In this course, on the homepage, there were icons that linked to various types of course content and learning activities. Students were expected to start learning in the folder "Weekly Module", after they read the general course information in the folders of "Syllabus, Schedule, Assignment Information" and "Course Tour". The evaluation that took place in the fall semester showed that students tended to ignore such supportive information and go directly to the "Weekly Module" folder. This made it more difficult in accessing learning content and participating in group discussion. It also increased the instructor workload for answering students' questions. In the winter version, the designer moved important course information to Module One delivered by the Learning Module feature and marked it as compulsory reading. The concern that students could be lost in the cyberspace led to a structured site,

a linear learning path that chained up a group of learning activities, including the group discussion with constructivist components.

Limitations of integrating with browsers: During the design and development process, the designer anticipated a problem with opening WebCT pop-up windows in various browsers. She had prepared corresponding support materials for students and even participated in the orientation sessions to answer students' technical problems. However, adult students who were less familiar with technologies still experienced access problems in the fall semester of 2006. According to the instructor's point of view, the technical support for online learning was not prompt enough due to the distribution of teaching and learning services in the university (IMS, TLS and Virtual Helpdesk at ICS).

> The university just was not ready to deal with all the access problems that Cont Ed students had. We found ourselves in Week Seven, we still had students [who] had problems to access part of the materials, like the flash lectures. The university works on all the assumption that students come to campus everyday and they have computer labs. If they don't have computers at home, they can sign in at anywhere on the campus. That is not the Cont Ed crowd. (Interview, Dec.20, 2006)
>
> Nobody was ready to answer the questions from the students. It was always running behind trying to get the answers for them. That added to a lot of frustration... Part of the problem last fall for the students and me was, for one question, we were sending them right, for another question, we were sending them left...It [the support] was not coming together. A lot of people just gave up for the technology... The main reason is that the university was not ready to help the students come up to [the technical] standard quickly. (Interview, Dec.20, 2006)

(*Breakdown*)

The contradiction eventually culminated with the development of a new tool for blended learning (*Object*) - "Now for the next group, we have created a separate webpage which brings all on one page how to test your computer and how to bring it up to standard for the WebCT [course]" (Interview, Dec. 20, 2006) (*Object*). The course revision which happened in the winter of 2007 generated more support materials, such as "How to submit assignments in WebCT" in both PDF and flash video format to facilitate the online learning experience (*Object*). Moreover, the instructor, as a program coordinator, started building seamless and prompt learner support for future development. "ContEd should do some planning" he insisted, "We have agreed to schedule a meeting at the beginning of the New Year to discuss this" (Interview, Dec. 20, 2006) (*Object*).

Limitations of managing course files: In summer 2006, the development of the course was accomplished by the team of three: the designer, the instructor and the course secretary. All were responsible for uploading files to the File Manager in WebCT Vista. The default file folders in the File Manager are: My File, a personal folder used to store and edit files for the course; and WebCT-Files, containing the default files that are packaged with WebCT. The system allows its users to create subfolders to manage course files based on the needs of the course production.

The designer had set up a structure in the File Manager. But she did not have an effective content management plan for the team, which specified the regulations for uploading files to the system and how to control different versions. The other two members uploaded files without paying much attention to the pre-determined structure. During the course revision in the winter of 2007, the designer wanted to modify the

course website, moving some files from one page to another and creating new links. She found that she could hardly find the files in the File Manager and make a link to the texts on web pages. "It was a mess." she recalled in a conversation with the researcher (See Figure 4.14). She had to compress all the files in the File Manager, download, reorganize them on her local computer, and then re-upload the files. "The revision was like creating the course from scratch" (Conversation, Mar. 2007). The File Manager became much more organized after she revised the course (See Figure 4.15). The revised structure was more specific and to the point. In collaborative course design projects, it is necessary to have strategies of content management before the large scale development begins.

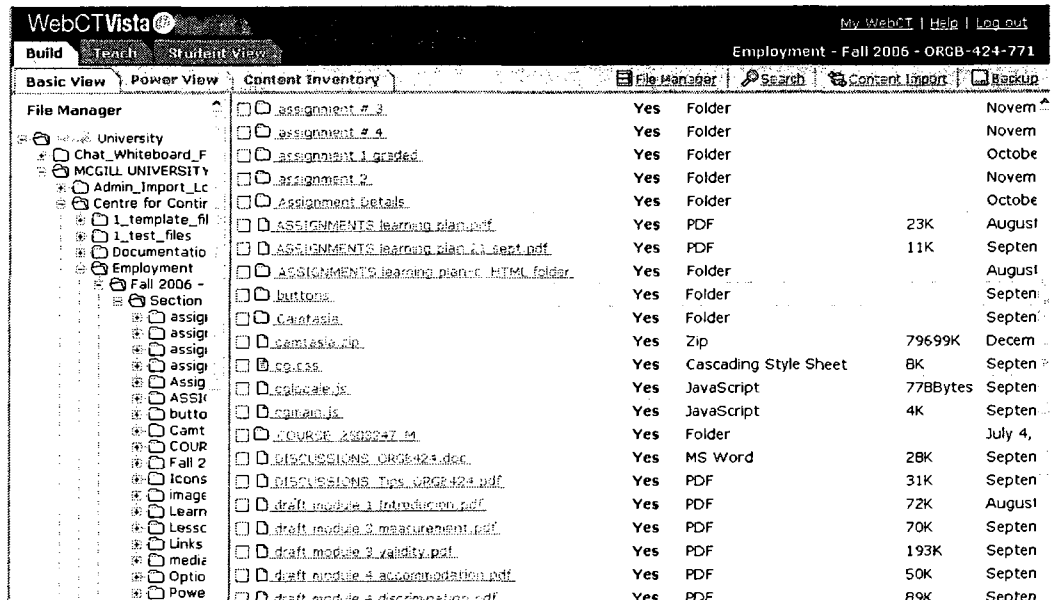


Figure 4.14 File management - before revision in Case One

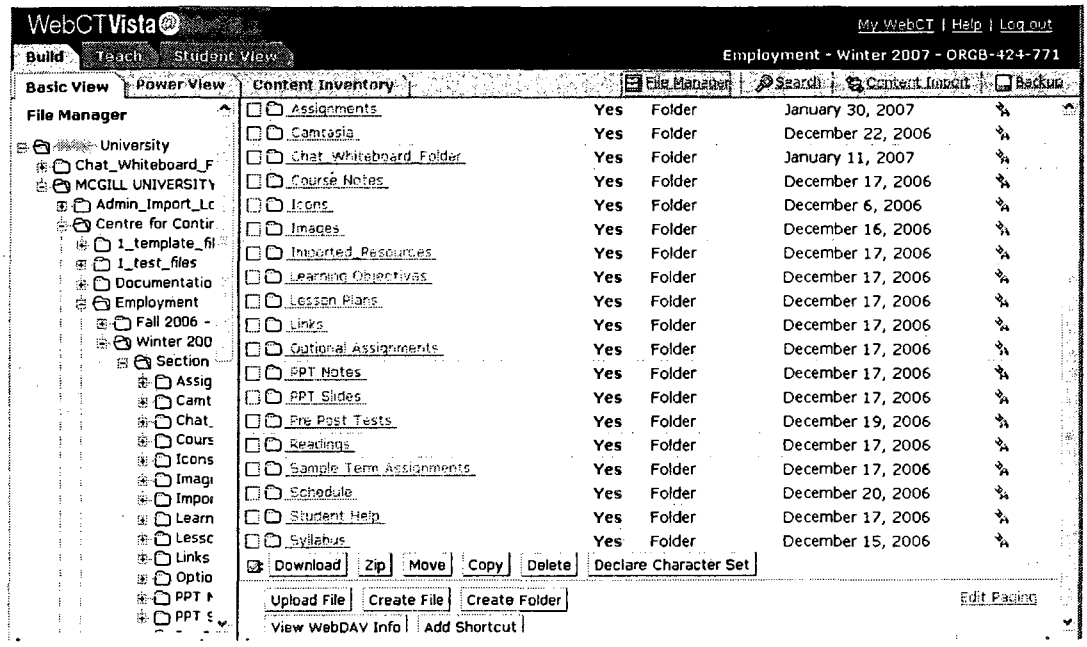


Figure 4.15 File management – revision in Case One

Adapting existing tools to overcome technical limitations and meet instructional requirements. Course management systems cannot always satisfy their users and meet all instructional requirements. However, the designer pointed out "if we milk the system well enough, if the instructional designer knows [it] well, she or he can find workarounds" (Interview, Sept. 12, 2006). From the analysis above, we have noticed the workarounds that the designer came up to overcome the limit of word number in the Sign-up Sheet. There were other examples of this type of adaptation and workarounds in this project.

For example, the instructor planned to use WebCT tools to track the roles each student would take in the group discussion. (Because the number of assignments was reduced, the machine- tracking was not pursued). The designer suggested they could either use the discussion forum or adapt the WebCT Quiz feature to track students'

performance: making a private forum for each group, in which the group members specify their roles or creating multiple choice questions so that students can choose the module and the roles they play in that module (*Object/ Focus shift*). In an interview, she described another way to adapt the CMS: using a wiki as a sign-up tool and the Quiz feature for course evaluation.

> Somebody called me today. She said: I need to do a survey on what students want or do not want to be covered in the class. But the survey tool in WebCT is anonymous. She needed to know who says what. So I made a quiz and called it a survey, give it zero percentage. They make a column in the Gradebook, but what is different in the grade? No... But it's a kind of thing that I know that can be done. So we adapted, used the quiz tool in a public survey to get what she needs. (Interview, Oct. 17, 2006)

The designer summarized her pedagogical use of technology: "So I guess what I try to do is to find out what they need and to try to make it work" using various available technologies. According to her experience, the same instructional goal – knowledge sharing after group discussion, could be either realized in WebCT using the Assignment Publishing feature as it was in the course, or the Presentation feature, or even in a wiki: "you could have designed a wiki for each group and give access to the groups or to the whole class. And that group could have designed a webpage to show how to resolve their problem" (Interview, Oct. 17, 2006).

Conflicts of Collaboration

Roles and responsibilities to be clarified. The designer collaborated quite well with the instructor in general. But they had to clarify some responsibilities during the

process, because they were not clarified at the beginning. As previously mentioned, the instructor was not quite clear about the policy in IMS – IMS support will fade gradually to transfer the course autonomy to the owner of the course, which means instructors are eventually responsible for the course maintenance. This policy was consistent with one goal of the Center of Cont Ed which was not revealed to the instructor at the beginning of the project. The Center of Cont Ed wanted their teachers to learn how to use educational technologies to improve learning by participating in the pilot project (*Motive*). After a negotiation with the project manager, the roles and responsibilities were redefined and the course secretary was brought in to provide extra developmental help (*Object/ Focus shift*). The goal that the designer set up to transfer the course autonomy after the project was not fully achieved within the project.

Limitations of the distributed service: The integration of technology and the new way of learning, blended learning, forced the instructor to rethink the design of his course. He also found that the service he needed for redesigning his course is distributed in the university and his course redesign was hindered by such distribution.

> I would say that the time [students] spent online is better designed than the time in class. I am always embarrassed that I don't have the same quality in class in certain ways... In the end, they have to be the same level of quality. I have got help for using technology to teach. But we have never discussed the part I do in class. That is not their (IMS) business. So there is an imbalance there. All of our discussions were focused on how to use the technology, not everything that is not technology. Everything that is not technology is being neglected. It was not in IMS mandates. It was not in the mandates [of the director of e-learning]. It is easy

> just to care [for] the technology and neglect the other part. We need to find a solution to balance... I wanted to not only involve IMS but also TLS, which is Teaching and Learning Services, who up until now, may not deal [with] anything about technology while they are supposed to coach expert teaching... The university has a TLS and an IMS, but it does not have a TLS and IMS. But I, as an instructor, I have a need for both. I was lucky I had [the designer who has both types of knowledge]. But there is still a gap. (Interview, Dec. 20, 2006)

According to university policies, as a part-time faculty, the instructor had no priority to receive TLS's service. "I am still on their waiting list" he complained, "The Cont Ed has to leverage the resources to provide such support" and "the university has a lot to do if it wants to offer better [blended learning] courses". "The university should bring the two forces which are full of expertise together to develop something together". The positive experience the instructor had in this project made him an advocate of blended learning. "IMS and TLS are separate worlds in the university. Now I am trying to bring both together" (*Breakdown*). He gave a presentation and exerted his influence as a former staff in Human Resource in the university, appealing for integrated instructional support.

Lack of knowledge and skills for instructional design. The course secretary was called in to provide developmental support, building the course website based on the designer's design. He joined in the team at the end of design process and was not able to attend any design meetings. The course secretary had no instructional design background, and was not familiar with the more advanced features of WebCT Vista which allow customization of instruction delivery. As a result, he was not able to follow all the

developmental instructions given by the designer through the course map for production. "He is a technical person but does not have any instructional designer background. For me, it became problematic" she recalled in the interview (Oct. 17, 2006). She noticed that the course secretary did not devote enough care and attention to the "learning path" she had designed.

> The reading was No. 2 in this module; and in that module was No. 3, or No. 5 in another module... Students need to know that from one week to the next, No. 2 is always the readings... [The instructor] said he always wanted the readings done before the lectures. So I do want them to be No. 2. (Interview, Oct. 17, 2006)
>
> When we started numbering the assignment sign-up sheets, his numbering of the assignments and groups, they did not match...From the design perspective, for me, [if] I sign up for Topic one, when I go to the discussion form, it should still be called Topic one. For him, this was not [important]. 'What is the difference that will make? That is the one they are going to see'. He saw all these as [redundant] details. But I don't see these as [redundant] details. I see this is important, otherwise students get confused. (Interview, Oct., 17, 2006)

For the group activities, the designer wanted to configure the system so that the Sign-up sheet, the Discussion and the Assignment Drop Box could connect with one another. The purpose for such a setup was to automate some learning management tasks to reduce the instructor's workload and exhibit the "learning path" to students.

> Because first of all, it [creating groups manually] is more work [for the instructor]. And there is a reason for this. There is a reason why the Assignment Drop Box, is set up in such as way that only this group can submit. The reason is that if you do

it this way, when the teacher gives 60% to the group on a 100%, let's say, every group member in the grade book gets 60%. Again it automates this for the teacher. If you don't do it that way, then the teacher has to manually put in grades for everybody. And so there are certain things, connections that you can make behind the scenes that facilitate the task for the teacher. (Interview, Oct. 17, 2006)

My feeling is that, because he did not understand the logic behind what the students were doing, he did not understand the nuances or the subtleties of the system...So the feedback I got from him is that, the design is too complicated. His comment is based on the technical design. [The setup] is too complicated. (Interview, Oct. 17, 2006)

The designer, however, had different understanding of the "complex setup":

Well, actually it (the CMS) is more powerful because of things behind the scenes. We are losing some of the functionality of the system, if we don't allow these things to be automated. Then we are not giving the teacher the advantage, the full potential the technology can give him to make his job a little bit easier. (Interview, Oct. 17, 2006)

Given the tight schedule, the designer took over the task from the developer and set up the WebCT features that were closely related to her design.

So finally I went in and did it myself. I did the Sign-up sheets. I did them all, attaching them to the discussion topics. Finally, I decided which tasks he would do and which one I would do. So I gave the tasks – "OK, convert these to PDF and put them here". (Interview, Oct., 17, 2006)

She commented on the work of the course secretary: "Give the teacher some help,

limiting some of the work he has to do, and in collapsing together the pedagogy and the technical [side]. That was the part he did not get" (Interview, Oct. 17, 2006). The contradiction and the solution have demonstrated again that using CMSs in a pedagogically sound way requires its users to have solid understanding of both instructional principles and the technology itself. "If I give any of my colleagues, instructional designers like this (the course map for production), I think they will be able to follow this. They would always put the lesson plan first; they would always put the Intro and Learning Objectives next". The failure of the course secretary may be due to his lack of background knowledge, but how to create an effective production document to coordinate the collaborative practice is also a topic worthy of more discussion and exploration.

What Had Been Changed and Learned – Transformation of the Activity System Blended Learning Course

Although there was still room for improvement, both the designer and the instructor considered the new blended learning course a success. The feedback from the students contained positive components in the fall semester of 2006. They appreciated the flexibility brought by online learning, though they had encountered technical difficulties. The instructor was satisfied with the learning outcome. The assignments he received in fall 2006 showed the same quality as in the face-to-face class. Compared with the face-to-face version, eight out of thirteen modules of this course were put online. The instructor explained his decision about the online modules:

> Obviously first week and last week had to be in class. Week 10, logically had to be in class, because that was the one we covered interview [techniques]. For

> Week 4 and 7, there was no major reason there. I needed to pace them so that they were not alone too long. They were never away for more than 2 weeks. (Interview, Dec. 20, 2007)

The blended learning design captured the best practice in the face-to-face version, but went beyond. The integration of technologies, especially a CMS, brought flexibility to learning and changed the course design at a deeper level. Instructional strategies were chosen and learning activities were designed to leverage the power of technology.

The change of learning activities: All the scenario-based group discussions that had taken place in classroom became online discussions. Students took different roles (contributor, facilitator and synthesizer) in different discussion groups, working on different topics. They built knowledge in a collaborative manner and shared what they had learned with the rest of the class by publishing the discussion synthesis in WebCT. Moreover, the blended learning design created more "proactive assignments". The scenario-based group discussions forced students to engage in the problem-solving in real contexts and students had more time to reflect. The instructor elaborated the benefit of active and meaningful learning in the interview (Dec. 20, 2006):

> As the process, the online version and the face-to-face version are almost the same. That is what I tried to reproduce online. What is very different however is in class, there are pre-made cases. They are cases from the textbook and other sources, relevant but are cases that they [the students] do not necessarily need to know much about. In a way, you could get away without doing much with them. If you do not come well prepared, if you are just a silent type, you can just listen to the discussion and do nothing. Even if you are in class, you are not forced to be

an active learner. Online, again [I] cannot force you. But the assignments are more proactive assignments. They are not "read and discuss". Most of the assignments and those I keep for the next generation are assignments that you have to first go out and get information, mostly through the web but you can also get through interviewing people from an organization where you know somebody. Then you have to do some analysis and comparison with that information. And then you have to say what would I do and what should I have done. So the assignments are creating more active learning. (Interview, Dec.20, 2006)

However, this type of design could only be partially carried out in a face-to-face class...If we do this in class, most students are not well-prepared for such case study...When I first started using more cases, there were a couple of short cases, I required them [the students] to bring in information, not just to read but to get information. And usually, from the whole class, I would have two, three or maybe four bringing it. So if there is a purpose, then you are not meeting your goals. So overtime, I ended up with dropping that part, because not enough students were doing it to make it worthwhile. (Interview, Dec. 20, 2006)

So the fact of online frees some time for you. You can use it to do part of your assignments...You have more time to think about and reflect what you learn. For me that is important. That aligns with my major term assignment that I have kept for a long time. It literately takes them to put into practice the different steps of the process. I have more real cases, not the ones from the textbook. I always say "get real information, and compare with the textbook". I keep asking them to come back and forth. That is why I say it is more active. (Interview, Dec.20, 2006)

> The assignments [in the redesign] force back to them but the trade-off is part of the course you are not in class. So don't tell me you have no time...Essentially, almost every single assignment that I have kept is a long road that never stops. I know someone tells me it is more mentally demanding than some of the other courses. I like the word "mentally demanding". It is true. I expect them to think not just repeat... So that is more coherent with what I want to do. (Interview, Dec.20, 2006)

The instructor appraised the extra value brought by the integration of technologies:

> The assignments [group discussion and knowledge sharing] has become a big plus of the course at least for those who are interested in learning...The fact that they did not come to the class every week has not created a gap for them, because they have learned a lot from the assignment and so on. (Interview, Dec.20, 2006)

The change of assessment: The boundary of in-class activities and take-home assignments was blurred when the course went hybrid. They all became learning activities that could happen in cyberspace with or without the guidance from the instructor. The designer considered two major aspects in her design: motivating and engaging students in online activities and controlling the workload for both students and the instructor. The assessment plan therefore had been changed to be consistent with the requirements of blended learning.

Group discussions, former in-class, non-graded learning activities, became assignments. Most were graded in order to encourage students' engagement. "The point is [that] grading is also a part of motivation for them (students) to work, which you have to keep this in mind as well", the designer persuaded the instructor (Observation, July 18,

2008). In the face-to-face version, in addition to in-class group discussions, the instructor had take-home assignments every week. If the instructor had used his original assessment plan, the workload for himself and his students would have been too heavy, because online discussion sometimes could be "very time consuming, especially when students want to articulate themselves in writing" (Observation, July 18, 2008). After consulting the designer, the instructor reduced the number of assignments to make the workload reasonable (the number was reduced again during the revision). The decision of grading former in-class activities changed the overall assessment plan and the distribution of grades on each assignment. As the result, the instructor decided that "the grade distributed to the final [exam] remains 50%, the term assignment will be remain 25%, and the group assignments in a way to replace the midterm at 15%" (Observation, July 18, 2008). In the face-to-face version, all students had worked on the same cases in group discussions. To control the workload, the blended learning design made each group work on different cases or topics. But the design of knowledge sharing allowed students to learn from each other so that they could achieve similar learning objectives through a manageable workload.

The design of learning support: Worried that students might be lost in cyberspace, the designer prepared learning support to facilitate learning. Her learning design meant more than designing individual learning activities. It addressed the overall online learning experience. She had various means to make students feel comfortable at the first moment they log on the course and to keep the learning flow. Her efforts included:

- Drafting the course tour script.
- Preparing "Collaborating on Online Discussion Assignments".

- Preparing "Discussion: Tips and procedure".
- Providing customized Camtasia tutorials on WebCT tools used in this course.
- Designing online ice-breaking activities for students and the instructor.
- Opening a communication channel between herself and the instructor during the course delivery to answer his questions.
- Designing and participating in face-to-face orientation sections

Such design of learning support may look less important than the design of learning activities, but it acted as a lubricant when the designer and the instructor assembled the blended learning course and when students followed the "Learning Path" to achieve the learning objectives. These types of learning support had become necessary as students experience a new type of learning. Among the support provided, the Course Tour was developed to address WebCT's weakness with regard to content presentation and to guide students' navigation within the online learning environment. The online learning strategies, such as ice-breaking activities and assigning students to different roles in online discussions, are familiar to most designers. However, the information included in the two documents - "Collaborating on Online Discussion Assignments" and 'Discussion: Tips and Procedure" - suggests that the designer is an experienced designer who was able to envision the learning process when she was designing. The capability of envisioning delivery requires the knowledge and skills to link pedagogy with technology, which is an essential component of instructional design expertise.

Advocate for Blended Learning

The participation in the project equipped the instructor with knowledge and skills needed for teaching in an online learning environment, but the goal to transfer course

autonomy to him was not fully achieved. After teaching the blended learning course in the fall semester, he became more confident and more aware of related workload. In the winter semester of 2007, the instructor had more interaction with his students in the cyberspace. He communicated with his students in online activities to build more social presence and participated in students' group discussion to provide feedback and monitor their conversation. Moreover, the success turned him into an advocate of blended learning. He started rethinking his instructional strategies for both online learning and face-to-face instruction, and appealed to Cont Ed to provide more effective learner support. "I would not go back (to unadulterated face-to-face instruction)" he claimed in the interview. As a person who has years of experience in the field of human resources, the instructor noticed an organizational problem at the university and pointed out that, to promote the use of technologies in teaching and learning, the university should have a unified center that offers holistic support for both face-to-face and online teaching, as well as solid learner support. He committed himself to pulling all the available services together to support the coming course development projects in his program.

Effective Collaboration

The designer expressed in one of the interviews that the course design was a pretty basic one to her. "I don't think I have learned anything new here that I will bring to another project." On the other hand, she admitted that "[her experience in the project] changed maybe not the way I design but changed the way I coach teachers and the way [I work] with course developers" (Oct. 17, 2006). The designer pointed out two major problems in the collaboration. First, the developer, the course secretary, was brought in at the last minutes and had not participated in any of the design meetings. "He has actually

to produce something that we have been talking about three months." Second, his limited knowledge of pedagogy and technology did not help him understand the design of the course and the pedagogical use of the technology. "It is a way of thinking that we (instructional designers) have and somebody just technical does not have." (Oct. 17, 2006) She insisted that, in the future, the team should be established at the beginning and the developers need to have a certain level of involvement in the design process and at least understand the design.

Case Two

Context – The Activity System of Instructional Design

In 2006, an open university at Canada realized that it was not sustainable to support multiple CMSs and decided to go for a single -platform solution for their course delivery (*Rule*). They chose a well-known open source application – Moodle, version 1.7 (*Tool*) - and initiated a pilot project to test the system before the full implementation planned for in the following year. The purpose of the pilot was to test Moodle, version 1.7 at the undergraduate level to see:

- If the system was compatible with the educational characteristics of the university. How the system would work for open and distance learning, how students and professors, as well as tutors would interact with the system.
- From the course development perspective, how many resources and how much time it would take to convert an existing print-based distance course into an online distance courses in Moodle, version 1.7 (*Motives*).

One of the courses tested was English 212, Plays and Poetry, an undergraduate course that first year students at the Center of English Literature will take. Every year, at least 100 students enroll in the course. Usually, a regular undergraduate course at the university is coordinated by a professor who is in charge of the course (The professor is also the course coordinator for course design and development). She or he manages several tutors who communicate with students and provide learning support. Students admit to the course continuously and start their learning at the beginning of a month. They study individually, at their own pace, with a printed course package and receive support from a tutor to whom they are assigned (*Rule*). In English 212, in addition to the

printed course materials, students also had access to a course website that contained some descriptive information about the course as well as some interactive learning activities designed for self-paced learning, such as crosswords. There were at least 3 tutors and students communicated with them mostly through emails and phone calls.

The pilot project was led by EMD (*Community*) at the university, a department that contributes to the high-quality courses and services across campus. It provides a variety of instructional technology services, including editing, digital typesetting, instructional design, visual design, and copyright clearance (*Rule*). The designer who was interviewed for this study (*Subject*) and the professor of the course (*Community*) volunteered to participate in the project. The designer wanted to know the issues that would come up with the implementation of Moodle by testing it (*Motives*). As usual, to guarantee the quality of the course, the project also involved other EMD staff, including a visual designer, a course editor and a copyright officer (*Rule, Distribution of Labor*). The course design and development of English 212 is defined as an activity system because its formal delivery involved new structure other than the structure of the pilot: new tools, rules and new pattern of division of labor.

Process of Learning Design – Goal-driven Actions Mediated by Tools

The course chosen was a mature distance course that had been designed, developed and delivered according to the quality control standards of the university. Given the nature of the pilot project, the goal in terms of instructional design was "not to redesign the course in an online format. It was mostly converting what was existing" into a course that could be delivered by Moodle (Interview, April 16, 2007) (*Goal*). The design process involved the same basic instructional design steps, but at the same time

had some unique components.

Selecting a Pilot Course

The first stage followed the normal procedure of course development in the university. It came from "the institutional level to the course coordinator (the professor) level" (Interview, April 16, 2007). At the institutional level, a committee decided to pilot test a few courses in Moodle. Led by the director, a group of instructional designers at EMD came up with some criteria for selecting courses for the pilot test (*Object, Rule*):

- The course needed to be a complete course.
- The course needed to have high enrolment, at least 100 students in the course.
- They needed to have the cooperation with the course coordinator (the professor) and the tutors in the course.

The criteria were set up in response to the time limit (less than three months) and the purposes of the project – EDS wanted to know the profit of using an open source platform through the pilot test.

Brainstorming the Potentials of CMS

The course team met to discuss what they could do to convert the traditional correspondence distance course into a Moodle course (*Object*). The designer and the professor (the course coordinator) met first, and then they involved the visual designer (*Community*), and later the tutors (*Community*). In those meetings (*Tool*), the designer, the professor, and the tutors first reviewed the course objectives, the assignments, the assessments, and some learning activities of the existing course. Then, they envisioned the course delivery in the new CMS and brainstormed "what would we ideally like to do" in the course conversion. Their discussion focused on what the professor and the tutors

wanted to achieve the most in this short term pilot project. . The designer recalled in the interview: "I needed the professor and the tutors to make sure that the ideas put in Moodle were the key and relevant information." "Relevance was probably one of the most important criteria" to determine the focus of the pilot project (Interview, April 16, 2007). The team envisioned the delivery in the new CMS and they brainstormed new ideas, since the designer believed that "the envisioning (of the delivery) was part of the design process" (Interview, April 16, 2007).

After several meetings, the team, mainly the designer and the professor, decided that, they would not change the course objectives in the pilot project. "It was a written statement", recalled the designer: "We decided to keep the units and use the units as main topics in Moodle; and we decided the amount of the information between the different website versions, to streamline and simplify" (Interview, April 16, 2007). Another important decision was that they would mainly test a few features in Moodle (the Assignment, the Assessment and the Communication feature), and explore the potential of converting some existing learning activities to a more interactive format (*Object*).

> The priority for her (the professor) was very pragmatic. It was not about redesigning the course but was more about using the existing features of the course in the original version and seeing what could be improved for the pilot test. (Interview, April 16, 2007)

After the first meeting, the designer summarized their brainstorming as a project plan (*Object, Tool*) and sent the plan to the professor. Based on that, the professor refined some of the ideas with the designer through email correspondence and teleconferences (*Tool*). She also consulted with the tutors to see whether it would be feasible to do or not

in terms of the communication with students (the professor, the tutors and the designer lived in different cities) (*Division of Labor*).

To refine the project goals they set up in the brainstorming meetings, the designer offered a customized training on Moodle to the professor and the tutors who had never used Moodle before (*Tool*).

> I told her [the professor] it was important to have a view of Moodle before we discussing even more what we would do... I went through each of the main features of Moodle [version 1.7]. I assembled what would be the ideal version, but also what would be the limitations in the pilot testing. (Interview, April 16, 2007)

To the designer, training for Moodle was an important design strategy for building shard understanding of the course design. She believed that a certain level of knowledge of Moodle would help the professor and the tutors bridge the gap between pedagogy and technology (*Object*). The direct experience obtained from the training sections helped the team members link the functionality of Moodle with instructional goals, and envision the course delivery in the CMS. It was actually the extension of brainstorming.

After the training, the designer and the professor refined the list of ideas they had brainstormed and prioritized what they would do in the pilot project, making sure that their plan was compatible with the status of the project. "The consensus of design went very quickly, given that we only concentrated on key activities", the designer recalled in the interview (Interview, April 16 2007) (*Object*).

Converting the Course in a Collaborative Manner

After achieving the consensus of design, the instructional designer and the visual

designer carried out most development tasks: one focused on the pedagogical aspect of the project, converting existing content and learning activities and developing some new activities, while the other worked on the visual aspect, taking care of the interface issues of the course website. The development, according to related policies, was carried out in a testing site of Moodle (*Rule, Tool*). To move forward to the production site (*Tool*), the designer first tested the learning activities and the system setup, and then asked the professor to retest – she needed to obtain the approval from the professor on what she had done. The professor then tested, made suggestions and corrections, and approved the majority of the designer's work (*Object, Division of Labor*).

Parallel to the course development process, computer programmers (from another activity system) at the university were developing new Moodle features (*Tool, Object from another activity system*) that could be plugged into Moodle, version 1.7 to meet the requirement of continuous enrollment, a special registration policy at this open university, because Moodle, like other CMSs, was designed for semester-based course registration. "So while I was discussing with the professor and brainstorming ideas, at the same time, I had to get up to speed very quickly with what was going on at the institutional level, because they (the programmers) were developing features while I was discussing with the professor" (Interview, April 16, 2007). The process of converting an existing distance course to Moodle format involved not only team members within the activity system, but also members from other activity systems within the university.

CMS as a Tool of Design/Development/ Delivery

The designer admitted that Moodle, version 1.7 contains many useful features to meet the goals they set up for the project, though in this pilot project, the university

decided to turn off some features for the testing purposes (*Rule*). She was satisfied with Moodle, version 1.7 in terms of making online learning activities and assessments more interactive, and providing effective communication channels for distance learners.

Table 4.4 Material and non-material tools in Case Two

Usage	Material Tools	Non-material Tools
Communication	• Emails, • Online conference	• Meetings
Design/ Development	• Microsoft Word • Project plan (Object_Tool) • Moodle Version 1.7	• Brainstorming • Previous instructional strategies • Trainings and discussions on the pedagogical use of CMS and online teaching • Knowledge/ skills/ experience of designing and developing online environments • Instructional design/ development strategies generated

Realizing Instructional Strategies

Increasing interactivity with content. To address the needs of distance learners who study at their own paces, the designer decided to leverage Moodle features to improve learning interactivity (*Goal, Object*). The team created online quizzes (*Tool*) for each module and converted existing Flash learning activities to Moodle format. The original self-assessments were paper-based and embedded in the learning materials in each module. "Students just go through the questions and answer them." From the pedagogical aspect, students learn better if prompt feedback is provided to help them reflect on what they have learned.

> We need to make sure that we had relevant self-assessment activities where students could go and test themselves and get the immediate feedback without

having to wait for the tutors or the professors to respond them by email or phone. So we used the Quiz feature in Moodle. (Interview, April 16 2007)

The conversion, on the other hand, enabled students "to do something rather than just reading the information passively" and allowed the tutors to keep tracking learning progress.

> It was a way for the tutors or the professor to verify the thought that students are actually using it (self-assessment materials), because, we did not have a way of knowing it before. We included it as part of the textbook, but we were not sure that students were using it. While as in Moodle, at least we have a chance to go and verify within the system whether students use it. I think that was useful information to gain, which is not possible otherwise. (Interview, April 25 1007)

The team also looked at online activities that already existed on the course website, such as the "Crossword Puzzle" and "Meter Exercise", and succeeded in transferring them to Moodle. In addition, the designer used the Book feature in Moodle, version 1.7 (*Tool*) to present important reference poets to students in a user-friendly and readable way. "The professor used to send those poets to students by email. The material was not paper-based and needed to be adapted for an online environment". The Book feature allowed the designer to display the content in a "neat way" – a "short web page format" so that students would not have to scroll down the long screens. "If students wanted to print, they could print the whole book. It would be printed well, not like using the default of Moodle, which does not print that well" (Interview, April 16, 2007).

The ideal design from the designer's perspective included the use of social software applications in Moodle such as blogs and wikis.

> Especially in the self-paced environment, we were talking about having experts or exposing students to the expertise of the field and giving them the opportunity to build a knowledge base among students. Because it is self-paced [learning], blog would be a very nice way, even though students are at different stages of the course. There was still a way of building knowledge and sharing knowledge. I thought it would be a very exciting thing. (Interview, April 16, 2007)

The team had to give up the idea because the administrative limits on what could be done in the pilot in order to make it manageable in a short period of time. However, the designer believed that Moodle, version 1.7 has the capability to enhance collaborative knowledge building in self-paced learning.

Increasing interactivity with tutors and peers. Using Moodle features to improve interactivity between students and tutors was a major goal in this project (*Goal*). Compared with the old version of course in which students interacted with their tutors through phone calls and emails, the Moodle course integrated multiple channels for more effective communication – emails, Forum, and Announcement (*Object*).

> The professor really liked the fact that there was a feature to post announcements and course news which could be controlled by the professor and students could read it. And also the professor really liked the fact that she could update more quickly than emailing in the normal way. So access to the whole group was quicker through the communication tools in Moodle. (Interview, April 16, 2007)

Interactions between students and their tutors were essential to self-paced distance learning. While students still would have contact their tutors through phone calls and emails, they would also have access to the discussion forums in Moodle. "There are a lot

of varieties of discussion forums in the current system that we could set up", the designer elaborated (Interview, April 16, 2007). Pertaining to the identified instructional goals, the discussion forums in Moodle consisted of at least three types:

- *Learner – Professor interaction:* "Professor's Corner" in which the professor put general course information for students, information such as cultural events - anything that was related to the course in general.
- *Learner – Tutor interaction:* The most essential forums in this course that were set up for each tutor to interact with their own students about the issues relevant to learning.
- *Peer interaction:* a forum set up for students where they could communicate with other students if they want to.
- *Professor – Tutor interaction*: a discussion board for the professor and the tutors to exchange their ideas during the course delivery.

These discussion forums "gave the tutors a chance to reflect on some of questions and share the answers with the whole group as they were supposed to answer only one student." Students "could interact with the questions and answers posted by their tutors or they could raise their questions based on other issues raised by other students" (Interview, April 16, 2007). For those students who would prefer posting questions or who were too shy to ask questions orally, these forums offered alternative way of communicating. The designer further explained: "We hoped Moodle would facilitate the instructional strategy in terms of facilitating communication and disseminating the information among the group of students, because there were frequent asked questions" (Interview, April 16, 2007). The new design of communication in this distance course succeeded in

transforming an informative course website into "a real interactive online website" where all students enrolled in the course would be connected. "I would say that [the discussion forum] is probably one of the good features in Moodle. And it is very easy to set up communication systems", as the designer expressed her preference of the versatile and user-friendly feature in the interview (Interview, April 25, 2007).

Facilitating course management. Course management in a distance course was another relevant aspect of the course that the professor wanted to address in the pilot project (*Object*). Students used to submit their assignments to their tutors by email. In the Moodle version, the team wanted students to test the Assignment feature because the feature has "the ability for students to track their assignments, [make sure the assignments were] not lost in emails, the traditional way to submitting." (Interview April 16, 2007)

Given that Moodle was designed for semester-based assignment submission, the university developed a new assignment submission feature to meet the requirements, continuous enrollment. Therefore, testing the newly developed feature became critical to the success of the university–wide CMS implementation. The limitations of Moodle in terms of handling continuous enrollment will be discussed later in the section entitled "Contradiction of the Activity of Instructional Design" (Page 165).

Assisting Collaborative Design and Development

A virtual space to build shared-understanding. Moodle, version 1.7 in this project, served as a public space as well as a private space for the team to build a shared understanding of the design and a shared object- a course website in Moodle. A virtual public space was necessary for collaboration, especially when the team members were

distributed geographically across different cities. According to the development policy at the university, the development was carried out in a Moodle testing site before the design was approved by the professor and moved to the production site (*Rule*). The testing site therefore served as a virtual public space for the development. The shared understanding was built in a continuous manner as the team (the instructional designer, the visual designer and the professor mainly) developed and tested the new version of the course. To best use Moodle as a virtual public space, the designer offered customized training sessions to help the professor and the tutors identify the most important things relevant to their to use of Moodle and understand her design better. Because there were parallel development processes involving staff from different departments (course design and software development), the designer experienced some difficulties in moving from her private working space to the public space where she shared her design with the professor. The difficulties will be discussed in the section entitled Contradiction of the Activity of Instructional Design (p.165).

A Tool for experienced designers. Although the designer admitted that "Moodle is accessible to novice designers", she pointed out:

> Based on my experience and the discussions I had with other instructional designers, we still think that it requires quite a lot knowledge of instructional design to put everything together. It is accessible to the novice and it is less complicated than other platforms like WebCT. However, if you really want to make it work effectively and efficiently, you still need a good knowledge of instructional design. (Interview, April 25, 2007)

"One needs a lot of knowledge about organization of the course within Moodle,

because there are so many ways of organizing the course". Furthermore, the effective use of Moodle requires the knowledge for adapting CMS features to meet certain instructional goals. "So you need to have the knowledge enough to tell yourself 'Oh, I need to adjust this.' or 'I need to find a way to twist the system'". In this case, it was important to understand the instructional requirements brought about by the continuous enrollment and find a way to "twist and adjust" the system to fit the non-semester- based delivery (An example of twisting will be given in the section, "Contradiction of in the Activity System of Instructional Design", p.165). The designer expressed her concern: "I am not convinced that the novice person would always think about that. They would just use the tools. But they need to think a little bit further in terms of details" (Interview, April 25, 2007).

A Technology-driven Approach of Instructional Design

On one side, the designer emphasized the pedagogical use of technology: "I really believe that technology should assist pedagogy". One the other side, she also realized that the technology-based design process, especially when a CMS was involved, was "really a mix of trying to look at the instructional goals of the professor and at the same time look at the capabilities of the system that were available by the institution" (Interview, April 16, 2007).

> We have to be a mix of pragmatism and idealism. We have to compromise a lot between what ideally I would like to do and what we have to make it to put in the system that we are being told to use. I think there is still enough flexibility [in Moodle]. We discuss ideally what we could do, and when it comes down to prioritize. We attend the limits of the system. This is what we are trying to do at

this point. (Interview April 16, 2007)

It seems that designing with a CMS is more like playing with what capabilities are available, an approach that indicates a technology-driven design process (*Rule*). The selection of instructional strategies could not go beyond the capability of the delivery system. The tendency to adjust the design so that the course would be suitable for the new delivery system was still apparent. For example, they chose to use the Book feature in Moodle, because it was available and suitable for presenting reference poets. To present content nicely in Moodle, the designer reconsidered the amount and the layout of information that needed to be presented in the new course website (*Object*). This meant she re-select, re-chunk and re-sequence the existing content to fit the new templates.

> Within Moodle, it was really to decide how to display the content. How much content would be too much? How much would be enough to have a nice balance for students? So we end it up to develop a lot of little module sections. I would say (that) we modulized it a lot. All the information in one place, we subdivided it in little chunks for students. So there would be clear headings. For each heading, there was information that was attached to the heading. (Interview, April 16, 2007)

The designer thought that Moodle contains many useful features allowing her to realize various instructional strategies. In this case, the major design constraint was established by the administrative decision to close some Moodle features for the pilot.

Distribution of Labor and Distributed Expertise

Shared Responsibilities within the Team

The Canadian Open University has a long history of using the Project Management model (Bates & Poole, 2003) in its course design and development, and

well-defined process, roles and responsibilities for quality assurance. In this case, the whole course was converted by a course team together with the professors and three tutors. The course team included:

- An instructional designer
- A visual designer
- A course editor
- A copyright officer

Table 4.5 Subject and community in Case Two

Subject	Community	Other Activity Systems
Instructional designer	• The rest of course team • The professor and the tutors • Students	• IT department (computer programmers) • EMS as an upper level system

The case studied represents one type of course design and development scenarios at the university in which "the professor is the SME and is developing the course from A to Z, and then interacts with me, the instructional designer and the rest of the team to make sure that everything has been accounted before it is delivered to students" (Interview, April 25, 2007). In this scenario,

> The professor has autonomy in terms of the content of their course, like the course objectives and the assignments. They have total control regarding the content. Regarding how it may deliver, this comes to a collaborative adventure and I work more like a consultant...For the core content of the course, I play a role but I am not the biggest role. It is the professor that is the center authority and autonomy to develop it. (Interview, April 25, 2007)

The involvement of the designer in this project included:

- Consultation on instructional design and online teaching: The designer led the brainstorming of the use of Moodle to improve self-paced distance learning, and determined the instructional strategies together with the professor. She offered a customized tutorial of Moodle to help the professor and the tutors familiarize themselves with the new CMS and equip them with knowledge for online teaching.
- Contribution to course production: The designer worked with the professor to select most relevant information from existing content, chunked and sequenced the selected content to fit the Moodle templates. She also developed the course website, configuring Moodle features, implementing and testing online quizzes and other interactive learning activities.
- Collaboration coordination: As the leader of the course development, the designer coordinated the collaborative process. She initiated the discussion on the selecting criteria to select courses for the pilot project, organized group meetings, and assigned tasks to other team member.

The professor in the project acted as a SME, supplementing course content (she provided quiz questions and the designer generated the question feedback) and approving what the designer proposed and implemented in Moodle. The designer described an alternative development model at the university in which the professor "is not SME who teaches the course. It is the external SME that has been hired."

In that case, the professor oversees the activities of the SME and the SME still has the obligation to interact with the course team, which includes the instructional

> designer, the visual designer and the copyright officer, to ensure that everything is respected legally as well as professionally, and ensure that the course is able to be delivered at distance. In those cases, sometimes, we tend to play a bigger role, especially when the SME is not familiar with the structure of distance education at the university. Sometimes we can intervene much more radically for them to consider activities that will be suitable for students or in a non-traditional system. (Interview, April 25, 2007)

The visual designer worked closely with the instructional designer on content presentation, determining the visual setup in Moodle and designing the interface for each page to enhance visual communications. The original course used a home-made template for content presentation. He succeeded in combining some visual elements in the previous website with Moodle templates to make the new site look more appealing. As the instructional designer appraised, "the visual designer was the key person who decided the visual presentation for the course in Moodle". Because the pilot project worked on a course that already existed, the copyright officer and the editor played a less significant role. The copyright officer was only involved to make sure that the copyright statement would fit in the Moodle version. In the future, the designer believed that all the instructional designers at EMS would "be in charge of implementing strategies" and multimedia technologists would upload the content. "They will have to follow the indication that we give them" (Interview, April 25, 2007) (Division of Labor).

Conversation concerning Teaching and Learning Online

During the brainstorming about the potential use of Moodle, the designer decided to capture the best practice in the original version (*Tool*) and but go beyond that by

leveraging the new CMS. She kept the overall course structure in the old version.

> There is a sequence of course content and assignments. And also in general, there is logic to have a specific course developed on theme or on unit." So "What we did was based on experience in tradition - what works and what does not work. (Interview, April 16, 2007)

To capture the essence of the distance course, she asked the tutors: "how do you communicate with your students normally" (*Tool*). From the designer's perspective, the best practice of a traditional distance course was "really a key element to think with" in this pilot (*Tool*). Another "key" to redesigning the course was to "refer to how they, the professor combining with the tutors, are going to develop the course". The second question she asked was "what is the most important thing relevant for you to use Moodle"(Interview, April 16, 2007). It was somewhat difficult for the professor and the tutors to provide the answers because, at that time, they knew nothing about the new CMS and the university did not have a course in Moodle that could be used as an example. But the designer found:

> If what you want [from them] was more in terms of "knowing your students and your normal activity to engage with them, and how you think this might be helpful for you", then they gave you answers and said: "we would like to communicate with them, would like to be able to respond to their questions, and would like to do in a way to benefit all students and not just one students". (Interview, April 16, 2007)

The professor and the tutors were able to describe the ideal communication strategies for a distance course. However, only the experienced designer, who has

advanced knowledge of pedagogy and technology (*Tool*), was able to link the best practices in a traditional distance course to the pedagogical capabilities of Moodle and make full use of the technology. For this reason, the designer decided to offer customized Moodle tutorials to the professor and the tutors. They needed some basic knowledge of Moodle to have a conversation about how to use the technology in a pedagogically sound way (*Object*).

Another reason for the customized Moodle tutorials was to provide training for online teaching. The pilot project was more than a test of using the new CMS for design, development and delivery. "The way we thought about [using] Moodle was to give them (the professor and the tutors) an introduction to teaching online." At this Open University, "the majority (of the professors and tutors) doesn't have to teach online at undergraduate level". The traditional way of teaching was "not really done online" even though each course has a website for course information and students communicate with their tutors through emails. "In some courses, there was some sort of use of discussion board, but it was really not used". "They (the professors and the tutors) need information about how to teach online". However, the official training of Moodle offered by the university focus on the technical use of Moodle and has nothing to do with online teaching. The designer decided to provide her own: "I did this in an informal basis to the professor and the tutors... I organized my own sections. I felt there was a need for them to know more than the functionality" (Interview, April 25, 2007) (*Object*).

During the training, the major concern of the professor and the tutors was still technology itself.

There are a lot of technical questions, expressing the anxiety of using a new

> tool...There were also questions about support, technical support and to some extent, pedagogical support. They wanted to make sure they were not alone and they were not going to be the ones who were going to trouble-shoot for technical problems. (Interview April 25, 2007)

In terms of the teaching with the CMS, the professor and the tutor showed great interests in Moodle Discussion.

> That was the focus. They wanted to know how to use the tool to communicate with students in an individualized and self-paced mode of study. Because the communication was asynchronous and there were still concerns about how to best use that tool within the course as well. They were also concerned how to use the tool for pedagogical purposes. (Interview April 25, 2007)

The training, for the designer, was "part of the design" that "inform[ed] them (the professor and the tutors) the possibilities of using Moodle from a pedagogical perspective" (Interview, April 25, 2007).

> I really do want to provide the first training to the professor. This was actually my design strategy not for the course, but for to discuss with the professor in an intelligent formal way. Even though, it was limited; it wasn't perceived as main focus, I still integrated that aspect. (Interview, April 25, 2007)

As the designer foresaw, training with Moodle would "have to happen more and more to give them strategies of teaching online", and it "more and more became the role of instructional designers within the university. The focus was to get the professors and the tutors familiar with the functionality of Moodle [in terms of online teaching], not why they should use the system rather than another" (Interview, April 25, 2007).

Rules, Objects and the Mediation of Tools

The delivery policies and the project policies acted as rules in this activity of instructional design and had significant impact on the use of CMS and the way the team members collaborated with one another. At the institutional level, the nature of the university determines that the major delivery model is self-paced individual distance learning for undergraduate programs. It requires the selected CMS to have a certain degree of flexibility in managing this type of learning and dealing with issues brought by continuous enrollment – a type of flexibility that regular CMSs don't have. As an open source product, Moodle features can be modified and new features can be added to the system. It is possible to customize the CMS to meet the special needs of the Open University.

The selection of Moodle as the delivery system shaped the way the designer designs. The redesign of the course was more like "playing with what [feathers] were available", indicating a technology-driven approach in which the selection of media becomes prior to the selection of instructional strategies. In addition to considering how technology could improve learning, the designer had to make sure that her design was suitable for the delivery system. Another rule that mediated the use of Moodle and the design was the decision to close some Moodle features in the pilot project. Because of the administrative constraint, the course did not include any collaborative learning components, although some could be incorporated in the redesign by using Blog and Wiki features provided in Moodle. However, in this project, the designer still succeeded in creating some added values through the use of technology – increasing interaction between students and content, and between students and their tutors.

The Open University adheres to the course team approach for course design and development.

> The envisioning is going to remain this way for a long time for a lot of reasons. It is not a traditional university so quality assurance is one of the biggest concerns. And there are some legal issues as well. I don't foresee in near future, it is going to be completely the professor that is going to do everything at the undergraduate level. (Interview, April 25, 2007)

This rule determined the way the designer collaborated with other team members and mediated the use of various types of tools in the project. Because there was no need to transfer the autonomy of design and, especially development to the professor, when selecting the Moodle features to develop the course, the designer gave more weight to the capability of support learning than ease of maintenance. Besides, the tutorials for Moodle offered by the designer focused on how to teach with Moodle rather than how to develop a course with Moodle.

Contradictions in the Activity System of Instructional Design

The Limitations of CMS

Inflexibility for continuous enrollment. The major contradiction in this activity of instructional design existed within the system, between the CMS selected and the objects the team wanted to create. The purpose for the project was to create an online learning environment for an undergraduate distance course that was characterized by self-paced and individual learning and continuous enrollment (*Goal*). However, Moodle, version 1.7 with its default features, was not capable of meeting the requirements of this type of learning (*Breakdown*). The designer found that she had two major challenges in using the

default Moodle features: one lay in using those features that require setting up certain dates for course management, such as the Assignment Dropbox, Quiz and Calendar; and the other lay in "making a traditional publicity". The designer described the contradictions:

> That was a main concern even for the professors and tutors. For our course, we need to have an assignment drop box that is customized and tailored for continuous enrollment and self-paced, asynchronous way of communication. That was very very important...It is not that each month there is a deadline. The system has to be flexible enough. [The deadlines are set up] depending on where students are in the course, because students don't start at the same time, or at the same place in the course. (Interview, April 16, 2007)

In the default Moodle, the deadlines are set up for specific dates, the calendar dates, e.g. for the fall semester and for the winter semester. Therefore, the designer could not use the defaults. "It was the same thing for the quizzes, because the default again was semester-based" (Interview, April 16, 2007).

Moodle, version 1.7 was selected because of its flexibility to be customized. The solution for this contradiction, which was anticipated before the project was launched, was to develop some homemade features that could be plugged into Moodle to customize the open source. "So they (programmers) had to completely modify the system [so that we could]set up the Assignment Drop Box not corresponding to calendar dates but more to the process of the continuous enrollment." The programmers finally developed a new Assignment Drop Box, but they were not able to develop a new quiz feature within the testing period (*Tool*). The designer had to come up with workarounds to adapt the system

to meet her needs. While she configured the Quiz feature in Moodle, she had to make sure that there were no specific dates for releasing and completing the quizzes. The strategy of taking off information related to a specific date also applied to content publishing in Moodle.

> We had to assure that every section and every activity in the forums were absent from dates for a semester. So we had to cheat a little bit. In the default setting, we had to put in dates that are so in advanced that the students will not see the dates. And it was the same thing with Calendar in Moodle. We cannot use their calendar as an organizational tool. It is a nice feature, but it is again semester-based, an assumption that it is not really adapted to continuous enrollment. (Interview, April 16, 2007)

Limitations of content presentation and navigation. While the designer thought Moodle improved the interaction of the pilot course, she was not very satisfied with the content presentation accormodated in Moodle templates.

> From the visual design point of view, I think the old course website probably is more appealing to start with and has more flexibility to play around...I could have used a nicer file, a versatile style in a normal course website. We could make it more appealing, at least visually. I would say that was the main challenges too. (Interview, April 16, 2007)

Although the visual designer did a good job to adapt the original style-sheet to Moodle, the reconfiguration was "not always easy and it was time consuming". In addition to this weakness of visual design, the navigation in Moodle was not intuitive as it was in the original site. The designer experienced some difficulties while moving

around with in Moodle:

> Sometimes, once you want to get out a particular section within the webpage, instead of leaving you at the section where you want to read the information, it goes back on the top of the page and you have to scroll down again. You have to do more than one click to get to your information...There is an option for you to jump from [one Moodle] topic to [another] topic. But once you get out of that topic, it does not leave you at a good spot on the page. You still have to restart, sometime and go back again one level before you go into the information you want to access...In terms of speed, in terms of accessing the information, even though there is more than one way of doing within Moodle, it is still not as dynamic as a normal course website. There are fewer options to access information quickly. (Interview, April 25, 2007)

From the designer's perspective, the impact of visual elements on learning was "more in terms of the clarity of information - the readability". Although it sometimes might be "too crowed on the screen for students to look for information" and the way of accessing information was not flexible, she did not think that students experienced the content presentation on a Moodle site in a negative way: "I would say I think the information was clear enough to the students" (Interview April 16, 2007). The only negative impact she found was that content present in Moodle was not very user-friendly from the printing aspect, while many distance learners prefer printing out their learning materials.

Because of an administrative decision, the designer was not able to implement all her instructional strategies in Moodle. However, she believed that the CMS had a lot of

potential: "We will get there, but we are not there yet" (Interview April 25, 2007). In the future, the designer would like to see if to develop a course completely from scratch, whether the way they thought about the design process in Moodle would be different.

Conflicts in Collaboration

In this project, contradictions also emerged as the team was working collaboratively with one another and with outside resources. The design and development process was not a linear process as things were happening at the same time or in parallel. While the designer was discussing with the professor and brainstorming ideas, at the same time, she "had to get up to speed very quickly with what was going on at the institutional level, because they (the programmers) were developing features" (Interview, April 16, 2007). The ongoing improvement on Moodle was a great challenge for the designer to coordinate with other team members.

> One of the frustrations during that stage was the fact that some of the capabilities [of Moodle] were still being worked on, like the assignment submission... We had to use the default. We were not able to fix it completely until the development was completed. That was the main thing we had to deal with. (Interview, April 16, 2007)

Therefore, not everything the designer showed the professor and asked her to test was exactly the same as they had designed. She had to repeat to the professor "whatever you see, you have to think this is a prototype. It is not the final version". "It took a lot of email correspondences to communicate that what she was seeing was not purely my design", recalled the designer (Interview, April 16, 2007).

What Had Been Changed and Learned - Transformation of the Activity System

New Online Learning Environment and New Moodle Feature

The activity of instructional design studied here transformed a course website that mainly offers course information into "a real interactive online website". The designer concluded: "The fact was that through the Moodle platform, we connected all the students who enrolled in that course" (Interview April 25, 2007). The new Moodle site was an integrated learning environment designed for self-paced individual distance learning. It contained activities to enhance interaction between students and their tutors, as well as students and course content. As many advocates of Activity Theory believe, the contradictions between the major tool used and the object the team pursued catalyzed a new Moodle feature – an assignment dropbox for continuous enrollment had been contributed to the Moodle community (although this new feature was a tool rather than an object of the target activity system according to the definition of activity used in this study).

Reflection on Instructional Design

The participation in the pilot project equipped the professor and the tutors with knowledge for using Moodle and teaching online. It also helped the designer reflect her understanding of instructional design as well. The designer admitted that her participation reinforced her beliefs about the design practice. The reinforcements were related to three main aspects of instructional design: training, teamwork and learning design. The designer believed that training was key to integrating technology in teaching and learning. For effective integration, we need "a really comprehensive training that includes both technical aspect as well as the integration of the pedagogical aspect" (Interview, April 25,

2007).

The designer highlighted the importance of the team approach in terms of course design and development for an online environment – the project management development model (Bates & Poole, 2003):

> I think that part of the pilot proved you need have difference types of expertise... There was also a fact that, when we were integrating technology, you needed to have a level of expertise where you are normally a subject expert. But you also need to be able to make connection between the subject and the possibilities of future development of the course. (Interview, April 25, 2007)

"It was definitely a course team approach would be the most effective way of integrating technology", confirmed the designer. From her experience in this project, she found that asking the professor and the tutors to do everything was not an effective way because of their regular workload. In addition, when having discussions with the professor and the tutors, she noticed that they felt "real sure" as "they had people with whom they could brainstorm ideas, balance ideas and refine ideas". The discussion made the implementation of those ideas easier. "Everyone felt comfortable with the decision". The designer thought "it is really really important to have those previous discussions before integrating technology within the course", in which the team made links between pedagogy and technology. Those discussions were "essential for the effective use of technology in distance learning" (Interview, April 25, 2007).

Importance of Learning Support

Even though it was her first time using Moodle as a design and delivery system, the designer pointed out the importance of providing learning support that reduces the

anxiety of online learning, especially the anxiety to adopt a new platform. She explained: "It was very important to be open and very clear in terms of the communication. What I mean by that is that designing communication for students so they understand quite well it was a new platform and giving them a very appropriate orientation" (Interview, April 2007). The designer used simple language with non-technological jargon to communicate with learners about the goal of the pilot project and provided an outline (an orientation letter in first module) about:

- How to use Moodle and tools in the CMS.
- How to navigate within the website.
- Where to get support.

Such information was not considered a necessity before the project. However, as the team advanced, "it became clear that it was very important to have appropriate information at the right time - Whether it was about the assessment, whether it was about the course content or even about how participation was going to happen." Feedback from students contained a lot of confusion about the deadlines, implementation and the tool itself. "So a very good communication strategy will be an essential design for the future courses, especially in distributed learning environments"(Interview, April 25, 2007).

This pilot project that converted a traditional distance course into a Moodle course was considered successful. The designer told the researcher:

> We have achieved the basic objective of raising awareness about using a LMS[7].
>
> We have achieved the objective of getting some familiarity to the professor and

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[7] Moodle is called learning management system (LMS) rather than CMS in the university since the university has another home-made system for course management which mostly manages course content. To the designer in this case, Moodle is more like a learning tool than a management tool.

> the tutors in terms of giving them some basic training with the tool. In terms of pedagogical objectives, we have established the priority of the course - what was central to the course and how we could match the technology to achieve that. (Interview April 25, 2007)

For the next implementation, the designer thought: "we need to be more careful about how to really integrate this [CMS and how to integrate] more completely within the course" – creating a real online learning community for self-paced and individual distance learning (Interview April 2007).

Case Three

Context – The Activity System of Instructional Design

Case Three is about designing an online course at a University in eastern Canada. Technology for Educational Change is an undergraduate course for students in the program of Early Childhood and Elementary Education. It had been taught in a regular face-to-face classroom with some lab sections. Usually labs are tutorials about the educational technologies relevant to the course. The online version was delivered in FirstClass, a delivery system used in the Department of Education and offers powerful tools to facilitate online communication and collaboration (*Rule*).

The majority of the students came from an undergraduate program that leads them to get the credentials to teach in K12classrooms. There were about 80 students in the class during the winter semester of 2007. Most of them did not have any experience with FirstClass. The instructor, who is an expert in Educational Technology, had taught the course in classroom once before he converted it into an online course. He views himself as a constructivist –

> Learning is based on doing something. It is not much that interaction with content is learning. Learning is something [accomplished] by manipulating objects, by working, by creating materials. There is a lot beyond. Learning also happens in a discourse space. When we talk with others, when we talk with peers or teachers, when we try to teach it again back to somebody else. These are the spaces of learning. (Interview, May 24, 2007) (*Rule*)

The process of redesign was studied to understand how a CMS mediates the practice of instructional. The case ended when the instructor recognized the need to

account in his design for related registration policies and the workload that his students would receive from other courses in his course design. The newly identified need suggested a possible structure change of the activity, the involvement of new tools, rules and a new pattern of distribution of labor.

Process of Learning Design - Goal-driven Actions Mediated by Tools

The first decision that the instructor made for the course redesign was to contextualize course content to the audience's needs, "getting it closer towards early childhood context and also finding activities that are meaningful enough to convey the key points" (*Object*) (Interview, May 24, 2007). He surveyed related literature and selected the slices that he wanted to focus on– some "theoretical parts that educational technologists bring in all different views of doing technologies" rather than "techniques of running technology packages" (Interview, May 24, 2007).The topics he picked up for the courses were: Mind Tools, Computer as Cognitive Tools, Information Behaviors, and Social Computing. The decision was made to take into account student needs and the ever-changing nature of the subject matter.

Based on these considerations, the instructor created the assignment plan (*Object*), giving his students four assignments: two were individual assignments and the other two were a mixture of individual and team work. He then designed the course structure and created a course in FirstClass on his own (*Object, Tool, Division of Labor*). Driven by his belief of "learning by doing" (*Rule*), the instructor abandoned the approach that emphasizes reading:

> For me, yes, there is an issue of intervention and when do you introduce the stuff. But a lot of articles are interchangeable. ... I am really more [into] "how can I

engage them in activities that are meaningful around that general topic area". (Interview, May 24, 2007)

He had a list of prepared learning activities to support the shift from passing information to students to engaging them in active learning. His major task of course design was to organize learning activities – assembling those learning activities pertaining to predefined learning objectives and ongoing needs of students (*Object*).

> I have a list of forty to fifty activities from which I chose, probably around ten to fifteen... It is like a Lego. I have a lot of Lego blocks. But the castle is not done. The castle could look differently. I just pick other Lego blocks and see if they fit right now better than others. (Interview, May 24, 2007)

The emphasis on active learning interventions, plus the fact that he would also teach the course, gave him the flexibility to modify the course design during the delivery phase. The design process was an ongoing process as the instructor kept adjusting his design to improve learning experience while he was delivering the course. He recalled the ongoing process in the interview:

> First of all, I planned the weekly tasks. As a general plan, it was done before the term started. The specific planning happened during the week when I saw how people reacted: is it too much or is it too little, what type activities students are responding, what type of questions are getting students engaged. That sharpened my activities every week. (Interview, May 24, 2007)

For each week, the readings and the PowerPoint file that highlighted the key points in the readings were predetermined, but not the questions for weekly discussion and learning activities:

> The questions are determined when I reread it for preparation when I saw they discussing. That is not prepared. The activities are not prepared in a sense that as you see in the weekly plan, the assembly is not predetermined, but the individual pieces are predetermined. (Interview, May 24, 2007)

The instructor kept a close eye on what was happening in the cyberspace. He inserted a five-minute survey on "what goes on and what difficulties arise in the moment" whenever students came to chat online during his office hours (*Tool, Community, Division of Labor*). Therefore, he was able to adjust the learning activities based on students' performance and feedback (*Object*):

> I see like "OK. The reading list of this week is very heavy. They just finished a large project last week. This activity will be a little bit lower, lower in the sense of less time-consuming for them". Or I did not envision that they had that much problems with learning objectives - determining and writing learning objectives, I added a learning activity of learning objectives. So I have already in my list of things. (Interview, May 24, 2007)

The instructor accomplished most design and development tasks in this case, only discussing with his teaching assistant (TA) when he needed a different opinion (*Community, Division of Labor*). "I bounced ideas off the teaching assistant", said the instructor in the interview. In the face-to face version, the TA was deeply involved in the design and "even taught two or three classes and led some of the lab sections." But in this distance course, the TA had fewer tasks in design but more acted as "a communication agent - somebody who was more present in the environment" (Interview, May 24, 2007). Driven by the constructivist approach (*Rule*), the design process also involved students.

> Some of the rubrics we co-constructed with them (students) –"What is really important in this particular project? How would you make a rubric for your own project?" They discussed with us what was important and what was not important. They involved in that. (Interview, May 24, 2007) (*Object, Division of Labor*)

The involvement of students in course design also required students to follow the instructions and post their questions and answers in specific places in FirstClass so that the instructor would be able to create a dynamic scaffolding to facilitate discussions. However, this learning strategy was not realized, and therefore, contradictions arose. More discussion on this point is provided in the Section, Contradictions in the Activity System of Instructional Design (p. 184).

CMS as a Design/ Development/ Delivery Tool

Overall Design

This course was a discourse and project-oriented distance course. Students came to the face-to-face orientation at the beginning of the semester. After that, they learned mostly in distance mode in the online learning environment, only having contact in person with the instructor and the TA during office hours (*Rule*). To equip students with knowledge and skills for integrating educational technologies to K12 education,

> The whole course was designed as every week: There are three or two readings, a PowerPoint [document] in which I asked questions on the readings, and the activities. The activities that came in addition to reading had either to do with topics of reading… or prepared students [for] something that will happen later in a project. (Interview, May 24, 2007) (*Object*)

The course provided a lot of materials for discourse oriented learning as well as

"hands-on" materials for lab sections. The lab materials addressed both key technical and pedagogical aspects of some educational technologies (*Object*). "There were some elements in there that were critical" because "one of the bigger learning objectives in the class was to think of technology not as the hard and software of computers, but a good outline and process you establish in your class is [also] good technology" (Interview, May 24, 2007) (*Rule*).

Learning Activity

As the focus of course, the learning activities emphasized active learning. For example, students were asked to explore an online library with thousands of stories about teachers integrating technology in their classrooms. They were required to investigate the stories and:

> Find real stories that are showing differences in using technology, either the one [in which] the teacher is using [a technology] or the other [in which] the students are using [it]; either it is at very low level or at a high [level]- such as modeling and simulation. Let them explore a range of things. Then they have to introduce the stories to their colleagues. That is also posted in these work group folders. (Interview, May 24, 2007) (*Object*)

Although learning at a distance, students were not isolated - all activities were designed to have exchanges with others. Every team project had individual and collaborative components. Everyone had to be prepared and worked individually and then the groups would start to work with whatever individuals had started already. Students were encouraged to work in a collaborative rather than cooperative manner in groups of 16 (*Object*).

While learning to be team players, students were expected to be self-regulated as well - be able to "move from a more structured assignment to a more unstructured with ease". Other than assignments with step-by-step guidance, Students had open-ended unstructured ones "where part of the learning experience was 'you have to structure it yourself. We help you structure it but we don't structure it for you'" (Interview, May 24, 2007) (*Object, Distribution of Labor*). However, this constructivist approach was difficult for some students.

In addition to the explicit instructional goals, the instructor had hidden ones that had "nothing to do with [the topics] of Technology for Educational Change". They were intended to expose students to different ways of teaching and learning. "So if I expose them to four different types of rubrics, they know that rubric is not always the same looking. A rubric can be differently done" (Interview, May 24, 2007) (*Goal*).

Learning Support

Given that students had little experience with FirstClass and online learning, the instructor offered six in-class orientation sessions that students could choose to take at the beginning of the semester. Half of the sessions were about how to use FirstClass, the delivery system. The other half focused on how to be a successful distant learner and what to expect from the course - "nothing about the syllabus, but just talking about time management and any questions on how to be a distant learner" (Interview, May 24, 2007). This included a whole session on collaborative learning versus. cooperative learning (*Object*).

The instructor understood the importance of human interaction in a distance course. "DE [distance education] classes need more human contacts. It is not just a

talking head in content materials and people flipping though" (Interview, May 24, 2007) (*Rule*). He therefore designed the communication between him and students, as well as between the TA and students. To avoid students treating him as an authority and stopping discussion, he purposefully designed himself out of online communication. But he still monitored learning and interacted with his students online or in person during his office hours.

> I made summaries; I made commentaries on projects in stages, but I did not communicate with students on a day-to-day basis. That was done by the TA and, often, I sent the TA stuff to say in there or the TA posted them. So I was not as visible in the environment as the TA. (Interview, May 24, 2007) (*Object*)

The TA's role was defined as a communication agent, being present and monitoring learning process. When someone was disappearing from the discussion or not doing anything for a couple of days or weeks, the TA would send him or her prompts, such as "What is going on" and "anything we can help with". The prompts and mini surveys were carefully structured to monitor learning. The instructor started the tracking mechanism after week three or four. Students who were tracked were rechecked in week eight or nine (*Object*). The structured support helped students be effective online learners. Despite only having had three hours in classroom, and though very few came in during his or the TA's office hours, students nevertheless expressed in a survey that they felt: "I have more contact with my instructor than I would have in regular class"(Interview, May 24, 2007). The instructor found that "contact time", to those distance learners, meant "if I have a problem and I get an answer" or "if something happens I can use that tool", since his students did not count the face-to-face orientation as contact time. "It was interesting

to see that this type of contact time was actually increased when we use a CMS or an electronic communication system", he said in the interview (May 24, 2007).

Course in FirstClass

Several learning materials and learning activities became basic components of a course carefully structured in FirstClass to foster a virtual learning community. The course in FirstClass had several folders for various instructional purposes: content presentation, course management and team work. To interact with others in the class, the class could send emails or upload files to these folders (*Object*).

Weekly Guide, Literature, Support Materials folders are designed for content presentation. "Weekly Guide" was a folder where the instructor posted weekly learning guidance for students. Usually the weekly guidance included two files: a PowerPoint file and a PDF. The PowerPoint files were a "small highlight" of the points in the weekly readings and could be seen as a mini lecture. But a lot of times, in his virtual lectures, the instructor posted questions rather than answers, to encourage thinking – "It is like 'do you agree with that statement from me'" (Interview, May 24, 2007). The PDF guild contained some structured information, presenting weekly activities and assignments, as well as some information regarding course management. Readings were listed in the "Literature" folder. Extra materials regarding instructional design, such as materials about how to start project, and how to create learning objectives, were in the "Support Materials" folder.

According to the design, students worked in "Your Work Group" folder, posting their questions for readings and collaborating on team projects. For course management, the instructor set up one folder as an "assignment dropbox" and another one for Class

Administration. However, the administration folder was not heavily used –"there was a general writing, like when class starts". Major course management information, such as activity reminders, information grading and technical support, was inserted in weekly guidance. The instructor explained that FirstClass was not a real CMS - "Everyone can post in there. So it is not a good place for announcement" (Interview, May 24, 2007). The contradiction related to course management which was brought by FirstClass will be discussed later.

Feedback from students suggested they have learned a lot from the course. However, the instructor insisted that the success was a credit for the instructional strategies used in the course rather than the delivery system, since he could otherwise use the same strategies in face-to-face class as well. In terms of the benefit of FirstClass, in addition to the benefit of learning at anytime, the instructor admitted that the system "provided a space for everything to happen" (Interview, May 24, 2007), increasing the interactivity of a distance course and helping him keep track of student performance. In this course, students were very active in discussions and felt they were closer to each other than in a big face-to-face lecture class. The instructor claimed that "it would not have had so much discussion going on", if the course had been a traditional print-based distance course. The written messages stored in FirstClass made it easier for him to monitor students' learning:

> I have a record, not just like a student coming to me and talking about it, then I forgetting what it was and [forgetting] writing it down. It (the use of FirstClass) was good for managing information. (May 2007)

According to what the instructor described in the interview, the strength of

FirstClass in terms of keeping track actually facilitated the learner-centered design process and allowed the instructor to make on-the-fly adaption based on students' performance and feedback. Because the learning activities in this course were mostly discourse-oriented, all the instructional strategies were realized in FirstClass, using mainly the Email and Grouping feature that allows students exchange emails and collaborate with team members. However, the instructor sometimes felt frustrated with the technology. The main reason he thought was that FirstClass was not a real CMS but rather a communication management system.

Contradictions in the Activity System of Instructional Design

Some contradictions in this case were brought by the limitations of the delivery system, FirstClass, as the instructor was not able to use the tool to create an online course exactly as what he had designed. Other contradictions were brought by special rules existing in this activity system. Those contradictions were exacerbated and had negative impact on learning since most students came into the online environment with little knowledge of FirstClass and online learning.

Limitations for Course Design Development/ Delivery

Limitations for Course Management. FirstClass is a powerful communication system where users can communicate through email exchanges. Emails can be organized into various folders that are set up by themes or groups. Basically, everyone who has access permissions can post messages in the folders. While the system was used to deliver a distance course, the fact that "everything is a discussion place" made it "not very helpful for course management" (Interview, May 24, 2007). For example, while the instructor wanted to have a folder only for course announcements (*Goal*), he found that:

> Everyone can post in there. So it is not a good place for announcements. Because if it is an announcement you know I am the only one who is writing and then it is clear that it is just one message from the instructor from another. Here it's like people don't know where to write a question; they just write it anywhere and someone picks it up. (May 2007) (*Breakdown*)

The instructor tried to set up the system in a way so that every time students come in, there is an announcement popping up. But he soon realized that, for students who even did not know how to open a folder in Firstclass, such setup was "too intrusive".

Limitations for discussion organization. In FirstClass folders, emails can be threaded by subjects, time or senders. When a new message comes in or someone replies to a message, the active message is automatically put at the top or the bottom of the message list. Emails don't have a fixed spot in discussion folders. They are shuffled as new messages are introduced. When there is a lot of discussion going on, it becomes hard to locate a specific message. This became a problem for this online course where both the instructor and his students wanted to keep track on what was going on in the online learning environment (*Goal*). "You know this thread is down there. But as soon as someone writes something on the last email in the whole discussion board [replies the email], the thread moves up on top. You cannot find it anymore" (Interview, May 24, 2007).

The instructor found it was so easy to get lost when there were more than twenty emails with similar titles in a FirstClass folder, since in a situation like that one tends to rely on location rather than title to locate the information. In the Question Mark folder, the class created about one hundred fifty to two hundreds emails.

> Students felt overwhelming and confused about that. They [students] come in; it [a discussion folder] doesn't have many changes, but it looks like to have a lot. If you get the feeling of a lot have happened when you were gone, you feel like "I can never catch up". They lose motivation. (May 2007) (*Breakdown*)

Limitations of content presentation. The instructor complained in the messages he wrote, he could not embed hyperlinks and reference to content resources in FirstClass (usually another folder) or other messages. Nor could he embed such links in the PDF guidance he created either. (*Breakdown*)

Lack of Online Learning Skills

Given that the course was heavily discourse oriented, the instructor wanted to provide some dynamic scaffolding to facilitate discussions (*Goal*). Though not presenting in the discussions, he spent a lot of time in monitoring. Sometimes, when a student asked a very crucial question but it was hidden somewhere, he wanted to copy it to a public folder where other students might look to provide an answer. The instructor thought this could help him create a FAQ list or a library of questions and answers. However, he found it was very hard to build such a dynamic scaffolding tool that "as soon as people have questions then there will be answers and they will be sorted as a question-and-answer format". "This had never worked out" (Interview, May 24, 2007), because students were not very clear where to post and what to post. Even though the instructor planned special orientation sessions on how to be a successful learner, not all students followed the communication recommendations. The instructor found students posting some private messages with their student identity numbers in a folder that was dedicated to group discussions. "It was hard to keep them on topic" especially when the system

allows students to post in any folders that they had access permission (Interview, May 24, 2007) (*Breakdown*).

Organizational Challenge

Another main difficulty the instructor encountered "had to do with organizational challenges and was also associated with FirstClass." Students can, at the university, sign up for a course four or five weeks after it has already begun; or drop off the course in the tenth week without getting a failure grade (*Rule*). In this course, the instructional goals were "pertinent to the use of communication, team work and small groups" and part of the grade was based on continuous participation in group discussions. Therefore, the challenge left for the instructor was how to integrate the new comers and those who had lost their group members in a meaningful distance learning environment. The instructor had a large debate with his TA on this issue, trying to find whether one large discussion board for the whole class or small group discussions were better for the predetermined goals (*Object*). It was not easy to make the decision:

> The disadvantage of one discussion board is, if we have 60, 70 people, everyone writes once a week, just once, you have a 60 questions plus other 60 for answers, you have 120 messages. Who will read that? It becomes overwhelming if somebody does not come in everyday. If you have small group, and we decided to go with small group, you have a problem that people coming late, they need a new group, but to whom you assign them? And what do you do when people drop? You made a group of 6 people and 5 of them drop. (Interview, May 24, 2007)

Reassigning groups was not an easy task, as well. "Huge communication effort!" the instructor complained during the interview (May 24, 2007). Besides, reshuffling

students and reestablishing groups did not solve the problem completely:

> Also how do you deal with all the messages that the old group produced but there are no numbers anymore? Let's see this particular group, let's say everybody drops the course except for Adams, so how do you bring Adams to the next group? Yes, you can add Adams as a writing member, giving him the permission. That is easy. But what do you do with all the messages that have been written by Adams. (Interview, May 24, 2007) (*Breakdown*)

In this course, although group discussions were about the same topic, each group could go to different aspects of the topic. For example, for the topic of semantic networks, some could discuss about how to structure semantic networks and others could talk about how to integrate pictures. Therefore, moving whatever Adams wrote into a group would not make any sense, "because Adams was responding to people who are not there anymore." The instructor admitted: "This is a huge challenge that you can rarely solve in small groups", especially when the groups were very functional teams. From the learning aspect, "it was not just about dropping out of the course. It was about being inactive for a couple of weeks, not doing anything or not much responding"(Interview, May 24, 2007). Some students would rather stay with a smaller group without being reshuffled so that their conversation could keep going. From a social aspect, reshuffling took some students out of their social context. They had to introduce themselves again and get to know the dynamics of the new group quickly. For those who were already in the group, working with a new member half way through was also somewhat disruptive (*Breakdown*). The instructor reshuffled the class once and kept the inactive group folders as archives only for their former owners.

> But they cannot take the conversation with them [while they were moving to the new group]. That I found very destructive. You said something before but you cannot reference it, because nobody else knows such discourse. That I found [was] very very tricky. I did not really find a solution for that yet. (Interview, May 24, 2007)

While asked about how other CMSs, such as Moodle might handle this issue, the instructor expressed that his difficulty in managing group work was more an organizational issue than an issue of a CMS: "That is an organizational thing that I cannot change". But the following learning problems were associated with the CMS used. No CMS seems to have been designed to address this issue. "I learned that I have to find a different way to work with groups" – rethinking about his instructional strategies (May 2007).

What Had Been Changed and Learned – Transformation of the Activity System

While he was looking for strategies to address the organizational issue, the instructor noticed that there were "life cycles going on in the course environments", especially in a university setting - "What I have learned [is that] there were weeks in the term that are more productive than other weeks" (Interview, May 24, 2007). When students did not have much to do in other classes, almost everyone showed up in FirstClass. But in the last several weeks, while students were busy with projects and final exams from other classes, they rarely showed up in the cyberspace. The instructor believed that such "life cycles" needed to be studied in distance courses – "what are times in which you [as an instructor] can use them nearly exclusively" (Interview, May 24, 2007). Although the registration regulation cannot be changed, the CMS cannot provide

any help, instructors still could "structure the course around these times" to avoid reshuffling students and reestablishing groups. It will not be an issue to "really make use of that tool, and space and time" (Interview, May 24, 2007). However, as the instructor pointed out, the solution for the organizational issue would rely more on instructional strategies rather than the specialties of a CMS. He expressed his interesting in finding out the indicators that would help instructors determine time they can utilize most. He envisioned:

> You do a very relaxed intro, because you know people can sign up until the fourth or fifth week. So before everybody is here, you give something to them to do but you don't want to give them too much, because the latecomers feel overwhelmed. Then when they are all there, how do you occupy them or even push them harder at that time. (Interview, May 24, 2007)

From the instructor's perspective, the delivery system, FirstClass, is not a real CMS. While summarizing his design and teaching experience in this course, the instructor claimed that the use of a non-CMS as a delivery system amplified common problems in distance education. At the same time he admitted that his experience with FirstClass actually helped him figure out what are the real points that might be difficult for students in distance. In this course, multiple communication channels needed to be clearly defined for various communication purposes. As the instructor emphasized, there should be some places in a CMS that are only accessible to instructors and where instructors can post important information to guide learning. His experience also showed that a CMS used to deliver a discourse-oriented course needs to have functions to facilitate group discussions: sorting and locating messages, as well as providing dynamic

scaffolding. Carefully designed learning support was another crucial factor contributing to the success of the course. It is necessary for increasing interaction and preventing students from being lost in the cyberspace. Such support will be more effective if students have enough knowledge and skills for online learning.

The instructor summarized in the interview, "in my opinion, it is completely a different class" compared with the face-to-face version (Interview, May 24, 2007). Although it was not only because of the use of a CMS, the instructor took a more constructivist approach while he was redesigning the course. His design avoid the stereotype of "lecture and lab", emphasizing students "learning by doing" and collaboration, and was still successfully realized in FirstClass, a non-CMS communication system.

CHAPTER FIVE: CROSS CASE ANALYSIS

The three cases that have been presented contain intensive contextual information about three course redesign projects. They took place in three different Canadian Universities and employed different CMSs. However, when we structure our analysis through the lens of Activity Theory, we find some cross–case patterns that help us understand more about the collaborative practice of instructional design and the impact of the tools used for design and development, especially a CMS. The relationships among the components of a design activity will be explored with a cross-case analysis approach to generate a replicative logic necessary for generalizing the findings in this study.

Three Activity Systems of Instructional Design

The three cases were about redesigning existing courses for new delivery methods.

- *Case One* for blended learning in which more than 60% percent of the face-to-face section was replaced by online learning.
- *Case Two* for distance learning in which online components were integrated with traditional print-based learning.
- *Case Three* for online learning in which most of content was distributed and most learning activities took place in a virtual environment.

Information technologies were deeply involved in the design, development and delivery in three cases. In cases One and Two, the courses were designed and developed by a team whose major members contributed as specialists in the roles of designer, SME, and developer. In the third case, the instructor, an expert in educational technology was the designer as well as the developer. The three systems used were:

- WebCT, Vista, version 3 – one of the major commercial CMS
- Moodle, version 1.7 – one of the major open sources that is compatible with commercial CMSs
- FirstClass, version 9 – an online collaboration and communication platform

Table 5.1: Mapping the three activity system

Activity Components	Case One	Case Two	Case Three
Subject	Designer	Designer	Instructor as designer
Object	Redesigning a face-to-face course for blended learning	Redesigning a traditional print-based distance course to integrate online learning components	Redesigning a face-to-face course for online learning
(Major) Tool(s)	• Knowledge and Skills for designing online learning • Brainstorming/ Discussion • Training • CMS – WebCT Vista 3 • Microsoft Word/ PowerPoint, Camtasia, Inspiration • Emails • Tools generated during the design process, e.g. course maps, instructional and developmental strategies • Instructional strategies in the previous face-to-face version	• Knowledge and Skills for designing online learning • Brainstorming/ Discussion • Training • CMS – Moodle, 1.7 • Microsoft Word • Emails/ teleconference • Tools generated during the design process, e.g. project plan and developmental strategies • Instructional strategies used in the traditional distance course	• Knowledge and Skills for designing online learning • Brainstorming/ Discussion • FirstClass as CMS • Microsoft PowerPoint • Tools generated during the design process, e.g. instructional and developmental strategies • Instructional strategies in the previous face-to-face version

(Major) Rule(s)	• WebCT as delivery system • Delivery format- Blended learning • Team approach for course design/ development • Pragmatic Constructivist approach for learning design • Access to supports for design/ online teaching and learning • Rules generated during the design process	• Moodle as delivery system • Delivery format- Distance learning with online components • Team approach for course design/development • Constructivist approach for learning design • Access to supports for design/online teaching and learning • Registration policy: continuing enrolment • Project rules • Rules generated during the design process	• FirstClass as delivery system • Delivery format- Online learning • Instructor worked as designer to design and develop the course • Constructivist approach for learning design • Registration policy for registering and dropping out courses
Division of Labor	Shared responsibilities among the course development team: • Instructional designer as a leader for design and development; • Instructor as SME, course secretary as developer; • Learners' feedback was incorporated.	Shared responsibilities among the course development team: • Instructional designer as a leader for design and development • Learners' feedback was collected	• The instructor designed and developed the course. • Students were engaged in designing constructivist learning activities. • Students and the TA's feedback were incorporated.
Community	Instructor, course secretary, project manager, learners	Professor, tutors, visual designer, copyright officer, learners	Learners, TA.

Dual Facets of Object and Collaborative Design

According to Activity Theory, the object is the critical component that distinguishes one activity from another. It refers to the "raw material" or "problem space"

at which the activity is directed (Engeström, 1987). In the two cases where courses were developed by a course team, their objects have more than one facet, indicating that the problem space in those two projects went beyond designing an online learning environment. In Case One, driven by the motives of the activity, the project objectives set up by the department of Conti Ed, the designer specified the object as "a re-thinking of the instructional plan to coincide with a technology-supported environment, a blended learning course including learning activities for face-to-face and online modules, assignments and assessment, and a course Website on WebCT Vista" (Email communication on Nov. 2006). She emphasized in the interviews (Oct, 2006) that it was important for the instructor to know why the course was designed in a certain way and how to teach (or how learners would learn) in the new learning environment, because, according to the university rules for course delivery, the instructor would eventually become the owner of the course. The designer opened discussions in the meetings and offered training sessions to explain her design and equip the instructor with knowledge and skills for online teaching and learning. Consequently, the object she worked on became a redesigned blended learning course that could be handled by its instructor. In Case Two, even though the project did not have a clearly defined objective of offering help for online teaching, the design had training built into the design process, because the designer believed that faculty members and tutors should know how to facilitate learning in cyberspace. Case Three did not have an object that had dual facets because the course was designed and developed by the instructor who is an expert of educational technology. Knowledge and skill for online teaching and learning was not an issue.

The dual-facet objects in Case One and Two indicated that when a course aims for

online delivery and is designed and developed by a course team, the object produced is not only a course into which has online components integrated, but one in which its instructor(s) know(s) how to teach. If the instructors do not know how to facilitate learning in online environments, it is unlikely that learners will achieve the expected academic levels. Working on a single facet of such objects will not ensure that the objects will be transformed into the anticipated outcomes – students' learning in the online environments - especially if the instructors are new to online teaching and learning. In this situation, related faculty development services become a necessary component of a successful online learning project. The dual-faceted nature of the objects also suggests the role of end-users in the course team – the experience of the instructor who is going to teach the course and use the website, no matter whether he or she is the SME or not, should be considered in the design process.

The Instructional Design Process Mediated by a CMS

Design as Negotiation between Problems and Solutions

Each case shows a different process of instructional design. Consistent with what has been found in previous empirical studies, none of the instructional designers followed the ADDIE model in a linear format. Not all activities were completed in a sequence as they are prescribed in the ID models and to the same degree of precision. The common instructional design features emerging from these three cases are similar to those described by Visscher-Voeman and Gustafson (2004) and Lawson (2004). These features suggest that the process of instructional design, as other design processes, is a continuing "negotiation between problems and solutions with each seen as a reflection of the other" and designers analyze problem space through synthesis - generating solutions

(Lawson, 2004, p.48).

In all three cases, the designers conducted a very brief rather than elaborate analysis before they started generating a solution. Their analysis focused on collecting information about the subject matter and learner characters, and (in collaborative design situations) the instructors' level of knowledge and skills regarding online teaching. Almost simultaneously, the designers exhibited a strong ability to synthesize the particular problem situations they were in, and formulated a brief but clear representation to address some key issues of online teaching and learning. Such brief analysis led to a relatively general solution rather than a detailed description of the design problems, representing a holistic view of the problem space. As can be seen in Case One (Figure 4.2), the designer worked out the details of her design later, as she was implementing her design and getting feedback from the instructor during their conversations about online teaching and learning. The rough vision of the course was transformed into more concrete objects: first the course map, then a prototype in WebCT, and eventually these were transformed into the outcome of the activity – the blended learning and teaching experience. The transformation of the object suggests that:

First, analysis sometimes was integrated with other design activities, just as Visscher-Voerman and Gustafson pointed out (2004).

Second, the designers understood problems through creating solutions. Rather than conducting a thorough front-end analysis, they generated early solutions to address the major design constraints. The three designers chose to stay with their original plans and explored alternatives within their early solutions. The exploration of alternatives added more details to the early solutions. These findings are similar to those of Rowland

(1992) and Visscher-Voerman and Gustafson (2004) and consistent with Lawson's description of design in other fields.

Third, the thick description in Case One provides evidence of the iterative characteristic of instructional design. The early solution, the rough vision of the course, was right away used to guide some development activities, while it was being revised.

In Case One, the main strategy, online scenario-based group discussion, was specified in the first meeting between the designer and the instructor. All alternatives the designer suggested addressed one aspect or another of the general plan, such as whether students signing up for groups based on their interests in the topic or based on the intimacy with group members. In Case Two, the ideas produced in the brainstorming meetings were documented in a written statement to define the project scope and the design never went beyond that boundary. The situation in Case Three was different from the first two cases in which the design and development were accomplished in a collaborative manner. Here, the weekly learning activities were designed but not determined before the delivery since the instructor who designed the course took a constructivist approach. The instructor selected proper learning activities from his database during the delivery and adapted his instruction to the learner's needs on-the-fly. However, his constructivist approach and the limitation of the CMS used (FirstClass) led to the decision to use online group discussion as the main strategy. Although learning tasks varied from week to week, the emphasis was always on group discussion that facilitates collaborative knowledge building.

Envisioning the Delivery in CMSs as Early Stage Solutions

Visscher-Voerman and Gustafson (2004) have found expert designers pay

attention to the upcoming implementation throughout the design process. The anticipation activities are integrated with other design activities. In cross-disciplinary studies, designer use mock-ups, models, prototypes, sketches to structure a design problem by depicting solutions to it (Tessmer, Wedman, 1995; Lawson, 2004). In the three cases, the generation of potential solutions was carried out through envisioning the delivery in early stages.

In all three cases, the designers claimed themselves to be constructivists and emphasized learning activities which were intended to engage students. In Case One, the design and development process had revealed many similarities to the learning design process described by Britain (2004). A critical step was envisioning course delivery and drafting the descriptions of major learning activities. Across the cases, such envisioning appeared in different formats. In Case One, it focused on a specific strategy recommended by the designer. The designer described in details how the instructor would teach and how students would learn in online scenario-based discussion in WebCT, Vista. In Case Two, the envisioning was a general brainstorming among the designer, the professor and two tutors on what Moodle could do to improve learning. In Case Three, the instructor who designed the course had a debate with his TA about how to reduce the negative impact of the registration policy on group discussion in FirstClass.

In all three cases, when a CMS was employed in designing and developing an online environment, envisioning became a major and crucial step in the design process. The envisioning process was actually a phase in which the designer, together with the instructor in a collaborative design scenario, visualized the integration of pedagogy with technology, exploring the capability of technologies in terms of improve learning, as well

as predicting potential problems. In their envisioning, they:

- Specified the CMS features or learning tools.
- Described the related learning activities – how teaching and learning would happen in a cyberspace.
- Predicted potential problems in realizing instructional strategies in a CMS and outlined solutions.

The level of detail of envisioning might depend on how experienced the designers were with the particular CMSs. As can be seen from the case analysis, major instructional strategies were developed during this stage and ways to implement those strategies were discussed. Those strategies were refined successively as the design processes were carried on. Tessmer and Wedman (1995) points out that "the visioning process is consistent with what is understood about solving ill-structured problems" (p 41) and it was recognized decades ago in the field of instructional design by Gagne and Briggs (1979, cited by Tessmer& Wedman, 1995). As a result, design becomes "a more holistic, organic process, anchored in the project context rather than in an abstract model" (p.42).

> [T]he holistic view of the design solutions allows the designer to consider the granular aspects of design in their proper context – how they related to one another in the final product or in the situation in which the product is implemented. For example, picturing how a training workshop will be implemented can give the designer guidance on the strategies, media, and content that may be effectively included. (Tessmer & Wedman, 1995, p.42)

It may even be necessary to envision the delivery at the beginning, when we shift our focus from content to learning activities in online environments and when we work in

a team to integrate technologies into learning. Eventually what we design and develop is not just a website, but an experience for both instructor and learners and such experience is not as easy to modify as it is in face-to-face classes. In collaborative design situations, sharing such visions with other team members at the early stage of design is an effective way of brainstorming and reflecting, and a process of analyzing through synthesizing as Lawson (2004) recommends. Technologies such as CMSs or Web 2.0 tools used for design and development usually are the pre-determined delivery systems that also set up affordances for learning. Sometimes those affordances, as we have found, may be constraints and there are situations where some instructional strategies are hard or even impossible to be implemented. For example, designers may have to revise a learning sequence in an online environment that cannot offer easy navigation. But designers will not realize the problems of the learning experience they have designed unless they put their feet into the shoes of the end users – instructors and students. And they had better identify those problems as early as possible to avoid trouble in development and delivery.

Envisioning the delivery at the design stage, on the other hand, indicates the technology-driven approach in designing and developing online learning. While waiting for better systems, we may need to ask another question: What kind of knowledge and skills do instructional designers need to have in order to envision course delivery at the beginning of course design? We will look for the answers when we analyze the use of another important tool in the activity systems of instructional design – knowledge and skills (Knowledge and Skills as a Tool, p.213).

Incorporating Feedback from Learners and Instructors

Unlike some instructional designers investigated in previous empirical studies

(e.g.Wedman & Tessmer, 1993; Winer & Vasquez-Abad,1995; Vannoy, 2008), the designers and the instructor in this study saw evaluation as an important activity in designing and developing online learning environments. As Visscher-Voerman and Gustafson (2004) have found, the evaluations conducted during delivery were formative in nature and were interwoven with design activities rather than conducted in a distinct phase. The purpose of evaluation was to incorporate the feedback into the design and revision. In Case One, evaluation was not even considered in the agreement between IMS and Cont Ed when they started the project. The designer strongly recommended the idea of evaluation to the team and collected learner feedback in the middle of the semester when the blended learning course was first delivered. The revision of the course in the following semester was based on the feedback from both the instructor and the learners. In Case Three where a constructivist approach was taken, the instructor conducted informal evaluations during the delivery and the feedback from learners helped him select learning activities on-the-fly. Evaluation has become a necessary activity when courses incorporate sizeable amount of online learning (blended or fully online), are delivered on platforms new to learners, or learners and their instructors have a low level of knowledge and skills in terms of online teaching and learning.

As it appears in the literature, the practice of instructional design is context-based: the design problems are built up of constraints in the contexts; the actions and decisions instructional designers take are in response to moment-to-moment conditions. In the following sections, our discussion will focus on the impact of contextual components within the activity system of instructional design.

The Mediation of CMS

Summary of CMS Meditation

They acted mainly as a "design-neutral" authoring tool (Merill, 1997). Integrated with some learning tools, they supported the development of online learning environments. However, their capabilities of assisting the design processes were relatively weak. The data analyses have shown that the functionality of the CMSs did mediate the design decision making. It determined whether the designers' plans were applicable or not. However, the extent to which they had an impact on the design was largely shaped by the effective use of another important tool, the knowledge and skills for the pedagogical use of technologies. Only expert designers would know how to leverage the technology and use it in a pedagogically sound way. In two collaborative design cases, the CMSs provided shared workspace for collaboration. The designers created prototypes (in Case One) and draft products (in Case Two) in the CMSs, and demonstrated their design to achieve a consensus with other team members. When the instructors are novice to CMSs or online teaching, it is important to show to them what their course websites look like and help them envision the delivery. In this study, such direct experience with the CMSs in the design stage motivated and enabled the instructors to participate in the discussions about pedagogy and technology.

Implementation of Constructivist Learning Strategies

The three projects were considered successful by their designers and instructors. Their accounts of their own experiences and the feedback from students indicate that the projects had achieved the predetermined objectives: providing more flexibility, increasing interaction and supporting active learning. In all cases, the designers or the instructor

stated their belief in constructivist learning in the interviews, and had implemented or planned to implement related strategies in course redesign.

In Case One, learners were asked to investigate real life issues and study real scenarios in either individual or collaborative manner. In Case Three, the instructor encouraged students to work on real cases and issues of their own interests in groups, and set up the assessment criteria based on personal learning needs. Those constructivist learning components were implemented by using a very common tool – the discussion forum. Other strategies such as peer review and "knowledge building" were forgone in the project in Case Two because of administrative constraints, even though the designer confirmed that the CMS employed, Moodle, offers tools (Wiki and blogs) for realizing those learning strategies. In contrast to the found critiques in the literature (Mara, 2001; Vrasidas, 2004), in the three case studies, current CMSs, especially with Web 2.0 tools integrated, are capable of implementing instructional strategies that contain effective constructivist components to various degrees. Taking a close look at those strategies, we find they were mostly about knowledge sharing and collaborative knowledge building based on online discussion or communication, the most common and well-developed feature in CMSs. While we can confirm that current CMSs are able to support constructivist learning, it would still be stretching the truth to state, based on what has been revealed from this study, they can support all kinds of constructivist learning well.

In cases One and Three, according to the instructors, the use of a CMS had significant impact on the final products. The instructor in Case Three told the researcher in the interview (May24, 2007) that the redesigned online course was a completely different course in comparison to its face-to-face version. When analyzing the two cases

side by side, we find that the use of CMS actually gave the designers a chance to rethink how to leverage the strength of the technology and implement more active learning strategies. In Case Three, lectures in the classroom were largely replaced by individual and group online learning activities that engaged students to do something on their own. Online lectures became learning guidance that summarized required readings and asked questions to provoke deeper thinking. In Case One, the instructor, with the support of the designer, revised his assessment plan. While reducing the number of assignments, he kept all the meaningful tasks for his students, including those that he had not been able to include in his face-to-face course. Those tasks had been given up because the majority of his students in the face-to-face course were professionals and did not have enough time to do research outside the class and prepare for the discussions taking place in the classroom. The new WebCT based delivery format allowed him to move those meaningful but time consuming case studies online, and allocate more time and give more flexibility to his students to accomplish the tasks.

Implementing the Idea of Learning Design in a CMS:

Learning Design. In Case One (see Table 5.2), the detailed descriptions of learning activities were written by the designer and the instructor, and presented as PDFs. The sequence of those activities, the learning path was mainly revealed through the navigation structure in each module (See Figure 5.1,a revision in the winter semester of 2006). In the interviews, the designer highlighted the Learning Module feature in WebCT, because it allowed her to exhibit the designed learning sequence to students and provide some learning guidance. Worried about students getting lost in cyberspace, the designer and the instructor produced the Flash video, and left prompts for students at various

places on the course website (e.g. in the lesson plans). In Case Three, the descriptions and sequence of learning activities, plus sequence prompts, were written by the instructor and presented in PDFs named "Learning Guidance". The instructor released the guidance to his students on a weekly basis.

Learning Support. In addition, the designer in Case One (see Table 5.2) and the instructor in Case Three included extra information in their design to support online learning. Such support information comprised:

- How to use learning tools that were involved in learning activities.
- How to learn effectively with those tools.
- Prompts to guide learners through learning sequences.

In Case Two, the designer also mentioned the necessity of "communication strategies" to facilitate online interaction. Her communication strategies included components similar to what the designer in Case One provided.

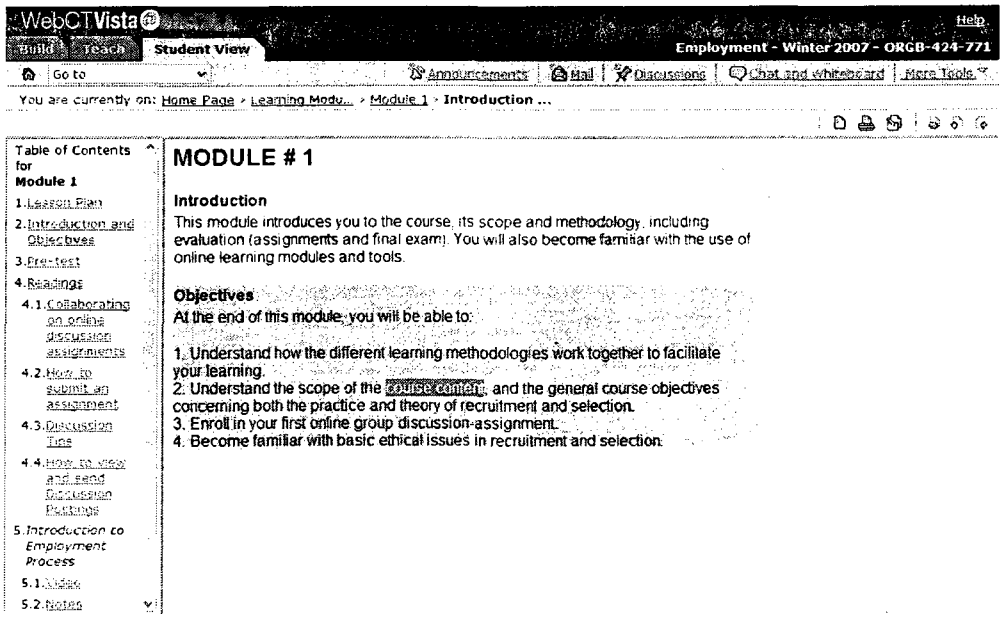


Figure 5.1: Learning path realized by the Learning Module feature in Case One

Table 5.2: Examples of learning design and learning support in Case One

		Example	Provider	Format
Learning design	Task & Resources	Discussion Topics such as "Compare the job application forms from a financial institution, an airline, and a manufacturing company, a retail company and a public institution ..." (See Figure 4.11)	Instructor	PDF
	Roles	Contributor, Moderator and Synthesizer (See Appendix H)	Designer	HTML
	Steps	• Sign-up for a discussion group (see Appendix H, "Collaborating on Online Discussion Assignments") • Self-select group roles • Discuss the topic • Publish the group synthesis	Designer	HTML
Learning support	How to use learning tools	• How to use the discussion tool (See Appendix H, Discussion Tips and Procedures) • How to use Assignment feature for submitting and publishing (see Appendix H, "Collaborating on Online Discussion Assignments", and a flash video not included in this dissertation)	Designer	PDF, Flash video
	How to learn effectively	Tips for communicating in discussion forum (See Appendix H, Discussion Tips and Procedures)	Designer	PDF

Table 5.3: Examples of prompts to guide learning in Case One:

Prompt	Purpose	Location	Provider	Format
Course tour	An overview of the course, introducing learning design at course level and module level	Homepage	Scripts drafted by the designer and flash video produced by instructor	Flash video

Module One (Added in revision)	A module introducing the course and how to learn in the course (See Image 5.1)	Learning Modules (access from Homepage)	Designer	WebCT feature, HTML, PDF
Module navigation	Revealing learning path in each module (See Image 5.1 for examples)	In each module	Designer	WebCT feature
Lesson plan	Briefly introducing learning activities in module	In each module	Instructor (feedback from designer incorporated)	HTML

Table 5.4: Examples of learning design and learning support in Case Three

	Purpose	Example	Format
Learning design	Task, Resources & Steps	• Read the assigned papers • Read the PowerPoint (Resource provided) • Discuss the questions in your work group (Resource provided) • Continue working on your assignment 2 (including individual and collaborative parts, resource provided) (See Appendix I)	Weekly Guilds (PDF)
	Roles	Collaborative learning	Face-to-face orientation (workshop)
Learning support	How to use learning tools	How to use FirstClass	Face-to-face orientation (workshop)
	How to learn Effectively	Collaborative learning vs. cooperative learning	Face-to-face orientation (workshop)
	Prompts To Guild learning	• Reminders of current and coming tasks • Information of course administration (e.g. grading) • Online communication guild (where to post and what to post)	Weekly Guilds (PDF)

Contradictions between CMSs and Object

While the designers stated that the CMSs they used helped them realize constructivist strategies, they were not fully satisfied with the major tool. Sometimes contradictions arose, and the designers had to shift their focus to work on emerging tasks or redefine their object. In other situations, their work had breakdowns as they could not find the solution to deal with technical issues (see Table 5.5 for a summary).

Table 5.5: Major contradictions between CMS and the Object

	Major contradictions between CMS and object	Focus-shift/ Breakdown
Case one	• A single Sign-up Sheet did not allow signing up for multiple tasks. • The Sign-up sheet could not display task descriptions longer than 300 words. • When the task descriptions had more than 300 words, the sign-up sheet was not changeable.	• New content structure (focus shift)"The designer had to restructure course content in the course website, moving all task descriptions for discussion from the Sign-up sheet to a folder that could be accessed from Homepage. • New learning path (focus shift): The designer created a different learning path for non-graded assignments that did not use sign-up sheets.
Case Two	Moodle default settings could not be used to create a course website for distance learning that requires continuous enrolment.	• New CMS features needed (Breakdown): New Moodle features were developed to meet the special requirement.
Case Three	The system employed was not a CMS system: • There were no place to post only announcements and all students would read them for sure. • The message board was not an effective learning tool for group discussion.	The instructor was not able to find a solution for the contradictions since FirstClass was a predetermined delivery system for the online course. The technical limitation prevented the course website from being an effective and user-friendly learning environment(Breakdown)

In the CMSs, features for content presentation are separated from learning tools and creating hyperlinks that linked to desired destinations was not easy or sometimes

even impossible. Because of these, in all three cases, the designers complained about the content presentation – content presentation was not visually attractive and the navigation for the course website was not intuitive. For example, in Case One, on the website in the fall semester 2006, the icons that represented major learning activities – pre-/post-tests, signing up, reading and presentation, and discussion, were put in each module but the sequence of learning was not clear. Because of a bug in the Sign-up Sheet, detailed information about the scenario-based discussion could not be entered. Instead, learners had to access the information by clicking the Syllabus folder on the Homepage. When she revised the site in 2007, she used the Learning Module feature to sequence some learning activities (pre-/post-tests, reading, and presentation), but directed learners to the Assignment folder on the Homepage, where the information about scenarios was put side by side with the sign-up sheets. However, none of the designs provided intuitive navigations that manifested the learning path in the virtual environment.

The limitation of creating intuitive navigation had an impact on learning design in cases One and Three. The descriptions or instructions of learning activities were independent files detached from the learning tools employed. The challenges for designers became how to organize the content files and tools so that learners would have a smooth online learning experience. Although the designers did not think this limitation prevented students from learning, when we analyze the "problem space"– the objects on which they worked (especially in Case One), the incapability of building intuitive navigation caused the designer to put a lot of effort into providing learning support that would guide students on their journey of learning in a virtual environment. From the perspective of Activity Theory, when such guidance is not for facilitating learning, but

just for helping learners navigate and locate information, it involves focus shifts in course design and development, which indicate contradictions between the functionality of the CMSs used and the objects of the activity, and therefore system improvement is needed! Because current CMSs also serve as delivery systems, the design of CMSs should not ignore the learner's needs, as it has been argued in the literature (Carmean & Haefner, 2003).

In this study, the implementation of learning design in the CMSs was different from learning design software such as the Learning Activity Management System (LAMS, Dalzeil, 2003). LAMS has models of learning activities and their workflow (learning sequences) actually built in, and provides designers or instructors with a highly visual authoring environment for the development of activities sequences. It allows automatic creation of one or more learning activities. Designers or instructors can quickly set up activities by dragging and dropping the relevant icons on to the authoring area, and arranging and rearranging them in that space by creating transition lines between each learning activity. Having emphasis on learning activity rather than learning content, the concept of learning design envisages content as learning resources attached to each learning activity. In the student view of LAMS, the instructions for a learning activity, related learning materials and the learning tool used are presented in close proximity to each other: either showing on the same interfaces or having links between one another. In the meantime, the transition lines from one learning activity to another are visible to students and guide them through linear or non-linear learning sequences. Although LAMS contains similar learning tools and features as CMSs, it creates learning environments that are more intuitive for learners to navigate and learn.

Current CMSs serve as a tool for design, development and delivery. When analyzing contradictions between CMSs capabilities and the objects on which the designers worked, we found that some contradictions suggested constraints on only design and development; but others on design and development as well as delivery. For example, in Case Two, the designer complained that the default Quiz feature was not good for continuous enrollment. This constraint made her shift her focus. When she set up the quizzes, she had to put a date that was far advanced so that students would even notice it. This constraint on development, however, did not actually appear to have any negative impact on learning. Constraints such as the bug in the Sign-up Sheet in Case One forced the designer to redesign the site structure to make the navigation more smooth. Such constraints influenced the learning design and had a direct impact on the learning experience as well.

The Mediation of Non-material Tools

Knowledge and Skills as Tool

In addition to the CMSs employed, knowledge and skills of pedagogy and technology served as important non-material tools in the instructional design activities studied here. It was the capability of linking pedagogy with technology that helped the designers (in cases One and Two) and the instructor (in Case Three) envision the course delivery – how teaching and learning would happen in a CMS. In the development stage, this integrated knowledge allowed them to configure CMS features for specific instructional purposes. Both designers in cases One and Two expressed the view that the CMSs employed were able to realize the chosen instructional strategies, only if the designers had deep understanding of instruction and technology, and also knew how to

adapt CMS features to meet their requirements.

The three cases in this study have highlighted the importance of the non-material tool – the integrated knowledge and skill of instruction and technology in the technology-based instructional design practice. While previous studies have demonstrated the impact of training on the adoption of CMS, the rich data collected in this study reveal that training focusing only on the technical side of CMSs won't be effective because instructors need to know more to link pedagogy with technology and implement their teaching strategies in a CMS. The descriptions of the training and discussions in cases One and Two sketched a portrait of workshops targeting the pedagogical use of CMS. The "Instructional Scenarios Wiki" and the self-developed WebCT manual in Case One were a great demonstration of this type of integrated knowledge and skills.

Training and Discussion as a Design Tool

In cases One and Two, the designers offered training on CMSs and opened discussions about online learning. Such training and discussion helped the instructors acquire knowledge and skills. From the perspective of Activity Theory, they were part of the internalization process in which the instructors were trained to be competent members of the activity of instructional design. The training and discussion were also used as important design tools that set up scaffolding for collaboration. Through those conversations, the designers captured the best practice of face-to-face instruction so that they could either replicate effective learning experience in cyberspace or leverage the technologies to improve learning. In Case Two, the designer believed that knowledge about online teaching facilitates the communication within the group, helping the professor and the tutors understand and comment on her design. When we look back at

Case One, although the designer did not define the training and discussions as a design tool, the conversation about pedagogy and technology engaged the instructor in the project. The amount of work he shared, the questions he asked and the comments he made indicate the depth of his involvement in the course design. The designer appraised his active participation as having contributed largely to the success of the project. Without the training and discussion, the instructor might not have been able to make the same contribution.

The non-material tools discussed in this section are consistent with some competencies of instructional designers that are identified in recent literature. Other than general skills such as writing learning objectives, acquiring the knowledge of current technologies and providing training to faculty have become parts of the responsibilities for instructional designers. This is especially true in the contexts of designing and developing online learning environments (Richey, Fields & Foxon, 2000; Bichelmeyer, Misanchuk & Malopinsky, 2001; Glacken & Baylen, 2001; Liu, Gibby, Quiros & Demps, 2002). However, the findings of this study show that expert designers have more advanced knowledge and skills of the technologies they use than "basic knowledge of important software tools" (Liu et al., 2002, p211). Such advanced knowledge and skills allow expert designers to:

- Envision potential solutions for design problems at early design stage.
- Use technologies in a pedagogically sound way.
- Adapt the technologies to meet special instructional requirements.

In all three cases, the designers were able to apply constructivist learning principles and leverage the technologies to create effective learning environments. They

each demonstrated their capability to generate early solutions and envision the implementation of their design in CMSs. This was especially true of the designer in Case One. In her first meeting with the instructor, she was able to describe the details about how students would learn and how WebCT tools would be used to realize her design. Therefore, the training and the consultation she offered after the first meeting were more focused. To overcome the limitations of CMSs, the designers all had advanced knowledge about the CMSs so that they knew how to "twist" the systems. As described in the cases, the designer in Case One planned to use the Quiz tool in WebCT to assign students to different roles for group discussion. In Case Two, the designer set up the Quiz tool in Moodle in a way so that students would not be affected by the time constraints of the quizzes.

Contradictions between Division of Labor and Object

What happened when members in the course design teams did not have enough knowledge and skills to use the technologies in a pedagogically sound way? Some issues in Case One were brought out by the lack of knowledge and skills related to the pedagogical use of CMS – the lack of a necessary tool in technology-based instructional design. As a result, the course secretary who was hired to configure WebCT features and upload course content was not able to follow the directions from the designer. This contradiction caused tension between the designer and the course secretary, and eventually changed the division of labor in the activity system – the designer had to take over some critical development tasks. It also attests to the necessity of the knowledge of pedagogy and technology and the capability of making links between the two. We are not surprised at the statements that the designers in cases One and Two both made: CMSs

were not a tool for novices; novices would not be able to use the tool in a pedagogically sound way to design complicated online learning environments because they would not have the related knowledge and skills to do so. This may partially explain why faculty members tend to use the system in modest ways, as Morgan (2003) reports.

The lack of skills concerning online learning made some "noises" occurring during the design and development in Case Three in which a more constructivist approach was taken and students had their voices in the course design. The idea of the instructor to create a "dynamic scaffolding tool", a FAQ list or a "library of questions and answers" failed because the learners were not able to cooperate: they could not follow the instructions about online discussion and so they posted messages everywhere. In this situation, what was required was the learners' ability to understand and follow the instructions provided in the course.

The Mediation of Other Design and Development Tools

The designer in Case One pointed out that neither the WebCT help menu nor the system itself contains sufficient information to help the course secretary to bridge the gap between pedagogy and technology. Also, the tension that arose between the designer and the course secretary makes us reflect whether another tool, the revised course map for development (see Appendix G), would have been an effective development tool for collaborative practice. In a regular e-learning project, the development is usually guided by storyboards. However, in the three cases studied, the designers and the instructor used CMS templates (or default settings) to map out content, and none of them had mentioned storyboarding techniques in the interviews. Using CMS templates might simplify the work of mapping out content, and an instrument such as the course development map

might provide some guidance instructions on where to put course content (mostly individual documents to be uploaded to different locations on the CMSs). However, the course development map did not seem to provide enough direction on:

- How to configure complex CMS features to meet predetermined instructional strategies (linking feature configurations with instructional strategies. For example, how to set up the parameters of Discussion feature and present discussion topics)
- How to connect various CMS features or tools according to the designed learning sequence, for example, to connect Sign-up sheet, Discussion, and Assignment.

Such information is needed to bridge the gap between pedagogy and technology and should be passed to other team members with no ambiguity. In Case Two, although the course was developed by a team, the designer, who were aware of the pedagogical use of Moodle, was in charge of configuring Moodle features. She did not have any difficulties in setting up the system the CMS to meet instructional requirements. The designer admitted in the interview that, at the university, they did not use standard design and development documents. What was used instead was a Word document that summarized the brainstorming about what Moodle could do. The two cases show that there is a need for developing effective instruments that help developers link pedagogy with technology. Such integrated knowledge and skills was captured by the "Instructional Scenarios Wiki" and the self-developed WebCT manual that were created by designers in IMS in Case One, and should be embedded in future tools for collaborative design and development.

The Mediation of Rules

Rules impose constraints on the operation of activity of instructional design. They drive the process of molding and transforming objects into outcomes. The process, in the meantime, is also mediated by the tools employed. In this study, while rules and tools both mediated course design and development, rules had an indirect impact on the selection of tools and their use. Sometimes, rules were the source of contradictions between tools and objects that were transformed. Despite various case contexts, the rules that mediated the activity of instructional design practices showed some common features. In all three cases, some rules were set up by higher level activity systems – at the university or department level - while other rules were generated within the activity system during the transformation process or based on personal belief and routines of designers and instructors. These rules fell under the following categories:

- Rules for delivery
- Rules for division of labor
- Rules for project management
- Rules for design and development

Table 5.6: Major rules in three cases

	Case One	Case Two	Case Three
Rules for Delivery	• Blended learning (more than 60% time online) • WebCT as CMS • A class of 35 students who were professionals	• Self-paced distance learning with online components • Moodle as CMS • More than 100 students • Continuous enrolment	• Online learning with face-to-face orientation • FistClass as CMS • More than 80 students • Registration policy for quitting a course

Rules for division of labor	• Using Boutique and Project Management model for course development • Transferring course autonomy to instructor • Support for instructional design, teaching, and learning distributed in the university	• Using Project Management model for course development • Remaining course autonomy at the institute level.	Instructor designed and developed the course.
Rules for project management	• Project initiator • Course selected • Project deadline	• Project initiator • Course selected • Project deadline • Administrative constrains on using Moodle features	N/A
Rule for design / development	• Designer's belief of constructivist learning • Designer's design and development approach • Decisions about design and development strategies generated during the process	• Designer's belief of constructivist learning • Decisions about design and development strategies generated during the process	• Designer's belief of constructivist learning • Decisions about design and development strategies generated during the process

Technology-driven Approach for Design and Development

One of the rules of design and development that is worth being discussed is the technology-driven approach which the designer in Case One took. She admitted that she had become used to thinking about what tools were available in a CMS and how to use or adapt them to suit her design within the system, rather than selecting the right design strategy first and then thinking about how to realize her design in a CMS or with other means. In the other two cases, the technology-driven approach was not mentioned. However, in Case Two, we noticed that the discussion in which the designers, the

professor, and the tutors brainstormed what Moodle could do, was actually an exploration of the pedagogical capability of the CMS. In these two cases, the designers tailored their instructional strategies so that they could be implemented in the selected CMS. They relied on tools and features within the CMS rather than looking for means outside the system. From the data collected, we cannot confirm a technology-driven approach is a common practice. However, the designer in Case One admitted that she had become accustomed to course design that was defined by the technical features of CMSs. Instructional designers are often required to use a CMS (a delivery rule) and have many years of experience of such systems. Thus we suspect that a technology-driven approach is likely to be unconsciously employed by many designers.

From the data collected for this study, it is not possible to tell whether the technology-driven approach had any negative impact on the course design and development. The CMS functions seemed to have satisfied the needs of the designers and the instructor. However, if designers tend to take a technology-driven approach as did the designer in Case One, they may consciously or unconsciously limit their strategies to those that could be realized in CMSs. The same could happen in collaborative design scenarios, when designers only select those strategies that they think could be handled by the instructors and students. A technology-driven approach may reduce contradictions, since employing external tools might cause integration problems and could be very time consuming, as in Case Two where the visual designer incorporated old templates into Moodle.

Technology as Vehicle of Learning

Technologies or tools may facilitate learning, but as the instructor in Case Three

pointed out, what had enabled students to learn were the instructional strategies he designed rather than the CMS used. The same strategies used in his online course could be used in a face-to-face classroom as well. But the technology did provide a space for learning to happen. In one of the interviews in Case One, the designer gave an example of how to implement the same strategy in two different CMSs, validating the perspective of technology as learning vehicle. The challenge for course designers therefore becomes how to design effective learning activities and make them work in cyberspace. Three case studies presented here tell us that meeting such a challenge requires that one who designs a CMS course to have both knowledge and skills for instructional design and technologies employed, and must be able to make the link between the two types of knowledge and skills.

The designer in Case One also defined the role of technology as a tool rather than an instructional goal. Even though she was enthusiastic about integrating technology into teaching and learning, even though she knew more than one way of using technology for collaborative knowledge building and sharing, she chose the simplest way – creating Word documents and using the Publishing function in the Assignment feature in WebCT to share the documents with the class. From her point of view, if the major audience of the course, students or the instructor, have relatively low technology skills, it is unlikely to be worth integrating sophisticated learning tools unless mastering the tools is one of the instructional goals. Instead of asking for more tools for constructivist learning (Mara, 2001; Vrasidas, 2004), instructional designers may need to assess the characteristics of learners (as well as those of instructors) to see whether employing a cognitive learning tool will overwhelm the users and whether training sessions should be included in the

design, much as they were included in all three cases studied here.

Indirect Impact of Rules on the Use of CMSs

Rules for delivery in all three cases helped define the problem space within which the team worked – the object. While we look back to the major contradiction between the object and the CMS in Case Two, it was quite obvious that the rule of delivery, continuous enrolment, was the source of the contradiction between the object and the CMS. The transformation of the preset object into a desired outcome was not very smooth because some Moodle default features, e.g. the Assignment and Quiz feature, could not be set up for continuous enrollment. In order to use the Quiz feature in Moodle, the designer had to tweak settings to avoid specific release and completion dates, and set up the release and completion dates far in advance so that the students would not see the dates. She described her solution as "twisting" the system, which required advanced knowledge about the technology and understanding of instructional requirements. The lack of this type of integrated knowledge could create contradiction between the subject and the CMS used for design and development. The unsolvable contradiction in Case Two eventually triggered the development of a new Assignment feature in Moodle that fits the registration policy of self-paced distance learning.

The rules for division of labor in cases that involved collaborative instructional design defined the relationships of team members and their roles and responsibilities in the project. The significant difference between the rules in cases One and Two lay in who would have final authority over the course delivery - maintaining and updating the course websites, after the projects were finished. Being the owner of the course in Case One, the instructor shared more responsibilities in course design and development, and obtained

more training on maintaining his course site in WebCT. In Case Two, the major tasks for the professor and the tutors were to brainstorm the use of Moodle and test the course website. In Case One, the same rule set up constraints over the selection of WebCT features for development – the designer relied on the feature of the Organizer Page (she called it a "container") to structure the course site and present content, because the feature would allow the instructor to follow simple steps to upload his documents (in .doc or PDF) to the site. Later, when the rule was modified and the instructor was not responsible for uploading documents, she changed her development strategy and embedded HTML files into the organizer page to improve content presentation.

Contradictions between Rules and Object

There were some situations in which rules prevented the designers or the instructor from working on the objects they wanted. In Case One, according to the rule of distribution of labor in the university, the designer focused on improving the quality of online learning. The frustration of the instructor was that he could not get enough right-on-time support for teaching in the classroom. He felt the course had better quality for the online sections but the face-to-face section was weak. In Case Two, the contradictions brought about by administrative rules were quite direct. For the testing purpose, some Moodle features were closed. The designer had to give up her ideas of constructivist learning using social learning tools; there were no collaborative tasks for learners (e.g. case-based reasoning). In Case Three, the registration policy concerning quitting a course challenged the instructor in his design of online collaborative learning. When students were allowed to quit the course after the class had begun for more than a month, he found not only had he to regroup students, but also students who lost their group

suffered from the regrouping since what they had contributed became meaningless in the new group and they had to warm up quickly for a new topic. As the instructor pointed out, current CMSs were incapable of dealing with the contradiction between the registration rule and the object – the strategy of online collaborative learning. He decided to study the lifecycle of online learning and expected to solve the contradiction by starting a group project when most students are available.

Analyzing the function of mediators within the activities of instructional design (tools, rules and the division of labor) gives us a chance to see how design problems (object) are structured and defined. As Lawson (2004) argues, the design constraints were generated from the requirements of various stakeholders, including the designers. Some were considered internal and radical constraints that dealt with the primary purpose of design and formed the basis of the problems (e.g. offering flexible online learning experience). Others were practical ones and related to the contexts in which the design was to be used (e.g. the predetermined design, development and delivery systems). These design constraints were the sources of the primary generators (Lawson, 2004), the brief solutions that the designers generated very early in the design processes.

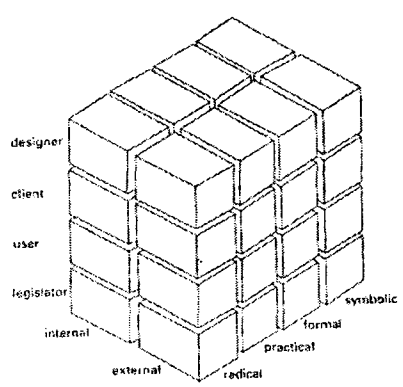


Figure 5.2 The completed model of design problems (Lawson 2004, p106)

In the three cases studied here, the design problems varied because the mediators varied from one case to the other. However, three expert designers who believe in constructivist learning selected similar constraints to build primary generators that were common in nature. They all emphasized active learning and interactivity in their design, and paid close attention to whether their design could be implemented in the pre-determined delivery systems. It seems that the main task of designing online learning experience remains the same cross different design contexts. Lawson's research has found that the primary generators do more than simply get the designer process started.

> Good Design often seems to have only a very few major dominating ideas which structure the scheme and around which the minor considerations are organized. Sometimes, they can be reduced to only one main idea known to designers by many names but most often called the 'concept' or 'parti' (Lawson, 2004, p189).

The analysis in this study has shown us how expert designers started with similar primary generators and then organized other considerations around them to define the design problems that were unique to each context. In all three cases, another common consideration is how to provide learning support for learners that had little online learning experience. But in Case one, the division of labor in terms of design, development and maintenance introduced a unique aspect of the design; whereas in other two cases, it was the requirement of continuing enrollment in Case Two and the regulation about quitting a course in Case Three that brought about the challenges to the designers. Lawson (2004) thinks the ability to select proper constraints to build appropriate primary generators is a matter of experience and may be one of the central skills of good designers. The analysis of the activities of instructional design suggests that

the expertise required for designing and developing online learning environments includes the capabilities of:

- Identifying major and appropriate design constraints.
- Generating early solutions to address the major constraints.
- Envisioning the implementation of the early solutions to determine whether the design is applicable.
- Linking pedagogy with technology to build an effective learning environment, working on the details of the early solution.
- Adapting the CMS to meet instructional requirements.

CHAPTER SIX: CONCLUSION

One of the major purposes of this study was to study the mediated practice of instructional design, and provide some insights on:

- The complex nature of instructional design
- How to improve one of the major mediators – CMSs, and
- How to support the mediated practices

Using Activity Theory as the analysis framework allows us not only to capture current practice status - the components of an activity of instructional design and their relationships at different stages - but also to study the practice from a historical perspective, examining the dynamic interactions among the components and the transformation from object to outcomes. We cannot discuss the practice of instructional design mediated by a CMS without mentioning the contexts in which it takes place. As a conclusion, let us look back to see whether the study has answered the four questions proposed at the beginning.

Means and Ends

Sub-question 1: In a given situation, to what extent does a CMS facilitate and constrain the attainments of instructional 'goals?

When we talk about the mediation of CMSs in terms of design and development, the first question to ask is who uses it (Subject) and who provides support (Division of Labor). This study showed that CMSs were insufficient as the sole means used for design and development; in addition, the knowledge and skills to use technology in a pedagogically sound way or the capability of linking pedagogy with technology acted as an important tool in the design processes to integrate online learning experience into

face-to-face classroom or print-based learning. Clearly, the requirements for a CMS vary depending on who uses the tool and who provides support. For the expert designers studied here, current CMSs systems are helpful in supporting constructivist learning. But for novice designers who do not have the appropriate knowledge and skills, the process from means to end won't be productive. The strengths and limitations of CMSs discussed in this study were identified based on the practice of expert instructional designers because the researcher is more interested in how CMSs mediate the overall process of design/development (at the action level) rather than how to use the tools step by step (at the operation level).

Viewing the activity of instructional design through the lens of Activity Theory, we found that the CMSs employed had multiple roles. The CMS was a design and development tool used by designers and instructors, as well as a delivery tool used by instructors/tutors and students. The users of CMS were from different groups and they interacted with the tool at different stages in a course lifecycle in their own ways. We cannot convince ourselves that a CMS is an effective design tool because it was hardly used in the design stage in the three cases we studied. The primary tool on which the designers relied for design was their integrated knowledge and skills related to the pedagogical use of CMS. The major function of a CMS was to act as a shared work space and as a shared object in collaborative design scenarios. In all three cases, as a development tool, the ability of CMSs to present learning content and organize learning activities was not satisfying. When the focus of design shifted from learning content to learning activities, the lack of capability for creating an intuitive learning environment entailed extra work for designers and might even prevent students from following

designed learning sequences. Another significant limitation of CMS appeared in Case Two where the CMS had to meet special delivery requirements for continuing enrollment in distance education.

Social and Physical Aspects of the Environment

Sub-question 2: How are the characteristics of a CMS consistent with the nature of the social and physical environment in which it is used by instructors and instructional designers?

The three CMSs used in the projects studied were able to integrate with their physical environments. Development tools such as Camtasia, CourseGenie and Microsoft Word and PowerPoint worked well along with the CMSs. In Case One, the browser problem that posed problems during the first delivery cycle was solved when the team revised the course. The physical environment did not generate many design constraints in this study. It appears that being a main platform used in higher educational institutions, the integration of CMSs has been addressed by the producers of CMSs and other educational software applications.

As we examined the social environment in which the CMSs were employed, three types of rules had a major impact on the use of the technology and the focal activities of instructional design. These social elements set up design constraints and shaped the design problems – they brought multiple dimensions to the central ideal of integrating online learning into face-to-face classroom and traditional print-based distance learning. Those rules included rules about course delivery and the division of labor among course teams, as well as rules about design and development. Fascinated by the ideas of constructivism, the designers used CMSs to create learning environments with

meaningful learning activities that engaged learners and extended the courses to the real world. As we have discussed above, rules about delivery (CMSs as predetermined delivery system) and the division of labor made envisioning course delivery a necessary step for designing and developing online learning in a collaborative manner. Therefore, the designers had a chance to analyze the design problems through their synthesis of early solutions. These rules also mediated the selection of CMSs features and the way to use those features. As in Case Two and Three, their mediation sometimes resulted in contradictions between the CMS's capabilities and the objects toward which the designers and instructors worked (e.g. default features in Moodle did not support continuous enrollment).

Learning, Cognition and Articulation

Sub-question 3: How can the instructional design activities mediated by a CMS be externalized and supported by human beings and external artifacts involved in the activity, including a CMS?

The discussion of internalization and externalization in the practices of instructional design studied is based on the experience of expert designers. From the perspective of HCI, they were able to transform external activities into internal ones by envisioning the use of CMS and the course delivery in the system, and identify optimal actions before actually performing an action. Envisioning solutions at an early design stage demonstrates that instructional designers, much as designers in other fields, learn about the design problems through creating solutions. The analysis, design, and evaluation are interwoven with one another throughout the whole design process. As Lawson (2004) explains, the process of design is a "negotiation between problems and

solutions with each seen as a reflection of the other" (Lawson, 2004, p.48).

The attempts at envisioning, from one perspective, reflect the complex nature of instructional design whose complexity can hardly be handled by a novice. As the two designers in cases One and Two admitted, CMSs do not seem to be a tool for novices to design complicated online learning environments. The contradiction between the designer and the course secretary in Case One and the effort that she put into explaining her design to the instructor showed that internalization of necessary skills is not an easy job for novices. The key for internalization is the capability of linking pedagogy with technology. Novices need support for their mental exercise with CMSs. Externalization, transforming internal activity into external ones, in the projects studied, took place in training and discussion about the pedagogical use of CMSs and such knowledge could be documented as it was in the "Instructional Scenarios Wiki" mentioned above. From the perspective of organizational learning, discussions and training were part of the internalization in which the instructor was trained to be a competent member of the activity of instructional design. To facilitate the collaboration within the course team, a better development document is necessary to help developers understand the thinking of designers and follow designers' instructions or intention through the development phase.

Development

Sub-question 4: Are there any changes to the instructional design because of the implementation of the CMS?

According to feedback from students, the three projects studied had successfully transformed face-to-face courses or a traditional distance learning course by incorporating online learning components at different levels. Designers and instructors

were able to leverage technology to improve learning, and the use of CMSs brought new ideas to course design and development. In cases One and Two, the designers showed their preference regarding collaboration when designing sophisticated online learning environments. They emphasized training and discussion of the pedagogical use of technology as an effective design strategy to facilitate collaboration. When CMSs were employed, proactively envisioning the implementation of CMS tools/ features and course delivery became an important step in the design stage.

In terms of selecting instructional strategies, in cases One and Three, online learning extended classrooms to the real world and offered the flexibility to students so that they had time to explore more and reflect more. The collaborative design experience changed the instructor's perception of online teaching and learning in Case One, and led to a number of pedagogical shifts. He started rethinking the overall design of his blended learning course. In Case Three, the instructor noticed the existence of a "course lifecycle". He wanted to explore the idea and design more meaningful collaborative learning activities to reduce the negative impact of registration policy on course dropout. In all three cases, the designers and the instructors realized the importance of providing various types of support for online learning. Such support became necessary when course design focused on learning activities rather than learning content. The need also became apparent because the CMSs employed did not seem to be able to support the creation of intuitive learning experiences.

The contradictions brought by the limitations of the CMSs became a driving force to improve the systems or the use of the systems. In Case Two, the university invested resources in developing brand new Moodle features to support continuous enrollment. In

all three cases, the designers described new ways of using the CMSs. These experienced designers "twisted" the systems and adapted existing CMSs features to meet particular instructional requirements. For example, in Case One, the Discussion forum was used as a sign-up sheet. In Case Two, the designer set up the Quiz feature in a way to avoid showing time constraints.

To summarize, let us re-map the activities of designing online learning environments based on the analysis of the three cases (See Figure 6.1). Compared with Figure 2.3 (p.49), there are significant differences between the literature review and the empirical findings in this study.

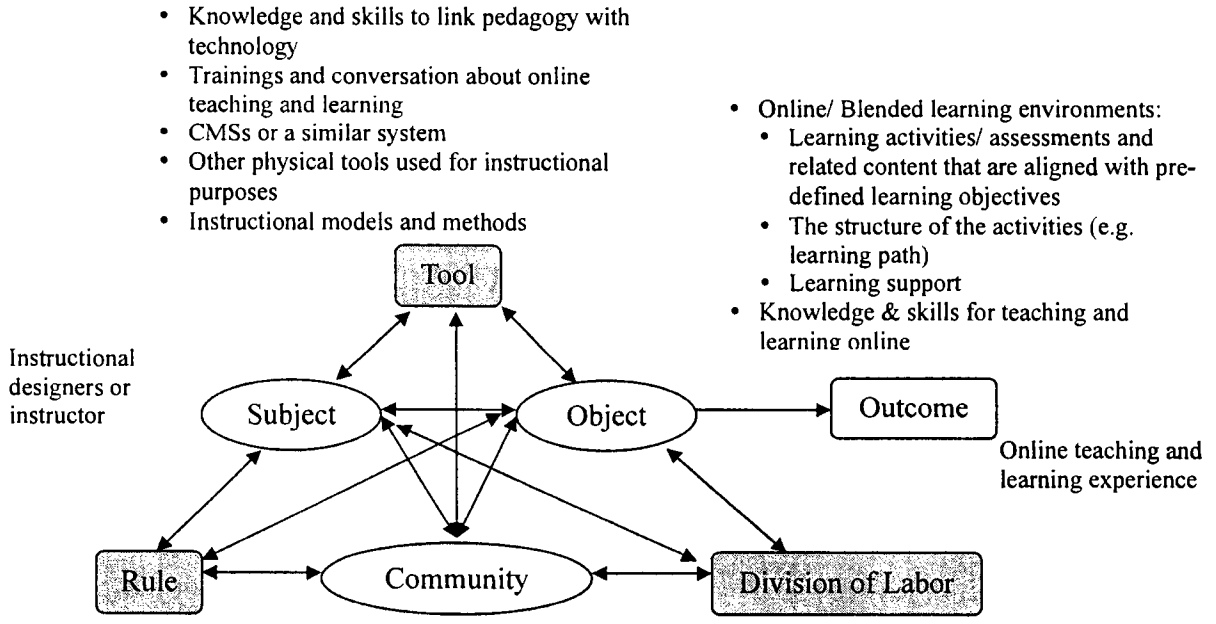
First, the objects have dual facets. Believing in learning by doing, the design had more emphases on learning activities. Orchestrating online learning activities (e.g. the learning path in Case One) became a major design task. In addition, when courses were designed in a collaborative manner, the knowledge and skills for teaching and learning had to be addressed. As a result, related training and learning support became a necessary part of the design.

Second, to generate early solutions and work on the design details, the major tool that the designers relied on was their knowledge and skills to link pedagogy with technology rather then CMSs employed. Training and conversations about online teaching and learning were used as a tool to help the instructors be active participants in collaborative design and prepare them for facilitating online learning.

Third, the selection of CMS had impact on the course design and development and the designers took a technology-driven approach in their design. Although viewing technology as a vehicle of learning and thinking their instructional strategies were

applicable to different delivery formats (e.g. in cases One and Three), the designers tended to choose the strategies that "fitted" the CMSs or adapted their design to the delivery systems. Another emerging rule concerned the registration policies. In cases Two and Three, they trigged the development of new CMS features, new ways of using the existing system, and new ideas of designing online collaborative learning activities.

Figure 6.1 Re-mapping the activities of designing online learning environments



CHAPTER SEVEN: STUDYING THE PRACTICE OF INSTRUCTIONAL DESIGN

The Application of Activity Theory

Activity Theory has been used throughout the study to analyze the practice of instructional design processes mediated by a CMS. The purpose was to provide some insights into the complex nature of design and illustrate the mediating role of a CMS.

Literature Review

In the literature review, Activity Theory helped the researcher organize the existing knowledge about the practice of instructional design mediated by CMSs. Mapping such practices gave some directions for the study: what to pay attention to in observations and interviews. However, this rough mapping was not exhaustive, because the role of some important components, such as the knowledge and skills that link pedagogy with technology, was not clearly mentioned in literature.

Research Questions

The principles of Activity Theory shed light on the important aspects of complicated human activities such as instructional design. The researcher used the principles proposed by Kaptelinin, et al. (1999) to identify the foci of the study and break down the main research questions into four meaningful sub-questions. Exhibiting the relationship among the components of the activities, those principles allowed the researcher to

- Study the complex activity from a holistic perspective, within its overall context, but also from a specific angle, having an emphasis on the mediating

role of an important tool, a CMS.

- Analyze relevant objects and the subjects of activities at both the activity and action level (Bødker, 1995)- situating the artifacts in the web of activities, at the same time, analyzing and tracing the actual focus shifts in specific use situations.

Case Study Design

Activity Theory provided tools to define the unit of analysis that aimed to examine the process of instructional design. The model of the Activity System and the concept of expansive cycle (Engeström, 1987, 1999) set up the boundaries of the cases. They specified, in a certain period of time, who was involved in the process, why they were involved, what they experienced and what impacted their experience. Therefore, each case was considered an activity, a unit of analysis in which the sub-processes were viewed as the actions of the target activities.

Data Collection

The methodological implications of Activity Theory summarized by Nardi (1996) provided general guidance for data collection and analysis. According to Nardi's suggestion, data were collected through interviews, observations, and design documents. The large amount of data was collected to make sure that the data covered the changes of objects over time and captured enough contextual information to reveal broad patterns in the activities of instructional design. The Activity Checklist based on the same set of Activity Theory principles (Kaptelinin et al., 1999) was used to identify the issues of interest and generate the protocol for observation and the interview questions.

Data Analysis and Discussion

The coding protocol was generated based on the model of Activity System (Engeström, 1987, 1999) and related principles. The codes were applied to identify the activity components and understand the relationships or mediation among the components. The principle of historical development required data analysis to focus on tracking the transformation of objects. It helped the researcher reveal the iterative process of instructional design and the impact of mediators or the contextual components within the activities. Special attention had been paid to the contradictions, the driving force of development. When the data collected covers the changes of objects over time, coding the contradictions can be achieved by applying the checklist recommended by Bødker (1995, p 167). The researcher located the focus shifts and breakdowns in the chain of actions by comparing the differences between the original goals and the real objects worked on by the subjects or the community. To better communicate the results of this case study, the researcher relied on Activity Theory to organize the data analysis and report the research findings.

Challenges in Using Activity Theory

Using a sophisticated framework to understand a complex design process raised many challenges in this study:

Lack of Techniques to Put Activity Theory into Practice

As Engeström (1993) has noted, Activity Theory does not offer "ready-made techniques and procedures" for research; rather it is a conceptual tool that must be "concretized according to the specific nature of the object under scrutiny" (p.8). In the literature, many authors present their analyses of human performance through the lens of

Activity Theory but few have discussed their methods or shared the details of their application. The lack of standard method might be attributed to the existence of the basic principles of Activity Theory (e.g. Engeström, 1993; Nardi, 1996; Kaptelinin et al., 1999) on which different investigative methods can be based (Mwanza, 2002). To use the framework, the researcher examined three major methodologies found in the literature. These are the Activity Checklist by Kaptelinin et al., (1999), the AODM (the Activity Oriented Design Method) by Mwanza (2002), and the steps recommended by Jonassen (1999).

The AODM by Mwanza (2002) provides more structure in using the model of Activity System for data collection and analysis (Engeström, 1987). Her tools help researchers break down a complex system into smaller manageable sub-systems, identify the sub-system components and describe the relationships within and between sub-systems. Those tools, such as the Eight-Step-Model and Activity Notation, contain a few guidelines and show a direct relation to Engeström's model of Activity System. The Activity Checklist by Kaptelinin et al. (1999), on the other hand, seems to lack any clear mapping with the Activity System (Mwanza, 2002). However, the checklist presents a detailed list of key issues to study within mediated human performances. These key issues are deduced directly from the important principles of Activity Theory. The checklist assists researchers in finding their own solutions. It helps them ask meaningful questions in interviews and make sure important problems are not overlooked in observations. By linking the key issues with the major principles of Activity Theory, rather than the model of the Activity System, which is another tool, the checklist gives directions to inquiries and keeps researchers focused on their interests. Jonassen (1999)

describes how Activity Theory may be applied to determine the components of the activity system that will be modeled in any constructivist learning environment. Although it provides assistance in designing a learning environment, his list of questions does not quite match the goal of this study, namely, understanding how the environment is designed and developed.

For the purpose of this study, the researcher relied on the Activity Checklist and its sample questions (Kaptelinin et al., 1999) to develop instruments for observation and interviews and, in data analysis, to ask questions to make sense from the data. The tool was flexible to use in a multiple case study. As long as the key issues are not overlooked, interview questions can be adjusted to each case and don't necessarily have to be the same. To use the tool effectively, the checklist is more important than the sample questions. As Kaptelinin et al. (1999) emphasize, practitioners who want to use the checklist should familiarize themselves with the checklist and even try to internalize it. However, the study would be have benefited more from the literature if there were more discussions and more detailed sharing within the research community concerning the methodological issues.

Dilemma in Defining the Unit of Analysis

The model of the Activity System and the concept of the expansive cycle (Engeström, 1987, 1999) defined the boundaries of the cases. In this study, a case is an activity of instructional design. A case about certain processes needs to have a start and end point and one key task in historical analysis of an activity system is "periodization" (Engeström, 1999). From the perspective of both case study and Activity Theory, it is important to determine an appropriate period to conduct meaningful research. However,

the concept of expansive cycle is not fully elaborated in the literature (there are more discussions about, and applications of, a related concept – "expansive learning"). As a result, the researcher also depended on the well-known ADDIE model to set up the time constraints delimiting a case.

When the whole instructional design process was considered as one activity, the sub-processes were treated as actions. All actions (sub-processes) were driven by the same object and motive – creating online environments in CMSs that offer flexible and active learning experiences, and are manageable by the instructors and learners. This hierarchy, the motives, and goals were coherent with the principles of Activity Theory. However, the process of instructional design is a complex process in which many relatively independent actions and sub-actions take place in a nonlinear manner. Tracking the evolution and transformation of the objects became hard when sub-process were viewed as actions.

In order to solve the problem, the researcher tried to define the sub-processes of instructional design as individual activities and create a network of activity to represent the whole process. The attempt seemed to exhibit the transformation of objects slightly better. However, the risk was that it might weaken the link between the motives and the objects, and detach the objects from the background or the context of the entire process. The attempt was abandoned because small chucks of data could lose the context in data analysis and bring difficulty in understanding the objects. This was not consistent with the purpose of this study.

Difficulties in Defining the Components of Activity System

Although the components of an activity system have been defined in the literature,

identifying the components in the activities studied here was not as easy a task as the researcher had envisioned. "Object", a very important concept, has different meaning within the two most influential approaches in the current literature. The approach developed by Leontiev and the one proposed by Engeström are similar but have different voices in terms of the nature of activity and object. All activities are considered by Leontiev to be social, including both individual and collective ones. For him, the concept of object is predominantly the object of individual activity, its "true motive". However, from Engeström's perspective, activities are collective phenomena and individuals can only carry out actions. Being viewed as the motivating force, the object is defined as "raw materials" or a "problem space" at which an activity is directed and which is molded and transformed - a definition related to production (Engeström, 1987, 1995, 1999). However, the differences between the two major approaches of Activity Theory are often ignored in current literature and Leontiev's ideas are misinterpreted (Kaptelinin, 2005). Readers may feel lost when reading some papers about the application of the framework. Such confusions in the literature were the source of the challenges the researcher faced when identifying the components of the activities in this study. The researcher finally chose to follow Engeström's definitions of object and activity which are well-accepted in the fields of human computer interaction (HCI) and organizational learning.

According to Engeström (1987, 1999), activities are collective and actions can be both individual and group work. The actions in this study were collective to various extents. Some seemed more like individual actions supported by team members; others, such as discussions and training sessions in cases One and Two, were collaborative

efforts led by the designers. Given the purpose of the study, instructional designers were defined as subject. But the community was hard to define, since the researcher had difficulty in determining whether the actions were individual or group work. In the literature, the subjects of collaborative actions sometimes are individuals in leading positions, for example, those in a series of collaborative diagnosis studied by Engeström (2000). For the convenience of tracking the transformation of objects, the researcher decided to treat those actions as individual performance in which the subjects were the designers and the rest of the course team became the members of community. The decision had an impact on the objects. The same action could have different objects when treated in different ways. For example, treated as individual actions, the training sessions aimed to equip the instructors with knowledge and skills for online teaching and learning. If they had been treated as group work, the object on which the designers and the instructors worked would have been to create online learning environments.

Difficulties in Coding Data

In general, using Activity Theory to analyze the historical process of an activity system is far more difficult than mapping the system. The object of the activity, as Foot (2002) points out, evolved overtime and was transformed to the outcomes, new teaching and learning experience, as well as new knowledge and skills for online teaching and design. An object of an activity can have different versions during its evolution (Center for Activity Theory and Developmental Work Research) and takes some time to form (Foot, 2002). Because of the complex nature of instructional design, the objects of its actions or sub-actions sometimes did not seem to be continuous and coherent until the object of the activity emerged and became apparent in the data analysis. What confused

the researcher were

First, some actions seemed to address different objects that turned out to be parts of the ultimate object of the activity. For example, the production of the course map aimed to propose the structure of the course website and the major instructional strategy; while training sessions were set up to equip the instructor with knowledge and skills for online teaching, and the course development and maintenance.

Second, some actions took place simultaneously, but worked on the objects that seemed to be the activity object at different stages in its evolution. While the designer still produced the course map to propose her design, the instructor had started revising his lesson plans which would be uploaded to the website. The objects for the two parallel actions were course design and course development that theoretically should be one after another.

Third, there was incessant movement between the nodes of activity – the object of an action could become a tool for another action or even a rule. For example, the course map was used to guide the development of the course website.

The challenge for data analysis was how to code those action objects or different versions of objects so that we could exhibit the transformation of the activity objects. The temporary relationships among the components of the activities are important for us to understand the complex nature of instructional design. In this study, the action objects were coded as "Object", "Object_Tool", "Object_Rule", but these codes are not able to reflect the sophisticated meaning embedded in the concept of object in the Activity Theory. We might need a new term to label those intermediate objects in order to represent the evolution of each object.

In addition, the researcher could not always locate texts that specified the components of activity system, such as objects, motives, and rules. Sometimes, those abstract concepts were embedded in the texts, but were hardly identifiable when they were detached from the big picture, the activity system. For example, during the interviews, the designer in Case One repeated her concerns that the instructor and learners who were novices to online learning and related technologies would be lost in the cyber space. She never made a clear statement that making her design manageable for its potential users was part of the object of the activity. The researcher identified this aspect of activity object by linking the concerns she expressed in the interviews with the characteristics of the website she created (data from design document) and the conversation she had with the instructor (data from observations). Such data characteristics presented challenges in data coding, especially for the second rater recoding the randomly selected sample data to enhance the reliability of the study. One can hardly interpret small chunks of data without a clear understanding of the historical development of activity. The challenges also demonstrate the legitimacy of Nardi's methodological suggestion (1996) regarding the application of Activity Theory: using various data collection techniques and covering a relative long time to understand the formation of objects.

Difficulties in Interpreting Data

Internalization and externalization are two important concepts in Activity Theory. However, the researcher found their definitions have subtle but significant differences across different fields. In the field of HCI, internalization refers to mental processes in which people, supported by artifacts, interact with reality without real objects (such as

mental simulation, imaging, considering alternative plans, etc.). In Case One, internalization took place when the designer envisioned the delivery and generated the "rough description" of the course in the first meeting with the instructor. Externalization happened when the team carried out the course design. From the perspective of HCI, the externalization was a collaborative process supported by various types of tools, such as WebCT, discussions, and training sessions. However, from the perspective of organizational learning, discussions and training were part of the internalization in which the instructor was trained to be a competent member of the activity of instructional design.

In addition, in HCI, the principle of development has an emphasis on the use changes of the artifacts that mediate the activity. In this study, how the designers adapted the CMSs to realize their design demonstrated such use changes. The adaptations were usually driven by the contradictions between the capabilities of the CMSs and the objects on which the designers worked. However, development, according to the concept of the expansive cycle from Engeström (1999), has much broader meaning. The development of an activity results in the formation of a new social structure, which could be new members, new rules, new tools and new patterns of division of labor. This study explores the use of CMSs in the process of instructional design and the process itself, but has an emphasis on the mediation of CMSs. Therefore, the researcher decided to analyze the activity from the perspectives of both HCI and organizational learning. However, the subtle but significance differences discussed here brought challenges to the analysis. The researcher was not convinced whether the same activity system could be analyzed from multiple perspectives. It could be two different activities rather than one: one whose object was designing and developing an online learning environment, and another one

aiming to provide training to the instructors involved in the projects.

The challenges the researcher encountered in this study were mainly due to:

- The complexity of Activity Theory
- The lack of experience in qualitative research as well as the application of Activity Theory

Activity Theory has its roots in German philosophic and its immediate origins in Russian psychology of last century. It is better described as a variety of approaches sharing basic principles rather than a monolithic one. Different approaches and different understandings of Activity Theory are also better understood as "complementary frameworks", each of which has its strengths and limitations. Articulating the differences between two prominent voices, from a dialectical perspective, ensures sustainable development of the framework as a whole (Kaptelinin, 2005). Although the researcher encountered various challenges in the application of Activity Theory, the framework helped the researcher generate insight into the complex nature of instructional design and the meditating role of CMSs. The main lessons learned in this study are:

- The application should stick to the key concepts and principles of the framework.
- The application should follow Nardi's methodological suggestions (1996).

The better one understands of Activity Theory, the more a researcher will be able to leverage the framework in his or her study to understand the historical development of a complicated human performance set in its real context.

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Appendix A: List of Design Documents Examined

Case One

1. Design/ development documents
   - Screenshots of the course website in WebCT Vista 3
     3 screenshots taken on August 23, 2006
     12 screenshots taken on September 22, 2006
     6 screenshots taken on March 26, 2007
     2 screenshot taken on July 7, 2007
   - Course Tour about the course in the fall semester of 2006 – produced by the designer and the instructor
   - Course Tour about the course in the winter semester of 2007 – produced by the designer and the instructor
   - Site map to illustrate the design to the instructor - produced by the designer
   - Site map to provide instruction to the course secretary - produced by the designer
   - "Discussion Tips and Procedure" – produced by the designer
   - "Collaborating in Online Discussion Assignment" – produced by the designer
   - Results of course evaluation (student survey) on October 18, 2006 – provided by the designer
   - Registration information introducing the online course to students who want to register for the course – produced by the instructor
   - Example of lesson plan – produced by the instructor
   - Examples of evaluation rubrics – provided by the designer
   - Essays about how to write learning outcomes and learning objectives
2. Home- made WebCT Manual
3. Presentation about the course redesign – offered by the instructor
4. Emails exchanges between the instructor and the designer

Case Two

1. The original course website of English 212
2. Institutional policies and documents related to online distance learning

Case Three

1. Video about the course website in Firstclass
2. Examples of weekly presentation and learning activity

Appendix B: Instruments for Data Collection

1. Using the checklist of Kaptelinin et al (1999) to find the focus areas of data collection

Subsystems with in an activity (Engestrom, 1987)

Subsystem		**Mediator**	
Production subsystem (P)	**S**ubject (S)	**T**ools (T)	**O**bject (O)
Exchange subsystem (E)	Subject	Rules	Community
	Community (Subject)	Rules	Objects
Distribution subsystem (D)	Community (Subject)	Division of labor	Object
Consumption subsystem (C)	Subject	Community	Object

Four dimensions of the Activity Checklist (Kaptelinin et al, 1999, p36)

Means / Ends (hierarchical structure of activity)	**Environment** (object-orientedness)	**Learning/ cognition/ articulation** (externalization/ internalization)	**Development** (development)
Understanding the use of any technology should start with identifying hierarchies of goals of target actions and analyzing actions at different levels.	Understanding the social and culture environment through identifying the objects involved in the target activity and constituting the environment of the use of the target technology	The target technology should support the internalization of the new ways of action and articulation of mental process.	Analyzing the history of target activities to reveal the main factors influencing the development. Analyzing potential changes in the environment to anticipate their effect on the structure of the target activities.

Focus of this study (revised based on the Activity Checklist by (Kaptelinin et al, 1999)

Dimensions	**Major tasks for data collection**	**Focal areas (within/ across subsystems)**

Means/ends (Hierarchical structure of activity)	• Identify the target activity
	• Identify target actions
		• The object of the target activity
		• The components of Production subsystem of the target actions (**S-T-O**)
		•The levels of actions/operations
		• The goals and sub-goals of target actions (goal setting, goal decomposition and attainment)
		• Constrains imposed by goals on the choice and the use of tools.
		• The conflicts between goals and the changes of goals (considering the influence on the use of tools)
		  • Conflicts between goals within the Production subsystem (**P**) and the resolutions
		  • Conflicts between different goals within the community (**P+C**) and the resolutions
		  • the goals associated with the rule and division of labor within the community (**P+D, P+E**)
		• Alternative ways to achieve target goals

Environment (Object-orientednss)	• The artifacts (objects) produced in target actions and the final outcome • the context in tools are used	• The tools used and their roles in production (**P**) • The Consistency or integration of target technology with other tools (physical and cognitive tools) (**P**) • The rule, norms and procedures regulating social and physical interaction and coordination related to the use of target technology and their influences (**P+E**) • The division of labor in target actions and their influence on the use of tools (**P+D**) • Access to and the share of tools and resources within the community (**P+C**)
Learning/ Cognition (Internalization/ externalization)	• The way the target technology support learning process and problem-shooting	• The components of target actions that are to be internalized (**P**) • The use of target technology for simulating target actions before actual implementation (**P**)

	• Knowledge and skills required for operating the target technology and the access to them	• Supports for problem articulation and help request in case of breakdowns **(P)** • Time and efforts necessary to master new operations **(P)** • Knowledge and skills about using target technology that reside in the environment and their distribution and access **(P+D, P+C, P+E)** • Collaboration within community (coordination, shared representation) **(P+D, P+C, P+E)**

Development (Development)	• The changes of the use of target technology
	• The changes of the activity
		• The attainment of goals because of implementation of target technology
		• The changes of goals (refer to Means/ends)
		• Anticipated changes in the environment and levels of activity
		  • The change of the use of technology
		  • The change of instructional design
		  • The change within community
		• The change of user attitude toward target technology

2. Generating the interview questions and observation protocol based on the checklist of Kaptelinin et al (1999).

Interview Questions

- Please tell me something the project. Who and why initiated the project? What are the objectives or goals set for the project?
- Do you have your personal objective for the project? What do you expect the CMS can help you to achieve?
- Please describe the process you will take to accomplish the design processes? Or So far, which stages have you gone through? And what the next stages are?
- Could we review the design process you have gone through (since our last interview)? What are the goals you set up for each stage and how did you achieve those goals?

  Pay attention to

  - Components of P subsystem of the target actions **(S-T-O)**
    - ✓ People who involved in these processes (their believes, roles and responsibilities, or influences)

  - ✓ The artifacts (objects) worked on
  - ✓ Tools used in target actions (cognitive and physical tools - When, how and why are they used)
- Transformation of goals of target to operations (goal-setting, decomposition, attainment)
- Conflicts and changes of goals and the influence on the use of CMS
  - ✓ conflicts btw goals within the P subsystem (horizontal/ vertical) (P)
  - ✓ conflicts btw different goals within the community (P+C)

- In which stage or tasks do you use the CMS? Please specify which features in the CMS are used. What do you think about the CMS that you are using?

- In those stages in which the CMS is not used for design and development, does the functionality of the CMS influence your design decision-making? How?

  Pay attention to:
  - How the CMS functions and the benefits/ limitations to use it
  - The functionalities of the CMS that influence or support the design practice and decision-making
  - The integration of CMS with other tools: the conflicts caused by the incompatibility and the solutions

- What are the difficulties you encounter when using the CMS to design? Any focus shift or breakdown? Does the CMS provide any support to help you find a solution or formulate a request for help?

  Pay attention to
  - The shifting focuses, the causes of the shifts and the consequence
  - The breakdowns and the causes of breakdowns and solution

- Please describe the processes during which you collaborate with others. With whom you collaborate? How do you collaborate?

  Pay attention to
  - S-T-O (tools shared among team members, shared representations)
  - The distribution of work (collaboration patterns): Strategies or procedures, coordination, shared resources and representation...)
  - The distribution and access to knowledge and skills required for the success of the project, especially about the use of CMS
  - Conflicts during collaboration and the solutions

- How do the rules, norms, procedures and assumptions existing within the community guide the design practice, especially the use of the CMS in terms of goal-setting, human and tools involved, and objects worked on? (Identifying the rules...)

- How does the CMS facilitate the collaboration?

- Is it hard to learn how to use the CMS for design? Do the features of the CMS help you to learn quickly? How?

- In your opinion, what is the ideal design for the course? How the CMS might support or constrains the ideal design process?
- Have the tools used (physical and cognitive tools) or the usage of those tools changed overtime?
- What are the positive/ negative side-effects associated with the use of CMS that will affect your design practice in the future (assumptions, procedures, and practices, etc.)?
- Do you think you achieve your objectives you set for the project? Does your attitude to the CMS change overtime? How it changes?

Observation protocol

Individuals Observed:
Observer:
Role of observer: Non-participant

Time:
Place:
Length of Observation:

Setting:
Something to look for: the goal of observations is to map the activity system studied (see the focus of study). Pay attention to:

- The goal of the actions (original goals and focus shifts)
- What object they work on in each action.
- Who included in the community.
- Tools used by the community
- Rules applied to the activity
- The pattern of the division of labor

Notes:

Code	Time sequence	Descriptive Notes:	Reflective Notes:	Analysis
1				
2				
3				
4				
5				
6				
7				
8				
9				

Appendix C: Coding Protocol

ActivityMotives

- The objectives of the focal projects set up at the institution and department level
- Personal objectives of people involved in the focal projects.

ActionGoal

The goals set up for course design and development.

Action

Descriptions about the processes or sub-processes of course design and development as well as their characters.

- Processes or sub-processes have taken place or are taking place
- Processes or sub-processes that are going to take place

The code describes a sequence of performances. Sometimes, the descriptions contain words suggesting a time sequence: e.g. "first", "next", "then" or "after", etc.

Contradiction_ToolLimit

Descriptions about the issues or problems (breakdowns and focus shift) of course design, development and delivery that are mostly brought by the functional limitations of the technologies employed in the focal projects.
Tools includes materials and non materials tools used in the focal projects. The issues or problems have impact on the course design and development.
They are verified by checking the consistency between goals and objects to see if there are breakdowns or focus shifts.

Contradictions_WorkloadTimelimit

Descriptions about the issues or problems (breakdowns and focus shift) of course design, development and delivery that are mostly brought by:

- The time limit of the focal projects
- Different schedules of team members
- The workload of team members

They are verified by checking the consistency between goals and objects to see if there are breakdowns or focus shifts.

Contradictions_KnowledgeSkillExperience

Descriptions about the issues or problems (breakdowns and focus shift) of course design, development, and delivery that are mostly brought by the lack of knowledge and skills of people involved in the focal projects. For example:

- The lack of knowledge and skills for using a CMS for course design and development
- The lack of knowledge and skills for teaching and learning online

They are verified by checking the consistency between goals and objects to see if there are breakdowns or focus shifts.

Contradictions_DivisionLabour
Descriptions about the issues or problems (breakdowns and focus shift) of course design, development and delivery that are mostly occur when the supports provided by the institution or department don't meet the expectation of team members in the focal projects.

Contradictions_Implementation
Descriptions about the issues or problems (breakdowns and focus shift) of course design, development and delivery that are mostly brought by delivery policies. For example:

- The administrative decision about the selection of CMS and its features
- The registration policies
- The policies related to providing technical supports for students
- Other technical problems in delivery

They are verified by checking the consistency between goals and objects to see if there are breakdowns or focus shifts.

DistributedLabor_CollaborativeIDCommunicate
The practices and the part of conversations in which the designer and other team members inform each other about the ongoing status of the project, e.g. their work progresses and their achievements.
The code mostly appears in the data obtained from observations.

DistributedLabor_CollaborativeID ExplainNegotiate
The practices and the part of conversations in which:

- The designer demonstrates and explains his or her design to other team members
- The team members clarify misunderstandings with each other.
- The team makes decisions through negotiating with each other (usually the suggestion is proposed by the designer).
- The team members express their judgments on their work.

This type of practices and conversations is part of the collaborative design and development. Usually, they are referred to those explanation and negotiations about the details of course design. The code mostly appears in the data obtained from observations.

DistributedLabor_Designer_Coordinate
The practices or the part of conversation in which the designer coordinates the focal projects; for example:

- Assigning design or development tasks to other team members.
- Managing the progress of the focal projects, such as keeping communication flow, setting up schedule and checking the work progress.
- Explaining related institutional or department policies.
- Obtaining supports from other team members.

DistributedLabor_Designer_StrategyPlan
The practices and the part of conversation in which the designer:

- Analyzing learning context.
- Determining the instructional strategies.

- Designing the online learning experience in a CMS-based course.
- Designing the online learning environment, mostly the structure of the course website (navigation and major components).

DistributedLabor_Designer_Prototype
The practice and the part of conversation in which the designer creates the prototype of the course website in a CMS after discussing and negotiating with other team members by:

- Selecting media/ technologies and producing development strategies:
  - Selecting CMS features to realize the instructional strategies in a CMS; for example.
  - Selecting CMS features to transfer the design autonomy to instructors
  - Selecting other technologies for production.
  - Determining strategies (workarounds or adaptations) to overcome the limitations of the technologies to meet certain instructional requirements.
- Designing the website layout in a CMS (Realizing the designed structure in a CMS – navigation, chunking, and sequencing).
- Configuring the settings of selected CMS features.

DistributedLabor_Designer_Produce
The practices and the part of conversation in which the designer provides development support. For example:

- Preparing course documents and learning guidance, such as the online learning guidance and demos.
- Testing the capabilities of the technologies in terms of realizing instructional design and development strategies.
- Providing development supports (rather than strategies), such as uploading files to a CMS, transforming files into html format, and dealing with other technical problems.
- Providing instruction, feedback or suggestion on course development conducted by other team members from technical aspect.
- Modifying course websites based on feedback.

DistributedLabor_Designer_DesignTeachConsult
The practices and the part of conversation in which the designer provides pedagogical advices to other team members. For example:

- Proposing instructional strategies or asking questions to facilitate the generation of instructional strategies.
- Proposing suggestion in terms of the instructional design process (e.g. suggesting having an evaluation with students at certain point).
- Advising the instructor about the course design, and the content production from the pedagogical aspect (e.g. providing feedback, references, and tips).
- Answering the instructor's questions about on teaching and learning (e.g. how to provide feedback on students' assignments, or how to track their learning in a CMS).

This code represents an important part of the design support provided by the instructional

designer. Such design supports cannot be completely separated from those development supports.
Some ID suggestions proposed in observations become design and development strategies in later stages when they are accepted by the instructor and realized in a CMS. The code mostly appears in the data obtained from observations.

DistributedLabor_Designer_TechConsult
The practices and the part of conversation in which the designer provides formal or informal training sections on technologies involved in the focal projects by:

- Demonstrating and advising the capabilities of the technologies in terms of course development (e.g. trainings to use WebCT, Moodle and Camtasia).
- Demonstrating and advising about the capabilities of the technologies in terms of satisfying certain instructional requirements or offering certain learning experience.
- Recommending technologies used in the development.

In the focal projects, the technical training service provided by the designer to other team members emphasizes the pedagogical use of technology – how to use the technologies to achieve certain instruction requirements.
The code mostly appears in the data obtained from observations.

DistributedLabor_Instructor_Design
The practice in which the instructor modifies his or her original course design in order to match the new delivery format pursued by the project; for example:

- Determining which models are taught in online environments.
- Planning assessment strategy, e.g. developing pre-post tests and determining the number and type of assignments as well as the grading policy.
- Designing in-class modules.
- Approving the design strategies recommended by the designer and the prototype website in CMSs.

DistributedLabor_Instructor_Develop
The practice or the part of the conversation in which the instructor contributes to the course production; for example:

- Preparing, chunking and sequencing learning contents, e.g. lectures, reading list, resources, and questions for pre/post tests.
- Rewriting old or producing new course documents to meet the requirements of course design, e.g. learning objectives, lesson plans, grading grids.
- Producing multimedia course content, e.g. recording online lectures, course tour.
- Testing the course website and providing feedback to the designer or the team.
- Contacting other resources for developmental support, e.g. copyright clearance.

DistributedLabor_Instructor_Consult
The practice and the part of conversations in which the instructor raises questions or requests in terms of the pedagogical aspect of online teaching and learning. For example:

- Asks questions about online teaching and learning, as well as instructional design for online learning.

- Brings up his or her own requirements, ideas for course design and asks feedback from the designer.
- Brings up questions about the development of online learning materials.

Some requests of the instructor in observations become instructional Strategies (ObjectProduced_Rule_DesignStrategy) in later stages when they are realized in CMS. This code mostly appears in Observations. It represents an important part of the collaborative design process.

DistributedLabor_CommunityResponsibility

During the design and development process, those people who involve in the focal projects bear various responsibilities, including:

- Overseeing the project and allocating personnel and resources to various design and development tasks.
- Dealing with copyright issues.
- Providing design and development support; for example, a TA provides design suggestion, a graphic designer design the visual templates or a course secretary uploading documents in a CMS etc..
- Programming new features in order to fit the instructional design requirements and the delivery policies.
- Providing other technical supports.

People involved could be the community members within the activity system that is studied or the community in other activity systems which have influence on the transformation process of the focal system.

Object_Tool_DesignStrategy

The decisions about course design that are made during the course design and development process to guide the following practices. For example:

- The decisions about the proportion of online learning in blended learning design
- The instructional strategies chosen
- The decisions about chunking and sequencing the content.
- Learning activities design
- Learning assessment design
- Learning environment Design (the structure of course website)

Object_Tool_DevelopStrategy

The conversation or the practice in which the designer provides development strategies to:

- Adapt the use of certain features in of the technologies employed in order to meet certain instructional requirements.
- Provides walk-around plans to overcome the limitations of the technologies employed in order to meet certain instructional strategies.
- The decision about choosing media or technologies for course design and development.
- The decisions about the layout design of the course website in a CMS.

Object_Rule_Delivery
The decisions about delivery that are made during the course design and development process to guide the later practices. For example:

- The criteria of selecting a course for the focal project
- Other decisions about course delivery made in the focal projects

Object_Course
Components of the course that produced along the design and development process
The code applies for the names and the descriptions of the components of the course.

Object_Tool_DesignDevelop
The objects that are created during the course design and development process and used as a tool to guide the following practices; for example:

- Course map for instructor
- Course map for development
- Assessment plan as a development plan
- New developed CMS features to meet certain instructional requirements (One of the solutions for the contradictions that are brought about by the use of CMS)

Rule_CollaborativeIDAttitude
Perspectives of and attitudes toward collaborative instructional design practices. for example:

- The expectations of the instructor or tutors in terms of obtaining support from their institutions
- The perspectives of designer or other team members in terms of providing various types of supports in course design.

Rule_DistributionofLabour
Rules at individual, department and institutional level that impact the distribution of labor in terms of designing and developing online learning environments, as well as supporting online learning process - the way the team members collaborate with each other.

Rule_Delivery
Rules for delivering the course through CMS:

- The subject of the course
- The size of the course
- The delivery model: Blended, online, or distance learning, self-paced learning
- The delivery regulations in general, e.g. registration deadline, students being informed course format before their registration, continuous registration
- The selection of certain CMS as delivery platform (the functionality of CMS) and the policies about using the chosen CMSs
- The institutional or department strategies of providing student supports.
- The initiator of the project
- Time limits

Rule_ Design
Personal routines, preferences or perspectives in terms of designing online learning environments; for example; preference for constructivist learning.

Rule_ Develop
Personal routines, preferences or perspectives in terms of:

- Selecting and using technologies/ media in course design and development; for example: the preference for using regular html format to CMS templates.
- Designing and developing online learning environments or learning materials; foexample: the preference for web page layout design.

Rule _IDPractice
Personal routines, preferences or perspectives in terms of handling the design and development processes; for example: creating a course map to present the structure of the course website during the design process

Tool_Designer_KnowledgeSkillsExperience
The experience, knowledge, and skills of the designer which are required for designing and developing online environments in a pedagogical sound way; for example:

- The knowledge, perspectives and experience of teaching and learning online
  - The perspectives of learning.
  - The knowledge or experience of teaching and learning online
  - The understanding of the challenges of teachers and students.
  - The knowledge of institutional delivery/ implementation policy
- The knowledge and skills of instructional design, especially design for online learning.
  - The knowledge and skills of selecting and using technologies to meet instructional requirements, including CMS
  - The knowledge and skills of selecting and designing appropriate instructional strategies, sequencing learning content etc.

Tool_Instructor_KnowledgeSkillsExperience
The experience, knowledge, and skills of the instructors which are required for designing and developing online environments in a pedagogical sound way. For example:

- The knowledge, perspectives and experience of teaching and learning online
  - The perspectives of learning
  - The knowledge or experience of teaching and learning online
- The knowledge and skills of instructional design, especially design for online learning
  - The knowledge and skills of selecting and using technologies to meet instructional requirements, including CMS
  - The knowledge and skills of selecting and designing appropriate instructional strategies, sequencing learning content etc.

Tool_Community_KnowledgeSkillExperience
The experience, attitude, knowledge, and skills of the community that are required for

designing and developing online learning environments in a pedagogical sound way, or having successful learning experience in such environments.

- Characters or personal experience, especially experience of online teaching and learning
- The knowledge or perspectives of online teaching and learning
- The knowledge and skills of instructional design and development for online learning experience

Tool_PreviousInstructionalStrategy
Instructional strategies employed in the previous version of the focal course and their impact on the current course design and development, for example:

- Previous delivery model
- Instructional strategies
- Interaction between instructors and students
- Course contents presentation

Tool_DesignDevelop

- Material tools used for course design and development, including e.g. CMS, Camtasia, CourseGenie, Inspiration, email etc.
- Non material tools used for course design and development, including brainstorming and discussion about teaching and learning in online learning environments

The code also applies to the description of the tools.

Tool_ CapabilityAlternatives
The vision of using alternative tools (e.g. CMS) to realize the same instructional strategies employed in the focal course

Tool_Capability
Descriptions of the capability of a CMS in terms of design and development:

- The capability of realizing the course design in a way to support learning process
- The capability of realizing the course design in a way to facilitate autonomy transfer to instructors
- The user-friendly interactions between the tools and their users

The code also applies to the data that describe of how a CMS works.
The code also applies to the data that describe of how a CMS works. They are verified by checking the consistency between goals and objects.

Tool_ToolIntegration
The capability of the tools used in the course design and development to integrate with each other.

Transformation_NewLearnExperience
The outcomes of the focal activity systems –the new learning experience of students (comparing with the former version of the focal course) brought by the blended learning design.

The code applies to the description of:

- New learning design
- The achievement of students brought by the new ways of learning
- The problems of students in terms of online learning

Transformation_NewIDExperience

The outcomes of the focal activity systems – what has been learned by participating in the collaborative instructional design practices (rather than learning in online environments)

The code applies to the description of:

- The achievements in terms of course design and development
- The acquisition of knowledge and skills of designing and development online learning environments
- The change of attitude that suggests more understanding of online teaching and learning.
- The reflection on teaching in online learning environments
- The reflection on the collaborative instructional design practices

In many situations, the code applies to the same texts where the Object_Tool_DesignStrategy and Tool_Capability apply.

Transformation_AutonomyTransfer

The outcome of the focal activity systems – the autonomy of design and development (the course website edit most likely) that is transferred to the instructors after the focal projects end.

Scene Description_Observation

The brief description added by the researcher to sections in the observation data that describes certain scenes in the course design and development.

Topic Description_Observation

The brief description added by the researcher to sub-sections in the observation data that describes certain topics within a scene in the course design and development.

Note:

The community in the coding protocol is slightly different from the definition in the dissertation. Community here refers to the team members other than the designer and the instructor.

Appendix D: Coding Samples

Sample of Interviews

Sample unit: Interview 3 _ Case 3, line 978-1026, Random No. 35)

Scenario: The instructor was asked: What are the instructional strategies you employ in this course? Which ones are realized in a CMS?

Transcripts

Interviewee:

As far as content presentation, we have an extra folder and [it] was primarily from the instructor. That folder is called Weekly Guide. [1] Because one technical difficulty in this particular system... *This is not a course management system. This is a communication management system.* [2] So there are so many places that things can happen. It is very difficult to find a spot that you can insure that people can read it. It is not like Moodle (in which) you come in and you have an announcement section. [3] Yes, you can build something like: Every time you come in, there is an announcement that pops up. But that is very intrusive for people who are not familiar with this FirstClass. [4] That was the major difficulty they are running into. Half of the class had never used FirstClass before. They did have an email account there; they had never used it and they even did not know how to open folders. They did not know anything about it. They did not know that they could create conferences, all kind of issues[5]. The problem is "How do you *make the environment always looks like it always looks, but still have a space where you can post stuff that everybody knows they can go there and see authorized information on deadlines, that stuff*"[6/7]. In the Weekly Guide, they are numerical ordered. Every week, I post a file that is the PowerPoint, and a PDF file (open the file), saying the activity for week six, due day. In the beginning, there is always structured a few information pieces:

- Working groups, I want to remind everybody that the discussion in the Work Group (folder) is very important;
- Grading of the paper when something is done
- some highlights and encouragement
- The task for the week: read these assigned papers, read the PowerPoint and like... Here is the activity, "The following link has several [examples for] cognitive flexibility. Go to this link and find the hypertext and discuss the following questions. In the environment you choose....."

- Then it always has a point in between the assignments that says "this is the first assignment and the assignment two is being due in four weeks. Now think about the assignment two, individual stories from CAD library."
- And the end, there are always two messages that are always the same: "Is you have any technology questions, post them here... and not necessarily but why don't you consider starting reading the literature for next weeks." [8]

Coding results:

No. of Meaningful Text sections	Rater 1	Rater 2	Different Coding
1	Object_Course	Object_Course	
2	Tool_DesignDevelop	Tool_DesignDevelop	
3	Contradiction_Toollimit	Contradiction_Toollimit	
4	Contradiction_Toollimit	Contradiction_Toollimit	
5	Tool_Community_ KnolwedgeSkillEexperience	Tool_Community_ KnolwedgeSkillEexperience	
6	Action_Goal	N/A	X
7	Contradiction_Toollimit	Contradiction_Toollimit	
8	Object_Course	Object_Course	

Sample of Observation

Sample unit: Observation_M_3, line 700-727, Random No. 25

Scenario: The instructor asks the designer to go back to the beginning of a module, for example Module three. They start discussing the layout design of the module.

Summary of the observation:

- The instructor expresses *his logic of the content order in each module:* [1] *students take the pretest before they look at a new learning module, then they look at the content (readings and lectures), and at last they sign up for the assignments.* [2]

  So they agree to make the Pretest icon second on the content list in each module.) [3]

- The instructor agrees with the designer to highlight the Group Discussion by putting the icon on the module page instead of inserting it in the Learning Module. [4]

- The designer agrees with the instructor that *the logic showed in Module three is applicable to all modules.* [5/6]

- Because of the time issue and the potential change of textbook, the designer agrees with the instructor to *set up the pretest in a simple way by telling the students to find pretest questions in the textbook.* [7/8] They may redesign those texts in the next version of the course. [9]

- The designer tells the instructor that the layout design of each module is designed with the concern in mind that *the students who register for the course don't know this is a blended learning course.* [10/11] The instructor agrees with the designer to keep the layout design simple and highlight the content with important icons. [12]

- The designer proposes some suggestion on how to improve the design in the next version, such as designing an interactive pretest and glossary. [13]

The designer checks her list to see the next point to discuss. The instructor agrees to check th copyright issue with librarians. [14] They further discuss the use of video in another course.

The designer checks her list to see the next point to discuss.

- The Designer shows the instructor some reference about online discussion and asks him if he is interested in reading them, since this is his first time to teach a blended learning course. [15]

- The designer will prepare some guidelines for students and put it on the course

website. [16]

- The designer strongly recommends the instructor to have a rubric for evaluating the online discussion. She is willing to provide support, helping him to create the rubrics. [17]

The focus of their conversation shifts to project management again: The designer talks about the current progress and scheduling. [19] The designer compliments on the work that has been done by the instructor. [20]

Coding result:

No. of Meaningful Text sections	Rater 1	Rater 2	Different Coding
1	DistributedLabor_ Instructor_Design	Tool_Instructor_ KnowledgeSkillExperience	X
2	Object_Tool_DesignStrategy	Object_Tool_DesignStrategy	
3	DistributedLabor_ CollaborativeID ExplainNegotiate	DistributedLabor_ CollaborativeID ExplainNegotiate	
4	DistributedLabor_ CollaborativeID ExplainNegotiate	DistributedLabor_ CollaborativeID ExplainNegotiate	
5	DistributedLabor_ CollaborativeID ExplainNegotiate	DistributedLabor_ CollaborativeID ExplainNegotiate	
6	Object_Tool_DesignStrategy	Object_Tool_DesignStrategy	
7	DistributionofLabor_ CollaborativeID ExplainNegotiate	DistributionofLabor_ CollaborativeID ExplainNegotiate	
8	Object_Tool_DesignStrategy	Object_Tool_DesignStrategy	
9	Object_Tool_DesignStrategy	Object_Tool_DesignStrategy	
10	Object_Tool_ DevelopStrategy	DistributionofLabor_ CollaborativeID ExplainNegotiate	X
11	Tool_Community_	Tool_Community_	

	KnolwedgeSkillEexperience	KnolwedgeSkillEexperience	
12	Rule_Develop	Rule_Develop	
13	DistributedLabor_ Designer_ DesignTeachConsult	DistributedLabor_ Designer_ DesignTeachConsult	
14	Object_Tool_Designstratgey	N/A	X
15	DistributedLabor_Designer_ Coordinate	N/A	X
16	DistributedLabor_ _Instructor_Develop	DistributedLabor_ _Instructor_Develop	
17	DistributionofLabor_ Designer_ DesignTeachConsult	DistributionofLabor_ Designer_ DesignTeachConsult	
18	DistributedLabor_ Designer_Product	DistributedLabor_ Designer_Product	
19	DistributedLabor_ Designer_ DesignTeachConsult	DistributedLabor_ Designer_ DesignTeachConsult	
20	DistributedLabor_ Designer_Coordinate	DistributedLabor_ Designer_Coordinate	
21	DistributedLabor_ CollaborativeID ExplainNegotiate	DistributedLabor_ CollaborativeID ExplainNegotiate	

Appendix E: The Checklist for Focus Shifts and Breakdowns

(Revised from Bødker, 1995, p.167)

For each specific focus, ask:

- What is the purpose of the activity/actions for the user?
- Which object is focused on by the user? Does the object reflect the original purpose of the activity/action?
- What are the tools used?

In collaborative actions, ask:

- Are the purpose, object and tools in accordance or conflicting (between the individuals, as well between the group and individual)?

For each focus shift, ask:

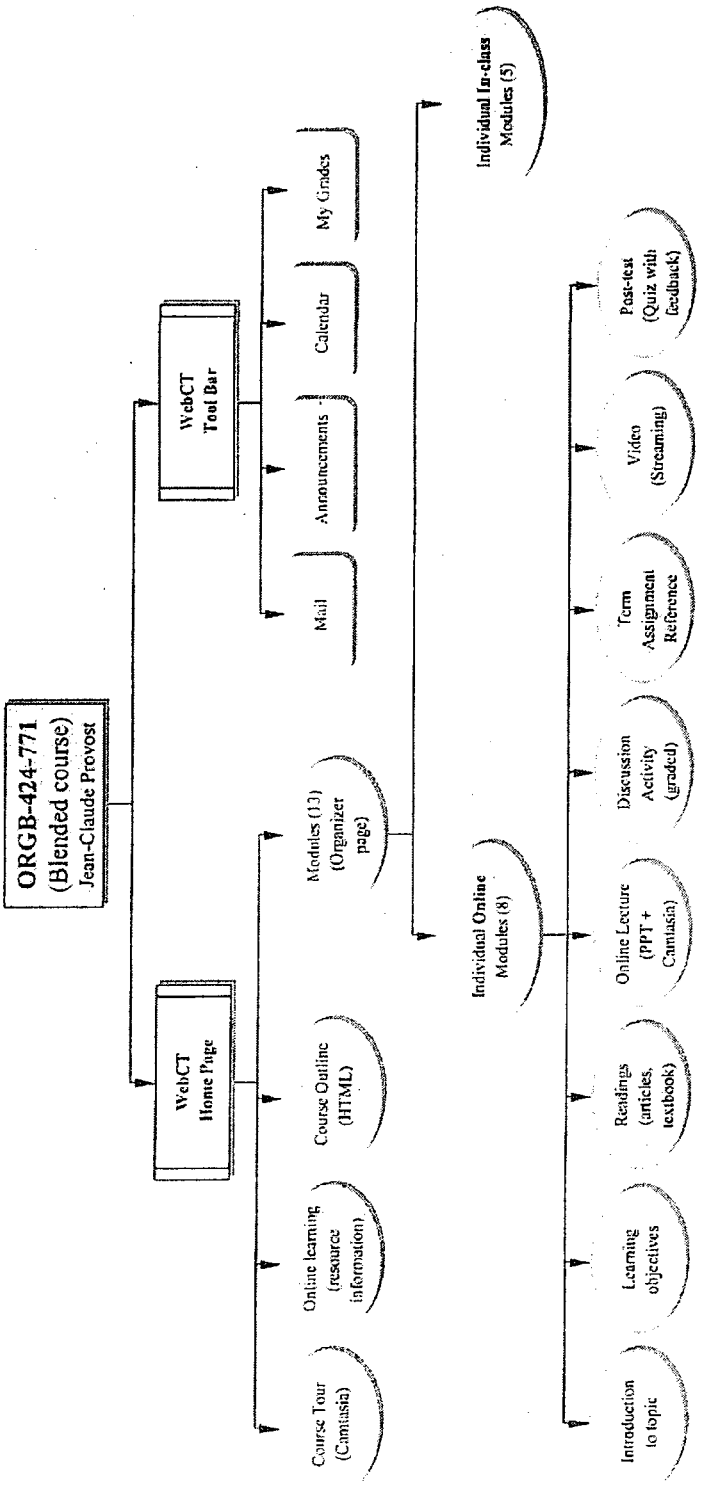
- From what focus/object to what?
- Is it a breakdown or a deliberate shift?
- What caused the shift or breakdown?

The use of The Checklist:

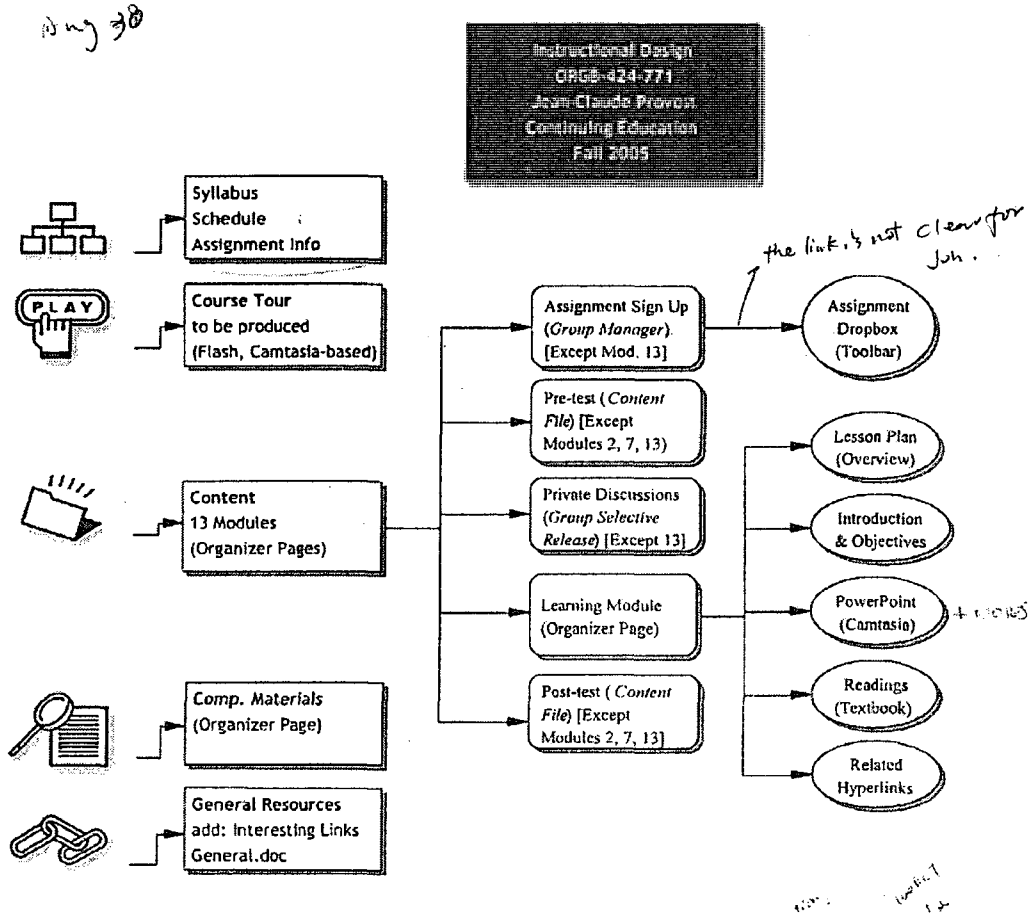
The researcher used this checklist to examine the transcripts where codes for contradictions were applied. Focus shifts and breakdowns were identified to ensure the correctness of the coding. For example:

Case	Original Goal	Object Focused On	Tool Used	Focus Shift/ Breakdown
Case One	To display detailed information about scenario-based discussion on the sign-up sheets	New content structure • The designer had to restructure course content in the course website, moving all task descriptions for discussion from the Sign-up sheet to a folder that could be accessed from Homepage. • New learning path (focus shift): • The designer created a different learning path for non-graded assignments that did not use sign-up sheets.	WebCT Sign-up Sheet (Descriptions of discussion topics should have less the 300 words.)	Focus shift
Case Two	To create a course website for distance learning requiring continuous enrolment	New Moodle features were developed to meet the special requirement.	Moodle Default settings	Breakdown in this activity. Task for another activity.

Appendix F: Course Map Developed in Case One



Appendix G: Development Map Created in Case One



Appendix H: Examples of Learning Support in Case One

Collaborating on Online Discussion Assignments

Participation in your discussion group involves sharing your perspectives and building understanding within an environment that respects diversity of opinion and a range of experiences. Your participation in the online discussions in this course is vital for your learning. Participation entails reading the course materials and related resource information, contributing to discussion and collaborating with group members to complete assignments. There should be evidence of your engagement within all the discussion groups you will take part in. What follows is a detailed description of the online discussion assignments activities. There are 4 main steps to completing an online discussion assignment.

1. Sign-up for a discussion group

Within each of the 13 learning modules, click the Assignment Sign-up Sheet icon. You will be presented with a list of different discussion topics available for the module. Click the **Sign Up** button to sign up for a topic. Note that once you have signed up, you cannot change your selection (if a change is necessary, contact the instructor using WebCT Mail).

2. Self-select group roles

Once you have signed up for a topic, you will be able to see the names of the other members of your group. Proceed to the **Group Discussion** area of the module, where you will find a *private* group discussion board. Only the members of your group and your instructor can read and add to this discussion area. It is within this space that you will discuss with your group members.

In each discussion area, the discussion topic you signed up for will be posted along with additional instructions (if applicable) for completion of the assignment. Generally, 4 students will be allowed to sign up for a topic. To help you learn the material and work together effectively, each group member should assume a specific role. It is your responsibility to take on one of the following roles within your group and to rotate roles for each of the assignments. This should be the first item addressed within your discussion space.

Contributor: All members of a group are expected to contribute to a discussion and relate current concepts and strategies to previously studied material. This could be also regarded as links between theory and practice.

Moderator: The *Moderator* is responsible for opening the discussion and to keep it moving, often by asking the other group members questions, sometimes about what they've just written. The *Moderator* sets the agenda, keeps the group on task, assures work is done by all, and makes sure all members have an opportunity to participate.

Synthesizer: The *Synthesizer* takes notes of the group's discussion and at the end of the discussion period provides a summary of the discussion for other members to approve or amend before posting to the entire class.

NOTE: To help you keep track of the roles you play in the weekly discussions, remember to log this information by clicking *Role Play Log,* and clicking *Begin Assessment.* The log is presented in the form of a quiz, but no marks are attributed for its completion and remains open until you submit it (week 13). The log is designed to help you keep track of the roles you play to ensure students rotate roles from one module to another.

3. Discuss the topic

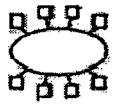
All group members should succinctly share their ideas, opinions, concerns, thoughts and questions during the discussion period. The discussion board, and not e-mail, should be the primary communication tool for this activity. All members are expected to contribute to the discussion, however the *Moderator* is expected to guide the discussion, and perhaps prompt other members as required, and the *Synthesizer* should prepare a summary of the group's discussion and/or findings.

4. Publish the group synthesis

The *Synthesizer* should wrap up the discussion and provide closure by preparing a synthesis of the group's discussion. The synthesis should be made available to other members of the group for approval before the synthesizer publishes it for the entire class. The report may be presented in point form (see POINTS TO CONSIDER IN PRESENTING ALL YOUR ASSIGNMENT REPORTS) in Word or PowerPoint format. **It is important that the final synthesis include the full descripton of the assignment.** To post your assignment to the class:

1. Click **Assignments** in the course tool bar.
2. From the *Inbox* tab, click the assignment you are preparing to submit.
3. Click **Add Attachments.**
4. On the next screen, click the **My Computer** icon to browse for your file. Double-click the file on your local computer to select it.
5. Back on the initial *Assignment* screen, you will see a hyperlink with the file name (indicating the file has been successfully attached).
6. Click **Submit.**
7. The next screen will confirm that the assignment has been successfully submitted. Click **Continue.** (The assignment just submitted will no longer appear under the Inbox tab).
8. Click the *Submitted* tab.
9. At the far right, under *Options*, click the **Publish Controls** icon.
10. On the next screen, click **Publish** to post assignment for the whole class.

Note: To view assignments posted by other groups, click the *Published* tab.
To view your grade and the instructor's comments, click the *Graded* tab.



DISCUSSION
tips and
procedures

The Discussions feature in the Employment course is designed to allow students to post private messages to their group members as they discuss and work on the online assignments.

Under the roundtable icon within each Module, you will find the group you have signed up for. In this area of the Discussion Tool you can post messages to, or read messages from your group members. The discussions in the group areas are available only to members of your group (and the instructor).

- The messages sent in the Discussions can be replied to, and can be viewed as threaded discussions.
- The discussions in the Discussion Boards are all logged.
- To read a message in any Discussion Topic, simply click on the Topic name on the main discussion page
- To respond to any message in the Discussion area, read the message, and then click on {Reply} in the message window.
- If you want to start a new topic in the Discussion Area use a new, specific, and appropriate subject line.

You may also include attachments to your message.

Guidelines for Using the Discussion Tool

In order for discussions to run efficiently, all students must ensure the following steps are followed:

1. Read all of the messages in a Topic before posting your own. If you read to the end of the messages, you may find that the question you are about to ask has already been answered, the topic has changed significantly, or some other reason has arisen why the message you are about to post might not be appropriate. Your participation in the group work depends in part on the quality of your reading and posting.

2. Keep your message short, and to the point. If you have more than one main point, it is best to divide your message up into multiple messages, separated by new Topic Headings. Generally, 15-20 lines should probably be enough (of course, it may be quite a bit less than that), unless you are recounting a detailed story or need to provide specifics that go beyond a typical email message.

3. Make sure that the entire group will want to read what you are writing. If the message is for only one or a few people, it's best to send a message just to that person using the course {Mail} tool. (As a reminder, your group discussions must take place in the Group Discussions area on the web site).

4. Read the Discussions regularly, at least three times a week.

5. There is no expectation that you log on every hour, or even every day (you should, however, monitor the course web site every three days). If you let things go for a while, you will quickly find yourself behind and unable to catch up. Your posts will be outdated, and the subject matter will have changed. Like any class, you will need to keep up.

Use the subject line.

If you are switching topics with your message, let your group members know where you are going. Instead of writing "re: your message", in your subject line, give your readers a clear sense of what you will be talking about.

If you are responding to a topic started by another student, then be sure to click {Reply} from within the message window. In this way your message will be threaded under the appropriate subject heading. You should not use the {Compose Message} option to respond to an existing subject.

Read the Discussions from your own account

If you are using a friend's computer, please log "off" and "on" to your own account when reading Discussions. In addition, the instructor may try to contact you using the course's private mail system, so you might miss an important message. Also, for the same reasons, it's important to access the course material using your own access codes. The instructor will occasionally monitor the messages and how many messages each student has read and posted, to assess and improve the use of online discussion for learning.

Appendix I: Example of Learning Design and Support in Case Three

Activity for week 7 Due Date: Monday, March 5

A few information pieces

1. Working groups I want to remind everybody that the discussions in your working group are important. Please login several times during the week, post questions or comments and engage in discussion with your peers.

2. Grading of HIB papers Grading on your HIB papers is completed. Grades are posted in firstclass (spreadsheet with student ID, grade breakdown and comments to ensure privacy)

3. **Extension of assignment 2. NEW due date: March 12**

Tasks for this week:

1. Read the assigned papers: Gee, James Paul. (2005). Why Are Video Games Good For Learning? Retrieved 11/08/2005 from: http://www.academiccolab.org/resources/documents/MacArthur.pdf

   Okan, Z. (2003) Edutainment: Is learning at risk? British Journal of Educational Technology, 34(3), 253-264. (PDF)

2. Read the PowerPoint, which is attached to the message, it summarizes the readings and asks further questions.

   Discuss the questions in your work group

3. (Optional) The following list of URLs leads you to different game sites http://www.fablusi.com/ http://www.smg2000.org/
   http://www.icons.umd.edu/
   http://www.indiana.edu/~istdemo/guest.html
   http://www.geosense.net/

   Check them out and discuss the present learning opportunities.

   1. When would you use them?
   2. What are benefits?
   3. What are disadvantages?

4. Continue working on your assignment 2:

   Individual activity (finish soon):

   Source: Use http://kite.missouri.edu

   KITE is a case library containing over 1000 stories of how teachers use technology in K12 schools (primary/secondary education). The stories are searchable in a

database designed with a case-based reasoning approach (retrieval of semantically similar content).

Individual Activities: Search the case library and select 5 stories. Post the numbers of the stories into your firstclass group space to avoid other students choosing the same stories. Post a short summary (in your own words) and a short reflection of your stories in your group space on firstclass. The reflection should include: a) what is the use of technology, b) what are the instructional and pedagogical choices of the teacher, and c) how does the story compare to your own experience

Collaborative

Select from your group's stories 3 stories for next activities. Please select stories where

You see the need for stronger constructivist orientation and overall improvement.

Write a reflection/recommendation paper not less than 10 pages and longer than 15 (doublespace)

Addressing the following questions:

How is technology utilized in the stories (teacher, students, group, individual ...)? Find your own categories.
What happened in the stories that you didn't expect/What stood out?
What would need improvement (what is not appropriate or not effective ...)
How would you re-design the learning activity

Suggestion: Major consideration will be given if you bring in the class literature to defend your suggestions.

Due date: March 12

5. If you have any technology questions, post them in the "?????" conference (We will try to answer the questions). Like what is a blog etc....
6. Not necessary but invited: You can start already reading the literature for the next weeks.