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Examining Instructional Design and Development of a Web-Based Course: A Case Study

Bude Su, Indiana University, USA

ABSTRACT

This paper describes the design and development process of adapting computer mediated learning from a residential course to a World Wide Web-based course offered in the distance master’s degree program in Instructional Systems Technology at a large Midwestern university. A description of the Web-based course, findings regarding the adaptation process, the major changes in course components, student reactions to the Web-based course features, and its implications for designing and developing Web-based courses are discussed. Through examining the instructional design and development process of this graduate course, the researcher provides useful references for instructors who need to teach a Web-based course in the future.

Keywords: course adaptation process; instructional development process in distance education; instruction design in distance education; student reactions to Web-based course; Web-based course design

INTRODUCTION

The growth of using Web-based instruction in higher education has been remarkable. Between the fall of 1995 and 1997 to 1998, the percentage of higher education institutions offering distance education courses in the United States increased from 33% to 44%. The percentage of institutions using asynchronous Internet-based technologies nearly tripled from 22% of institutions in 1995 to 60% of institutions in 1997 to 1998 (National Center for Education Statistics [NCES], 1998). More and more distance students are taking Web-based courses instead of learning through live audio or television. Sixty-eight percent of the master’s students who participated in distance education classes used the World Wide Web, while 45% and 29% of the master’s stu-
Students used live or pre-recorded audio or television, respectively (NCES, 2002).

Although Web-based education is growing fast, educators are not ready necessarily to teach online courses. Instructors in higher education often are asked by institutions to build online courses or to adapt some of their face-to-face courses to be delivered online. But are they ready to offer Web-based courses? Do they have enough references to which to refer? According to a National Center for Education Statistics report (2001), one of the greatest difficulties of teaching online was the lack of guidance on how to teach with technologies in their own situations. It seems clear to us that the instructional design field needs to have new and revised methods of instruction in order to take full advantage of the World Wide Web in education. In this study, through examining the instructional design process of a graduate level Web-based course, the researcher hopes to provide useful references for educators who may need to conduct a similar Web-based course in the near future.

RESEARCH QUESTIONS
1. How did the instructors and course designers build the Web-based course?
2. What major changes were made during course adaptation? Why?
3. What are the students’ reactions to the course features?

CONCEPTUALIZATION AND LITERATURE REVIEW

Instructional design also is known as instructional systems design (ISD). It is a systematic development of instruction using teaching and learning theories to ensure the quality of instruction. The instructional design process is concerned with “what process(es) a teacher or instructional designer should use to plan and prepare for the instruction” (Reigeluth, 1999, p. 13). It is the process of combining analysis of learning needs and objectives with the design and development of a delivery system to meet those needs; it contains development of instructional materials and activities and tests and evaluates all instruction and learner activities.

Designing any type of instruction involves identifying the overall instructional goal and the corresponding theoretical and pedagogical strategies that will help accomplish that goal. When people are faced with developing an online course that needs to be delivered through a relatively new medium, such as the World Wide Web, they tend to concentrate on the technological issues, such as the capabilities of the medium, instead of focusing on the instructional objectives, learner needs, specific task designs, and so forth (Bannan & Milheim, 1997; Rieber, 1994).

Littlejohn (2002) pointed out that there are several critical issues in instructional design in Web-based higher education that should be addressed to match the rapid shift toward online learning.

- **It should focus on course outcomes rather than content.** Heavy content-based course design without considering the possible learning outcomes may result in an unengaging learning experience, leading to surface learning. For this reason, educators should focus on the achievement of learning outcomes when developing online courses.

- **It should be placing dialogue and feedback central to course design.** Merely assigning a task to students is not enough for quality learning. Providing communication and collaboration is a critical part of online learning, and thus,
the course design should consider offering opportunities for dialogue and feedback for students.

- **It should be incorporating current educational theory.** Educational theories can provide valuable recommendations and justifications for the instructional design activities and, thus, can help educators to set and evaluate appropriate tasks and activities for students.

- **It should be deciding on the message before choosing the medium.** A common mistake nowadays is that educators often emphasize the technology issues too much while neglecting some critical course design issues. Therefore, it is important to design the course-related activities first and then to consider what technology may better assist those activities.

Some of the previously mentioned instructional course design issues are not entirely new, since they also exist in the traditional course design process. However, as Littlejohn (2002) emphasized, these issues seem especially prevalent in current online course design processes. For instance, because of the lack of technological skills in the online course delivery environment, faculty often relies on staff members to design the Web pages and to develop the major portion of the online courses. As a result, the technological issues usually are well addressed, while the actual pedagogical issues often are neglected. This point is also well illustrated by Hara & Kling (1999): “There has been an unrelenting cycle of technology promotion and adoption in classrooms since the 1920s, where technology was introduced by enthusiastic advocates, such as administrators and researchers, only to fail because teacher lacked equipment, time and training” (Literature Review section, paragraph 8).

It has become common knowledge that the World Wide Web can be a powerful medium for teaching and learning at a distance. According to Khan (2001), many interrelated and interdependent factors help to create an effective learning environment. He developed a Web-based learning framework that categorizes these factors into eight dimensions: pedagogical, technological, interface, design, evaluation, management, resource support, and institutional. Although Khan's (2001) holistic framework provides the scaffolding for designing quality Web-based instruction, it seems too broad to provide practical guidelines on design details. There is no doubt that such a comprehensive theoretical framework is absolutely useful as a reference for designing an effective online course; however, it is not sufficient. Other practical considerations, such as when faculty should start the preparation, what process they should follow, what external aids they may need, and what impact a certain design may have on students, also are critical for designing and developing an online course. The University of Illinois Faculty Seminar Report (1999) summarized two sets of guidelines for designing and developing online coursework. The questions asked in the first set of the guidelines — practical considerations for faculty — can provide additional insights to capture the critical issues in the online course design from the faculty perspective. They are as follows:

- **Whom do I teach?** It is critical to do learner analysis before building an online course. Not everyone is suitable to take online courses, and not all programs can be delivered through the Internet.

- **How do I teach?** Choosing the right methods and media in relation to the nature of the course is critical. For instance, text-based CMC
seems more appropriate for seminars, while interactive and graphically based materials are better suited for courses that are traditionally taught in the lecture mode.

- **How many do I teach?**
  Keeping student-to-teacher ratio low is important in order to maintain a highly engaged online class. The importance of motivation and the learning community also is addressed in this section.

- **How do I ensure high quality of online teaching?**
  “[Online course] quality is best assured when ownership of developed materials remains in the hands of faculty members” (p. 3) rather than in the control of non-teacher course designers or administrators. Evaluation of learning effectiveness is also a critical aspect to ensure course quality.

Unfortunately, there are not many empirical studies that showed how educators were building online courses or how they were adapting the residential courses to the online environment. One possible reason may be due to the fact that every course is unique in terms of course objectives, content, students, and resources. The uniqueness of each case may result in different instructional design processes and, thus, hinder the transferability of a case to other situations. However, as Dick and Reiser (1989) pointed out, instruction (sequences) generally have seven common elements: motivating learners, specifying objectives, remining previous knowledge, presenting new information, providing guidance and feedback, testing student ability to perform, and supplying enrichment or remediation. Since these common considerations exist in all types of instruction, educators still can learn a lot just by reading others’ experiences. A close examination of a practical case can provide valuable experience to readers who may learn and adapt certain design strategies in to their own situations.

**CASE SELECTION AND CASE DESCRIPTION**

The selected case is a computer-mediated learning course (R547). The researcher is one of the teaching assistants (TAs) of this Web-based distance course and had experience assisting with the residential version of the same course in the past. R547 is a three-credit master’s level course on design, development, and formative evaluation of computer-mediated learning programs. Students use software development tools to create and evaluate interactive lessons.

It is an intermediate level design and development course, and thus, the students enrolled in this class are fairly familiar with software and hardware applications from their previous class experiences. The faculty members who teach R547 have strong technological backgrounds. The traditional version of R547 has been taught for many years, and it is still offered once a year to the residential students. It is important to note that the primary instructor of the online R547 did not have previous experience teaching R547, although she took this course as a student several years ago.

Fourteen students enrolled in the online R547. All of them had full-time jobs, and most of them had families. Four students worked for higher educational institutions, three students worked in corporate settings, and seven students were K-12 teachers.
METHODOLOGY

Data Collection Methods
According to Yin (1994), case study is an appropriate strategy, when the nature of the research questions aims to discover the how and why of certain phenomena within real-life contexts. The current study posed how and why the instructors and course designers were planning, designing, developing, implementing, managing, and evaluating their online courses. It also provided how students felt about the major features of this Web-based course. The specific methods of collecting data are listed in subsequent paragraphs.

Instructor Interviews
Seven people were interviewed, including the primary instructors of both online and traditional versions of the R547, teaching assistants, technical coordinator, and institutional supporter. A 30- to 80-minute, one-on-one interview was conducted with each participant. Each interview was audiotaped and partially transcribed. The interview questions were designed to capture the essential activities and decision-making points of course design and development process and also addressed other related questions. The interview questions can be categorized into a few major categories:

• Related background information of participants
  This piece of information helps understand what kinds of knowledge and skills are involved in this online course design and development.

• What
  What are the objectives, scope, resources, content, and structures of the course? What activities and events did they conduct to accomplish what goals? Are they still making certain changes and adjustments to the course? What external help did they have?

• How
  How did they start the design process? How did they decide on the delivery methods and media? How will student performance and achievement be measured?

• When
  When did they start to prepare for the online course? How long did each critical step take? Was more time needed?

• Why
  To find out the rationales behind major decision-making points that took place during the online design and development process. How did the online course differ from the traditional version of the course? Why were certain changes made?

Document Analysis
Course syllabus, schedule, weekly readings, assignments, messages posted in the discussion forums, completed projects, and reports were reviewed and analyzed in various stages to provide additional information for a holistic understanding of the case.

Participant Observation
As one of the teaching assistants in both the online and traditional versions of this course, the researcher participated and observed the detailed design, development, and evaluation process of the instruction. Hopefully, such an experience can deepen the understanding of each phase of the development in great detail.
Student Survey on Course Evaluation

A mid-term course evaluation of 44 items was sent to the students after the first eight weeks of class. This anonymous survey was active for three weeks and received a 100% return rate. Among the 44 survey questions, the first 37 questions were 5-Likert scale items (1 = strongly disagree and 5 = strongly agree), and the rest were open-ended questions. The survey data will be used to analyze what impact certain instructional design strategies had on students.

Data Analysis Methods

There are numerous instructional design models in the field of education. But almost all of the ISD models are based on the traditional generic ADDIE model (Kruse, 2002; Molenda, 2003). Although the ADDIE model has been criticized as too linear, inflexible, and time-consuming, it is a systematic approach of designing instruction and, thus, provides a holistic perspective on the design and development process. Furthermore, the preparation stage of most Web-based courses, if not all, takes a fairly long time (at least a couple months) before the courses are taught.

The acronym ADDIE represents each phase of the instructional design process: Analysis, Design, Development, Implementation, and Evaluation. Villalba and Romiszowski (2001) pointed out another category: Management. Issues of management seem especially critical in an online course environment due to its heavy technology-dependent nature. A good management strategy can ensure maintenance of a high-quality program throughout the entire teaching and learning process. Therefore, the course design and development actions are classified into the previous six categories of an elaborated ADDIE model.

A comprehensive summary of major changes of the course adaptation is provided in the Results section. The major changes and timetables went through the member checking process.

The relevant student survey data were identified from the whole data set first. Next, the mean scores of the five-Likert scale items were calculated for each question. Then, the findings were matched to the relevant design strategies to reflect the student reactions to major course features. A summary of the reactions and the implications is provided in Table 2.

RESULTS

The collected data were analyzed in the following six categories of the elaborated ADDIE model: analysis, design, development, implementation, evaluation, and management.

Analysis

Early preparation. Four months before the online R547 was offered, the instructor of the course asked to be a volunteer TA of the residential version of R547 in order to gain necessary teaching experience and also to get more familiar with the course content. At the same time, she started to look for appropriate readings for her distance students. She thought that representative and high-quality required readings were necessary for distance students, since they will not have face-to-face lectures from the professor, as the residential students have.

Student survey of technology access. About three months before the online class started, the department sent out a survey to verify what computer platforms (PC or MAC) and network connections the
registered students had. Although not everyone was registered for the class at that time, they had a representative sample of the entire class (two-thirds of the class was registered at that time). Based on this student survey, the instructor contacted the University Information Technology Service (UITS) to find out what new technologies could be employed to enhance the communication of the class. She had five different meetings with the director and staff of UITS to discuss two issues. One was how to conduct Web conferencing with students in real time (synchronous communication), and the other was how to make a class tutorial using screen and voice capture.

**Finding available support.** The primary instructor of R547 sent out an announcement to find those who were interested in being volunteer TAs in the department. Six advanced graduate students were interviewed and accepted as teaching assistants. The department also asked another advanced doctoral student to be the technical coordinator of this course. Thus, a team of eight people formed to teach this online cohort of 14 students. Based on everyone’s preference and skill set, the following roles were given to six volunteer TAs:

- **Four frontline TAs.** Each would be in contact with three to four students on a regular basis to provide immediate feedback and help.
- **One pedagogical assistant and editor.** Since most of the TAs were international students, an English editor was needed.
- **Technological TA.** Part of the course content required students to have a certain level of programming skills and a TA who knew what programming was needed.

**Student Background Information Analysis.** Students were asked to complete a pre-assessment survey on the first day of class. This survey was designed to determine student background information, such as where they were in their program, how many other courses they were taking at the same time, where they worked, what their career goals were, and so forth. During the first week of class, the instructor conducted an hour-long, one-on-one voice chat with each student using either Netmeeting or Yahoo Messenger. The purpose of this synchronous communication was to know each of her students better and also to inform students that the class had officially begun. Based on the pre-assessment survey and the one-on-one voice chat, the instructor divided the class into four different peer support groups: a corporate group, a higher-education group, and two K-12 groups. Each group had a primary TA assigned to them from the volunteer TAs.

**Design and Development**

The design and development process of this course went hand-in-hand, and it was almost impossible to separate each development activity from its design stage. Therefore, they are described together in this section. About two months before the class started, the instructor and the technical facilitator started the course design and development process. All the resources that were used in the residential R547 were copied from SiteScape Forum to the Oncourse course management system. Some of the materials were converted into Web pages in order to provide a link. The residential version of the R547 syllabus and teaching strategies were modified in several ways to accommodate the online nature (see Table 1).
<table>
<thead>
<tr>
<th>Residential R547</th>
<th>Online R547</th>
<th>Justifications</th>
</tr>
</thead>
</table>
| Team-based project | Individual project | • To eliminate teamwork frustration at distance  
  • To increase engagement and motivation |
| Lecture (twice a week) | Facilitated discussion forum (weekly) | Using structured weekly discussions to partially substitute for the lectures. The purpose was to promote deeper thinking and engagement about key concepts related to their development work. |
| Less readings (no required textbooks; supplemental online sources provided) | More readings (structured weekly readings based on required textbooks; supplemental online sources) | This was designed to provide more structure for students, as a substitute for absence of face-to-face lectures. |
| Hands-on demonstrations | Job aids and CD tutorials | Since the hands-on demonstrations were not possible at a distance, online job aids and CDs were produced. |
| Use of course management system: | Use of course management system: | The use of various communication modes and weekly announcement of assignments and deliverables seemed critical in online R547, since the instructor could not share information and remind students in person |
  | • Reference resources | • Reference resources |
  | • Team working space | • Team working space |
  | • Gradebook | • Gradebook |
| Face-to-face consultation and problem solving | Synchronous (voice/text chat) and asynchronous (e-mail/discussion board) communications | Based on the group members’ computer platforms and broadband connections, different software was used to exchange ideas and to solve problems. Students were required to learn simple voice chat software, Web-conferencing software, and course management systems. The underlying assumption was that the context of different problems and users required different methods of communication. Voice chat was used as a redundant backup system in case firewalls and/or connection speeds prevented the use of Web conferencing software. |
| No assigned TAs for each student | Each student has a primary TA to contact | • To provide quality technical support with one-on-one tutorial support  
  • To provide rapid turnaround of the feedback  
  • To eliminate student feeling of isolation |
| Student to TA ratio was 8:1 | Student to TA ratio was 3:1 | It was believed that lower student-to-TA ratio could help provide quality and prompt feedback for students. |
| No regular instructor and TA meeting | Weekly TA meeting | • To keep track of what is happening  
  • To provide consistent feedback to students  
  • To implement consistent action plans |
| No assigned peer support groups | Assigned peer support groups of three to four students, based on their work background | • To reduce feeling of isolation  
  • To provide peer perspectives and support  
  • It was believed that people with similar experience tended to provide more relevant feedback to each other. |
| Peer evaluation is 10% of total grade | Class forum participation is 10% of total grade; written peer support group feedback is 10% of total grade | Since the project work is individual-based, there was no need for peer evaluation on project development process. Instead, the forum participation and peer communications were more critical for online courses. |
Changed the Team-Based Project to an Individual Project. This modification was made to eliminate the possible frustration of teamwork at a distance. Students could save a lot of time, if there were less management issues. Furthermore, choosing a project in their primary interest may result in more engagement and motivation.

Discussion Forum. A weekly discussion topic was led by TAs, based on each week’s readings. Each discussion topic was pre-designed and developed by one to two TAs first. Furthermore, the instructor and the pedagogical TA further revised and polished the discussion topics before they were available to students. All students were required to participate in the weekly discussion forum, since it was designed to partially substitute for the face-to-face version of lectures.

Hardware and Software Requirements. Were added to the syllabus.

Assignment and Activities. Were modified to reflect the weekly schedule of the online course.

Assessment Criteria. Were somewhat different from the residential version. Since the project was changed from team-based to individual, there wouldn’t be a peer evaluation component. Instead, the discussion forum participation would be considered in the final achievement evaluation.

Tutorial Design. As students were required to build an online resume and a Web-based instructional project, they needed to have individual server space where they could upload their homepage and Web product. About six weeks before the class started, the technical facilitator applied for server accounts for students and created a step-by-step online job aid for the students’ use. The programming language portion of the course in the residential version needed two weeks (four sessions) to deliver face-to-face. The programming TA worked with the University Information Technology Center to develop a lecture CD in which the demonstration on computer screen and the voice were captured. Each student received a copy of the CD.

Weekly Instructor and TA Meeting. Five weeks prior to the beginning of class, the first TA meeting (primary instructor and TAs) was held to determine the action agenda for designing and developing the following overall content focus as well as the content of weekly sessions:

- What the general course structure would be,
- What media might be used,
- What the online discussion topics should cover,
- What the discussion topic order should be,
- Who should lead which topics,
- What the class schedules (reading and assignment due date) should be, and
- What the evaluation criteria would be.

Discussion Topic Design. Each TA was responsible for leading one to two discussion topics throughout the semester. Who should facilitate what topic was determined based on the TAs’ preferences, background knowledge, research directions, and proficiency levels. TAs were asked to send a draft of a topic outline two weeks prior to the discussion week. The primary instructor and the pedagogical TA were responsible for checking whether the designed activities in each topic were ap-

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appropriate and engaging. Since the online
discussion topics were part of the substitu-
tude for the face-to-face lecture, it was criti-
cal to prepare each topic carefully. This
part of the content design and development
continued through two-thirds of the semes-
ter. Therefore, the design and development
of course content were not completely
ready before the semester started.

Another part of the substitutes for
face-to-face lecture was synchronous live
lectures that were given by four guest
speakers during the second half of the se-
mester. The primary instructor believed that
synchronous discussion and live lecture
could be a valuable learning experience for
distance students, once the technical issues
were overcome.

Implementation
The implementation phase was started
once the first course segment (the modi-
fied syllabus) was uploaded and tested on
the course management system. The tech-
nical coordinator needed to convert vari-
ous documents, such as the syllabus, sched-
ules, discussion topic outlines, and some
other course materials, into HTML Web
pages. During the couple of months before
the class started, the technical coordinator
spent about 20 hours a week converting
documents into Web pages, testing their
usability, copying/moving certain course
materials from the residential course site,
and setting up various work folders for stu-
dents and TAs on the course management
system. Once the class started, the tech-
nical coordinator mainly needed to maintain
the course management system, which did
not take too much time.

After the class started, TAs were asked
to contact each of their students for a one-
on-one or small-group voice chat. This was
to help students prepare for the synchronous
meeting and lectures in the near future. If
they learned to use the Web conferencing
tools beforehand, it would make their learn-
ing easier later in the semester.

Evaluation
During the content development, vari-
ous documents went through the following
recursive evaluation process.

- The technical coordinator first developed
the Web pages, and the primary instruc-
tor evaluated the quality of the work. If
they were not satisfactory, further revi-
sion was needed. According to the tech-
nical coordinator, the redesigning and re-
doing took much more time than she had
expected.

- Each online discussion forum outline was
developed by TAs, who were respon-
sible for that topic. If the primary instruc-
tor and pedagogical TA felt that it
needed revision and redesign, they would
have a small group meeting with the ini-
tial designers to revise the topic outline
until it reached a satisfactory stage.

- A mid-term course evaluation survey
was sent out to each student in order to
determine the potential enhancements for
the overall course design, development,
and evaluation. Plenty of positive feed-
back was received from students.

Management
In order to maintain a well working
online course, the following strategies were
employed:

- Weekly announcement on Oncourse to
inform student what the focus of the
week was and what the deliverables
were,

- Weekly TA meeting to discuss what was
happening with each group and what
actions should be taken next,
• TAs were required to check their OnCourse e-mail once a day,
• TAs were asked to respond to student questions within 24 hours,
• TAs were required to give out prompt and extensive feedback on student work, and
• TAs also had to contact students at least once a week, either one-on-one or as a small group.

Students' Reactions to the Course Features
This section of the report is based on the mid-term course evaluation. Overall, the feedback was very positive. Important findings that are associated with the changes made during course adaptation are analyzed as follows:

Reactions to Individual-Based Projects. In the course evaluation, 13 out of 14 students thought that having the class projects as individual-based projects enhanced their learning experience (Mean = 4.29, out of 5-Likert scale). One student wrote, “It has been very motivating to me and I recommend that you continue to have the flexibility to allow students to do projects that are meaningful to them.” Another student expressed a similar opinion: “I appreciate that I'm designing things that I can actually use.” On the other hand, another student wrote, “I'm intimidated by the prospect of putting this all together myself on Dreamweaver ... I need a technical advisor.” This made us question whether this modification was a total success. In general, the team-based projects were to promote collaborative learning. It is believed that team members' complementary skills were necessary to accomplish the task successfully and that they could learn from each other by working together. When the course projects were assigned as individual tasks, instructors needed to consider what other relevant changes should be made to match that modification. Was it fair to assign the same workload for one student, while three to four students were used to work on one project in the face-to-face version of this course? While we tried to keep a high-quality online course in which we made distance students learn no less than what residential students learned on site, we lacked experienced in how to balance student workload with various changed strategies that we made in distance education.

Discussion Forum. Eleven out of 14 students agreed that online forum discussions promoted their understanding of the concepts in this course (Mean = 3.7). In order to enhance the participation rate and engagement, the weekly discussions had various role assignments for each student, either in their peer support group or in the entire class. However, students seemed less happy with such structured discussions (Mean = 3.07). The open-ended questions revealed students' enthusiastic attitudes toward the structured weekly discussions, such as, “Don’t ask people to be wrappers — it is way too much work. Just allow us to freely discuss a topic”; “It would have been useful for the instructor to provide some type of summary of the topic—to capture key thoughts”; and “Some of the weekly discussions are a little too much with the other work we have.” These comments emphasized the importance of pedagogical aspects of designing online discussions. While it is critical to have such a discussion forum for distance students as a partial substitute for the live lectures, it should be carefully designed and cautiously implemented in real settings. Balancing
workload and providing key takeaways of the discussion topics may enhance the effectiveness and student satisfaction of discussion forum usage.

**Communication Mode.** Upon being asked to rate the overall value of each synchronous and asynchronous communication tools, students voted by e-mail of great value over other media.

- E-mail: Mean = 4.71
- Asynchronous discussion forum: Mean = 4.43
- Synchronous voice chat: Mean = 3.93
- Synchronous text chat: Mean = 3.86
- Enhanced voice chat with co-browsing and co-viewing of documents: Mean = 3.57

These data showed that students preferred to communicate asynchronously than to communicate synchronously. Students were introduced to several different synchronous and asynchronous software applications, such as Yahoo Messenger, Lvisit, Groove, Netmeeting, Oncourse, and SSF. The purpose was to accommodate students with different network connections (broadband vs. dial-up) and computer platforms, and to provide flexible communications. However, students expressed frustrations over learning to use so many different applications:

*We seem to be experimenting with a lot of different tools and modes. It feels a bit disintegrated to use Oncourse, SSF, Groove, Netmeeting, etc. For future reference I would narrow it down to fewer communication tools, fewer new software products to learn.*

*Too many options make for some confusion. Find something that works and stick with it.*

*At times, we seem to want to use online technology when a simple telephone call would do.*

The interactive tools proved to be a frustrating experience. We all seemed to have some problems with them. In theory, tools such as Groove and Netmeeting are wonderful. In application, it may be a different matter.

One suggestion of these survey data was to minimize the types of software applications for student use. While synchronous and asynchronous communications both have their own value, it is important to balance their proportions in distance education.

**Reactions to TAs and the Instructor.** All students agreed that TAs provided quality, supportive feedback to them (Mean = 4.57). Students gave a very high remark to the voluntary TAs. The open-ended feedbacks of “I am totally impressed with the dedication of the TA’s and the instructor to helping the class” and “It was nice to see the T.A. paying attention to the support group and checking in with folks,” help to illustrate students’ positive attitudes toward TAs. However, students may not want TAs to be involved in every aspect of the course. One student wrote:

*Although synchronous chats for the entire class tend to be inefficient and chaotic, because they end up being multithreaded, I think they are helpful to provide an ongoing focus to the class. These should be conducted by the instructor, with little or no participation by TAs.*

Although students appreciated the help from TAs, they tended to prefer direct support from the instructor at certain times, if not always. These empirical data poked a few questions for future research:
Table 2. Student survey data analysis

<table>
<thead>
<tr>
<th>Major Modification</th>
<th>Student Feedback</th>
<th>Implications</th>
</tr>
</thead>
</table>
| Individual-based project | **Advantages**  
- Provides flexibility over project selection  
- Promotes motivation and engagement  
- Eliminates the teamwork frustration at a distance  
**Disadvantages**  
- Increases student workload  
- Increases frustration for some students who do not have all the skills required for finishing the project successfully | Need to consider what other relevant changes should be made to align with this modification |
| Structured (role assigned) online discussion | **Advantages**  
- Promotes deeper thinking and engagement about key concepts  
**Disadvantages**  
- Inflexibility  
- Too much work while there are other assignments due the same week  
- Students easily get lost and do not know what the key points are | Provide key takeaways of the discussion topic and balance workload |
| Synchronous and asynchronous communications | **Student preferences**  
- E-mail  
- Asynchronous discussion forum  
- Synchronous voice chat  
- Synchronous text chat  
- Enhanced voice chat with co-browsing and co-viewing of documents  
Students frustrated to learn too many communication tools, including Yahoo Messenger, Ivisit, Groove, Netmeeting, Oncourse, and SIF | Minimize the number of communication software  
Balance the proportion of synchronous and asynchronous communication |
| Low student-to-TA ratio | **Advantages**  
- Provides prompt and helpful feedback on student work and questions  
- Eliminates the feeling of isolation  
**Student concern**  
- TAs are doing some jobs that should be done by the primary instructor | What should the TA’s role be in distance education?  
What is the best (cost-effective) student-to-TA ratio? |
| Assigned peer support groups based on students’ work sectors, preferences, and work experiences | **Advantages**  
- Provides most relevant feedback  
- Promotes deeper discussion on the focused topic  
**Disadvantages**  
- Decreases the chance of getting feedback from others who are from different backgrounds and, thus, limits the possibility to provide diverse perspectives | What are the best ways to assign peer support groups?  
How do you balance small group and entire class interaction? |

What should the TA’s role be in distance education, and how much should a TA be involved? Another relevant question is what the best (cost-effective) student to TA ratio is?

**Peer Support.** Based on the students’ work sector, preference, and relevant experience, the instructor assigned each student to a peer support group of three to four people at the beginning of the semester. The purpose was to eliminate the students’ feelings of isolation and to provide peer perspectives and support. All students admitted that peers in their peer support
group had been supportive (Mean = 4.5). “I’ve really enjoyed the group and class discussion forums. It’s helpful to get input from my cohort peers”; “Working with my peer group on projects [is the favorite aspect of the course]”; “The peer support groups have been more valuable than the larger group discussions. I appreciate the perspective of the corporate and higher education groups, but my goals focus primarily on the K-12 arena”; and “My least favorite is the discussions with the entire class. I don’t feel the feedback and time spent is helping me like the smaller group discussions have.” However, not all students like to be assigned to such a background-based peer support group. One student wrote:

I don’t like the segregation of K-12, higher ed, and corporate. While it is nice to have a peer group occasionally, I really miss the interaction with others and the valuable ideas and help I gain from the class as a whole. This format seems to be very limiting and I know I haven’t learned as much as I would have if I interacted with others in the class as well as those in my peer group.

There is no doubt that peers can provide valuable support and insight for each other. But the critical issues seem twofold: what are the best ways to assign peer support groups, and how do you balance small group and entire class interactions? The individual differences seem to be at play, as well. There may not be an easy solution to satisfy everyone’s needs and expectations on this issue, but future studies should be dedicated to finding better ways to accommodate the students’ preferences.

CONCLUSION

In this case study of examining instructional design and development of a Web-based course, the interview data were analyzed using the elaborated ADDIE model. The major changes made during course adaptation from a traditional version to an online version were highlighted. The consequences of major changes on students were analyzed from the student feedback received during the mid-term course evaluation. Useful implications and possible research questions for future research studies were drawn from the analysis done in the Results section.

The major limitation of this study resides in the fact that this is a single case study with 14 students. Since each course is unique in many ways, the result of this study should be referenced cautiously upon implementation in different situations. Similar case studies should be conducted in the future in order to provide more powerful results for educator use.

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