1-1-2006

The use of formative evaluation with online courses by teachers at the secondary level

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THE USE OF FORMATIVE EVALUATION WITH ONLINE COURSES

BY TEACHERS AT THE SECONDARY LEVEL

by

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A dissertation submitted in partial fulfillment
of the requirements for the

Doctor of Education Degree in Curriculum and Instruction
Department of Curriculum and Instruction
College of Education

Graduate College
University of Nevada, Las Vegas
May 2007

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

Dissertation Approval

The Graduate College
University of Nevada, Las Vegas

March 19, 20 07

The Dissertation prepared by

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Entitled

The Use of Formative Evaluation with Online Courses by Teachers at the Secondary Level

is approved in partial fulfillment of the requirements for the degree of

Doctor of Education in Curriculum and Instruction

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ABSTRACT

The Use of Formative Evaluation with Online Courses by Teachers at the Secondary Level

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This case study investigated the use of formative evaluation by three teachers who designed and delivered online courses at the secondary level. Formative evaluation involves collecting data that could be used to improve the effectiveness of the design and delivery of a course. Teachers were observed teaching the courses they designed for one quarter and then were given a workshop introducing them to formative evaluation techniques. They were observed for another quarter to determine if their delivery or design practices changed. Additional data were collected through interviews and through the analysis of course-related artifacts that included emails, journal entries by the teachers, and threaded web discussions. Data were entered into the ATLAS.ti qualitative analysis software to aid in the linking and reporting of the open and axial coding of the data. The following questions framed the study:

1. To what extent was the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school?

2. What changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who designed and delivered online courses at the secondary level in an online high school?
3. What standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating teachers?

The results indicated that formative evaluation was used by all three teachers in varying degrees. Only a few minor changes were evident in the design or delivery following the workshop. No framework at the school addressed the need for or value of formative evaluation. Due to curricular demands on the teachers, a lack of student compliance, and a lack of a formal or accountable framework, the feedback to improve the courses proved difficult for teachers to obtain. A framework, in the form of a checklist for conducting formative evaluation, was a product of this research.

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CHAPTER 1

INTRODUCTION

Formative evaluation was defined by Dick, Carey, and Carey (2005) as "the collection of data and information during development of instruction that can be used to improve the effectiveness of the instruction" (p. 277). It is a tool which when properly used, may contribute to the effective design and delivery of online classes by teachers at the secondary level. As the number of online courses offered at the K-12 level increases, more and more secondary teachers will be challenged with the instructional design of online courses. Additionally, as the demand for teachers with online skills increases, teacher preparation programs may consider the need to include specific professional development in the field of online design and delivery, and include methodologies in the use of formative evaluation. This case study explored the use of formative evaluation in online course design and delivery and the way it was addressed by three teachers at a virtual high school.

Purpose of the Study

The direction of a teacher's action at the level of the classroom generally turns on the feedback received during the delivery of the course. According to Dick, et.al., (2005), "too often instructors have been blamed for poor teaching and learners for poor learning when, in fact, the materials were not sufficient to support the instructional effort" (p. 277). Without specific feedback, instructors may not realize whether design and

delivery on some other component of teaching was the reason for poor learning. One method of obtaining feedback from a class that is geographically and temporally separated is through the use of an instructional system design step called formative evaluation. To test the applicability of this tool to online courses, this case study investigated the use of formative evaluation by three teachers who designed and delivered their courses online at the secondary level. The emphasis within formative evaluation was on the collection and analysis of data to support the revision of design and delivery of the instruction.

Background of the Study

The assumptions, values, and beliefs that teachers bring to a classroom shape the kind of learning a student receives. Richardson (1996) stated that teachers' attitudes and beliefs are important concepts in understanding classroom practices. When the thought of a favorite class is recalled, it is likely that a favorite teacher was also involved. Until recently, it was not likely that the favorite course of many students would have been an online course, but with the advent of online high school classes, some students and some teachers may find that these computer-based classes are preferable to traditional classes.

Traditional classrooms are defined as the face-to-face variety, in which students and teachers meet at the same place and time. This has been called by some, a *brick and mortar* classroom (Rogers, 2001). Teachers and students see each other, observe each other's body language, and look for non-verbal clues that can enhance the communication process. In contrast, what if the teacher is not in the classroom with the students? What if the teacher is separated not only physically, but also by time? What if the student is taking a course over the Internet and does not get to see the teacher at all?

Fullan and Hargreaves (1991) suggest that it is still the actions of the teacher that ultimately shape the kind of learning that those young people get. Without being present for it, new demands are placed on a teacher to understand the level of student interaction. A teacher of an online class must therefore develop new skills for revising course design and delivery to best shape the learning process.

Some consider interaction between a student and teacher the cornerstone of learning. For example, Keegan (1993) went so far as to say "education is a process most simply characterized as an interaction between teacher and student for the purpose of identifying, understanding and confirming worthwhile knowledge. Without sustained interaction, there is no way to facilitate critical learning" (p. 14). Similarly, Soo and Bonk (1998) reported that interaction is crucial to learning as the student negotiates meaning from his or her interactions with the learning environment.

Gaining Feed back in Online Courses

One challenge for any teacher is to be able to get feedback to determine if the desired interaction with the curriculum is occurring. A particular challenge for teachers of online courses is to design and deliver courses with an understanding that the kind of feedback available from a traditional classroom is going to be more difficult to obtain (Draves, 2000).

The effort put into the course design shapes the learning environment, but because there is such a lack of real-time feedback from the students, the teacher may have a difficult time determining the effectiveness of the class design or delivery. Student feedback is essential, however, North Central Regional Education Laboratory (NCREL; 2004) reported that "the value of all educational strategies and instructional delivery

should be established by measuring the relative impact on students' academic performance" (p. 63). Part of that impact is related to delivery methods.

A potential solution to gaining feedback, as proposed in this case study, is to conduct formative evaluation as part of the course design and as part of the instructional delivery. It is proposed that the formative evaluation will help provide the feedback a teacher needs to take corrective actions in the absence of the kind of feedback received in a face-to-face classroom.

Formative evaluation, as introduced by Scriven (1967), is a formal process of evaluating course design and delivery for improvement. Dick and Carey (1996) described formative evaluation as a vital part of the instructional systems design model. Their model outlines and describes what they consider the essential steps of instructional design: (a) analyze the needs, (b) design the course based on the needs, (c) develop the material, (d) implement the delivery of the course, and (e) evaluate the course for improvement.

Another model, very similar in nature, was proposed by Koontz, Li, and Compora (2006) and was called the ASSIST-Me model. The acronym represented the terms: (a) analyze instruction, (b) state performance objectives, (c) select instructional materials, (d) implement instruction, (e) solicit student response, (f) test (evaluate and revise), and (g) maintain the course (p. 45). Koontz et al. also gave specific guidance about the importance of formative evaluation.

Dick and Carey (1996) further divided the evaluation area into a summative evaluation and a formative evaluation. They called summative evaluation that which was accomplished in order to form a conclusion about something completed, while formative

evaluation was conducted while changes were still being made. Another way of considering the difference would be that formative evaluation could be used to evaluate the process while summative evaluation would evaluate the desired outcome. It was the potential use of formative evaluation by teachers that was the subject of this case study. More specifically, the purpose of this study was to examine the use of formative evaluation at an online high school as part of their design and delivery in the absence of traditional face-to-face feedback.

Online Education Defined

Online education is a growing phenomenon in the K-12 environment and is generally defined as the use of educational technology to connect a teacher with students who are geographically separated or separated by time (Phipps & Merisotis, 1999). The largest virtual schools include the Utah Electronic High School with around 35,000 enrollments in 2004-05, and the Florida Virtual School, with 33,000 enrollments that year (U.S. Department of Education, 2005). In 2002-03, about 38% of U.S. high schools had at least one student in either an online or video-based distance education course. (Setzer & Lewis, as cited in Smith, Clark & Blomeyer, 2005).

Online education is often used synonymously with distance education that also involves the use of specific educational technology. Online learning is actually a subset of distance education. Phipps and Merisotis (1999) also said that distance education can incorporate a variety of technologies, but using educational technology is not the total extent of distance education.

Keegan (1993) highlighted several distinctions between distance education and educational technology: (a) distance education is a form of education, educational

technology is not; (b) in distance education, the technology is a substitute for the teacher, but in educational technology, the technology is a supplement to the teacher; (c) educational technology studies the efficient use of technology for all types of teaching (at a distance and face-to-face) while distance education does not have this role; and (d) distance education studies the problems of students who learn in their homes, a group who often do not even have any face-to-face interaction with other students or the teacher, while educational technology does not necessarily in any way abandon face-to-face group-based communication (p. 17). Keegan's (1993) assertion that technology is a substitute for the teacher is not supported by all researchers in the online world (Draves, 2000; Paloff and Pratt, 2003). These researchers believe that even in online education, the teacher is a critical element in student learning.

Online education can be described as the replacement of face-to-face communication in the classroom by what some may consider a less personal mode of communication (Ko & Rossen, 2004). Teachers in the online environment have reported they got closer to their students in the online world than they did in the face-to-face classes. According to McDonald (2002), educators have been comparing distance education to the traditional face-to-face method and researchers have been trying to make sure that distance education is equivalent in learning effect as the traditional method. Some studies have shown no significant difference across a variety of delivery modes, however (Russell, 1999). In contrast, a few studies have demonstrated that distance students did better than their traditional counterparts (McDonald, 2002). Simonson (2003) pointed out that distance education is as effective as traditional education in term of learner outcomes. In

fact, distance education learners generally had more favorable attitudes toward distance education than traditional learners did, and distance education learners felt that they learned as well as traditional students (Simonson, 2003). A study of effective course design and delivery principles, such as the present one, may inform the growing community of online educators about ways of gaining feedback and provide a framework by which to guide practice and research in online courses.

Background

Online education has become more and more popular as a secondary education option over the past few years. Zucker, Kozma, Yarnall, and Marder (2003) described how the notion of offering high school courses on the Internet seemed futuristic; yet, they reported that thousands of students now log on to take high school courses leading to diplomas. The National Educational Technology Plan stated that "an explosive growth" in the availability of online schools had occurred (U.S. Department of Education, 2005). In another publication the U.S. Department of Education reported 36% of all public K-12 schools offered at least one online class (U.S. Department of Education, 2006). But the research literature does not appear to support a corresponding growth in the study of the pedagogy of online course development and delivery.

The increased speed of the Internet and the general access to the Internet via cable, digital subscriber line (DSL), or phone modem have made online education a more available choice for many students. Across the country, online high schools are providing students educational options that simply were not available a decade ago. The National Technology Plan stated that "some of the most promising new educational approaches are

being developed outside the traditional educational system, through online learning and online schools" (U.S. Department of Education, 2005, p. 45). Students using these online options no longer see each other, do not necessarily meet in the same place, and sometimes do not meet at the same time. Berg (2002) suggested that the main elements of distance learning were: (a) physical separation (complete or more than 50% reduced contact time) between teacher and learner, (b) administration by an educational organization, (c) frequent use of various media (e.g., print, video, film, computer), (d) communication between student and teacher, (i.e., synchronous or asynchronous), and (e) an administrative focus on the nontraditional learner. In addition, Palloff and Pratt (1999) described the California Distance Learning Project conducted in 1997 that proposed five defining key elements for online learning: (a) the separation of teacher and learner during the majority of each instructional process, (b) the use of educational media to unite teacher and learner and carry course content, (c) the provision of two-way communication between teacher and learner, (d) separation of teacher and learner in space and time, and (e) volitional control of learning by students rather than by the distance instructor.

Feedback is an integral part of communication in the online environment. In a face-to-face setting, feedback can be almost immediate, as the teacher can see the look on the faces of the students and can often tell who "gets it" and who does not. In the presence of the student and with immediate feedback, the teacher can help correct a misunderstanding or receive assurance that the message is being understood. On the other hand, the instructor in an online class is more likely to provide feedback that is hours or days removed from the initial student response. Additionally, students in the online

environment may be less willing to provide feedback that indicates misunderstanding than they would in a face-to-face situation. Because of this, teachers must design online courses so that the system and/or instructors can provide adequate guidance and feedback for the learner without the benefit of immediate feedback. Students must be able to interact with the curriculum without the constant presence of the instructor. The challenge for teachers online is how to determine if such interaction is taking place.

Online education has been well accepted as at least supplemental to programs of higher education for some time, and most colleges of education offer some online courses. In contrast, online education represents a relatively new paradigm in secondary education as indicated by statistics that show that only 36% of U.S. school districts had students enrolled in distance education programs in the 2002-2003 school year (U.S. Department of Education, 2005). A great deal remains unknown regarding the design and delivery of online education classes for the high school student and regarding the ability of teachers to design and evaluate their own classes at the secondary level.

One of the advantages touted by many online education researchers is the ability for students to work at their own pace. It gives them time to find their voice, to reflect on what they want to say, and to be able to respond without the pressure of responding immediately as in a traditional classroom. Many advantages of online learning are captured in the Florida Online School's motto: students can learn "any time, any place, any path, any pace" (Florida Virtual School, 2005).

A great deal of dialog often occurs between students and the teacher during an online course. The discussion is usually high quality, more curriculum related than not, and very

student centered. Generally, greater access to a variety of resources is available on the Internet (Draves, 2000).

Many teachers and students prefer the opportunity to engage in a synchronous session (i.e., communicating in real-time) where they feel a sense of belonging and have the opportunity for immediate feedback, such as a chat room. One challenge in conducting a session with a chat room is teaching in a way that all students are included and can respond. Palloff and Pratt (1999) described the use of chat rooms in online courses:

> Chat rooms rarely allow for productive discussion or participation and frequently disintegrate into simple one-line contributions of minimal depth. It can replicate the face-to-face classroom in that the participant who is the fastest typist will probably contribute the greatest amount to the discussions thus becoming the "loudest voice" in the group. Additionally, contributions may end up out of sync; a participant may respond to a comment made several lines earlier but be unable to post that response immediately due to the number of people posting or the speed of the connection to the discussion. (p. 47)

Paloff and Pratt (1999) went on to say that chat rooms "could be a dynamic and challenging setting in which to meet and can be especially useful in facilitating brainstorming and collaboration sessions" (p. 47). Other uses found for synchronous learning involved sharing computer applications, sharing Internet browsing, and sharing documents.

Haefner (2000) added to the discussion about the utility of asynchronous and synchronous methodology by stating that the immediacy of the real-time conversation brought its own benefits, and that it would be "hard to imagine not teaching without both of these modes of interacting with our students, and I can't believe many teachers would want to handicap their teaching by relying on just one of them" (p. 2).

Significance of the Present Study

Even though the use of online education is growing rapidly at the secondary level, it is still far from a mainstream option in the district selected for the present case study. For example, the school district has over 300,000 students, yet only about 150 were enrolled as full time online students. Nevertheless, the use of online learning is spreading fast. For example, McGrath (2005) reported that experts estimated more than half of all school districts offered some virtual coursework in 2005. According to the National Educational Technology Plan (U.S. Department of Education, 2005), nearly 25% of all public schools at the K-12 level offered some form of online leaning as of 2004. Finally, the state of Michigan recently became the first to enact legislation that required high school students to complete at least one online course as a requirement for graduation (SB 1427, 2006). As more and more districts begin to offer online classes, the pedagogy of online learning will have to continue to improve.

This study proposed that formative evaluation was a tool that would assist teachers in providing effective course design and delivery. The results of a formative evaluation can aid greatly in making decisions about course design, and they provide the teacher with options to improve the course continually based on the feedback. If problems were found, they could be fixed while continuing the course, or the course could be taken off-line while it is being revised. In order for the evaluations to be of value and to provide information that would allow instructors to make decisions and take appropriate action based on the findings, they should be conducted in the early stages of the course offering (Dick & Carey, 1996). Formative evaluation could help identify the strengths and weaknesses of the course and provide insight into how to improve the courses.

An assumption made for this case study was that most secondary teachers do not use formative evaluation techniques as part of their course delivery, nor are they familiar with the process. A goal of this study was to prepare teachers with the formative evaluation methodology, then observe them as they began to judge the effectiveness of their course delivery online. A further goal was to look for framework at the school that would encourage the use of formative evaluation.

The school selected for this case study used a tool called Centra Symposium (Centra, 2004) to facilitate the synchronous sessions for some classes. The use of Centra Symposium was explored in regards to how it might facilitate formative evaluation and help determine the interaction with the student, including the Internet browsing, brainstorming and collaboration mentioned by Paloff and Pratt (1999).

The process of formative evaluation, a key step in Dick and Carey's Instructional Systems Design process (ISD; 1996) was the focus of the review, and it was explored as a way for the teachers to determine if the class they designed was meeting their expectations. Throughout the study, the teachers were observed as they taught the course, as they made changes to the course, and as they conducted formative evaluations of their courses. The teachers were given instruction on fundamentals of formative evaluation in the middle of a semester of the new course they were teaching. The results of their reflections on formative evaluation were among the artifacts that were collected for this case study. Through semi-structured interviews, observations of online class sessions, and analysis of other artifacts, the effects of formative evaluation were explored.

Martera-Gutierrez (2002) reported on many studies that focused on the role of distance learners, but comparatively few on the role of instructional designers and their

strategies. Therefore, to add to the knowledge base of teachers as designers and presenters, the present case study looked at the work of three teachers at an online high school. One teacher was a veteran online course designer with more than eight years experience teaching online and over 30 years as a licensed classroom teacher. The second teacher had four years experience online and also worked at a face-to-face high school. The third was a teacher who had completed the first year of being an online teacher and 12 years as a licensed teacher.

A unique feature of this case study was the synchronous online sessions that were recorded on the Centra Symposium software system (Centra, 2004), along with the asynchronous portions that were captured in WebCT software. These class sessions were archived on a district server, and then downloaded by the researcher for analysis at a later time. More thorough discussion of these software systems is found in Chapter 3.

This research contributes to the growing body of knowledge regarding the pedagogy of online learning by focusing on the formative evaluation of the design and delivery of new online courses developed and taught by secondary level teachers at an online high school in the Southwestern United States.

Theoretical Framework

Keegan's insight on theory (1993) is often quoted in educational literature, "there is nothing as practical as a good theory. It stops one constantly starting from scratch, repeating the endeavors and mistakes of others, and responding continuously to 'crisis' situations without a frame of reference" (p. 12). Though many case studies do not begin (or even end) by framing the study with theory, this study included the instructional systems design (ISD) model by Dick and Carey (1996) to provide what Keegan described

as a frame of reference. The ISD theory of Merrill (1994) was also considered as part of the framework to consider how instruction should be structured to facilitate learning. To begin the study, Merrill's ISD theory and Dick and Carey's model were used to guide the semi-structured interviews with the teachers and the questionnaires that were developed.

Dick and Carey (1996), building on the foundational work of learning theorists such as Robert Gagné (1976, 1985, 1988), developed a systematic process of instructional design. It consists of several activities or stages including: (a) analysis, (b) design, (c) development, (d) implementation and (e) evaluation. It was the evaluation stage that was of interest for this case study. Although all instructional design models have an element of evaluation (Tessmer, 1993), Braden (1996) stated that a weakness of many instructional models is that they include only one step as formative evaluation at the end of the process, if they include it at all.

Instructional design theory is a broad field of theory that generally includes directed instruction; with roots in behaviorism and a positivist approach to learning; and the constructivist approach, with roots in the cognitivist style of learning (Merrill, 1992). According to Dick et al., most modern ISD models have moved from a more behavioral approach to a constructivist approach (2005). The three teachers and administrator participating in this study all agreed during their interviews that they were operating under a constructivist approach to ISD.

Research Design

This study was a descriptive case study, defined by Merriam (1988) as an intensive, holistic description of a social system or phenomenon emphasizing how people make sense of their experiences and their interpretations of the experiences (p. 21). The social

system was defined as three teachers at the secondary level, who designed and developed online courses that they taught through an online high school, and one administrator, who provided oversight in the area of instructional design. Data were collected through a combination of semi-structured interviews with the three teachers and one administrator, artifact analysis, field note analysis with the assistance of the software ATLAS.ti (Muhr, 2004), and observations of class sessions through the use of Centra Symposium software (Centra, 2004) and WebCT software (WebCT, 2005).

Research Questions

The following research questions guided this study:

1. To what extent was the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school?
2. What changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who designed and delivered online courses at the secondary level in an online high school?
3. What standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating teachers?

Definition of Terms

asynchronous learning - any learning event where interaction is delayed over time. This allows learners to participate according to their own schedule and be geographically separate from the instructor.

browser - any computer software that permits a user to view and navigate World Wide Web sites at will.

Centra Symposium - software licensed by a school that allows the teacher to conduct a synchronous online class that can be recorded for later viewing. Curriculum is pre-loaded by the teacher and allows applications including the Internet to be shared during the class. Students can provide instant feedback in a variety of ways.

case study - research that provides an intensive, holistic description of a social system or phenomenon emphasizing how people make sense of their experiences and their interpretations of the experiences (McMillian & Schumaker, 1997; Merriam, 1988; Wiersma, 2000).

distance education - education that occurs when the student and teacher is separated via distance or time.

emoticons - symbols created on the keyboard to transmit nonverbal cues like laughter or appreciation.

facilitator - a facilitator may be a leader or instructor, an outside observer serving a group, or simply a co-equal member who is taking a turn at facilitating.

hermeneutic unit - a virtual container in the ATLAS.ti software where all primary data material (primary documents) and all the by-products and results of interpretational work on such primary documents are maintained.

moderator - a person charged with fostering, the culture and the learning in an online dialogue or in a net- course discussion area.

naturalistic - while quantitative researchers structure their research environment to the greatest extent possible, a qualitative researcher goes "where the action is" to try to figure out what is happening and why (McEwan, 2003).

online learning - learning via the Internet, email, or other computer software -- either synchronously or asynchronously.

post - to send an electronic communication, generally to a threaded discussion group or a listserv.

qualitative - research that presents facts and collects data using rich, descriptive narratives. The research design is flexible and semi-structured (McMillian & Schumacher, 1997; Wiersma, 2000).

reliability - the extent to which a research fact or finding can be repeated given the same circumstances (Bassey, 1999).

streaming media - the audio or video media that are accessible to the users in small chunks without using permanent storage on the hard disk, as opposed to being downloaded as an entire file.

synchronous interactions - communications in real time, such as those via the telephone, videophones, or live text chat.

thread/threaded discussion - Threaded discussion refers to an asynchronous method of communicating in which comments to an original post are listed below, and indented under, the original. A thread refers to the full list of comments, including the original post and all the comments participants made in response to it.

triangulation - the use of multiple data collection methods to lessen the possibility of bias or reaching a conclusion based on insubstantial evidence (McEwan, 2003).

validity - the extent to which a research fact or finding is what it is claimed to be (Bassey, 1999).

WebCT - class management software that allows a teacher to conduct an asynchronous class, but includes synchronous components. Curricular content is pre-loaded, and teachers and student interact through the use of email.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

In order to research effectively the course development and course delivery efforts of teachers at an online high school as they relate to formative evaluation, several areas of literature needed to be explored. The first area reviewed was the historical background of distance education to provide a perspective on how the environment has changed since the years of correspondence courses. Next, the theoretical foundation of instructional systems design was established to provide the framework on which the study was based. Primarily, the instructional systems design (ISD) model of Dick and Carey (2001) was reviewed and used to frame this research. Third, a review of literature regarding student interaction was reported, as it was determined to be a goal of the online teachers and would be an observable transaction in the search for evidence on formative evaluation. This was followed by a review of the literature on existing standards for distance education that addressed interaction, an area of important formative evaluation insight. The final area reviewed was research literature on the processes of formative evaluation.

Historical Background

Distance education is not a recent invention, though online education as a specific form of distance education is relatively new. Some argue that distance education began when the first teacher gave a student a document and told them to go read it (Ehrmann, as

cited in McDonald, 2002). A more directly intended use of distance education first occurred in 1728, with a shorthand correspondence course offered by mail by Caleb Phillips of Boston (Distance Education Training Council, 2001). Distance education has been used at least since the 19th century in the United Kingdom, Austria, and Germany when they developed correspondence programs mailed to educate travelers (Gutierrez, 2000). Early critics of distance education programs believed that the technology used, such as television, caused a decrease in interaction that was necessary for learning, and even made education more about the image than the ideas (Postman, 1985).

Distance learning with its roots in correspondence programs and career training was called the *first generation* of distance learning by Nipper (1989). It was geared for the solitary learner with little or no feedback provided to the learner. The *second generation* came about with the advent of technologies such as radio, television, videotapes, and audiotapes (Nipper, 1989). Some thought these new technologies would change education and suggested that the new technologies would "ultimately be used as a substitute for certain teacher instruction" (Dockterman, & Hobson, 1998, p.7). For example, university laboratory experiments conducted in the 1960s telecast the professor to a lecture hall next door that was also filled with students.

The next change in technology, brought on by the use of computer technology, resulted in the *third generation* of distance learning that was seen more as a social process (Nipper, 1989). The main difference between this and the first two generations was that the third generation allowed for two-way communication among the students as well as between the students and the teacher. Through all three generations, distance

learning was sometimes viewed as a second-best alternative for those who could not attend regular classes (Nipper, 1989).

The use of the Internet and electronic mail opened up new possibilities and made the opportunity one that, instead of being seen as an alternative, was available only to those with computer access. One of the first online enterprises using this technology that attracted international attention was the Open University of the United Kingdom (McDonald, 2002). Now universities and high schools all over the world are incorporating online education as a viable and acceptable way of completing classes, though high school use of online education is not as widespread as post-secondary use. The U. S. Department of Education calls online education the fastest growing segment in K-12 schools (U.S. Department of Education, 2005).

Draves (2000) predicted that, in the 21st century, half of all learning would be conducted on the Internet. He further predicted that it would include not only pre-K through post-secondary education, but training for business and industry, civic education, and continuing education in nearly every occupational specialty. Draves established that, up until now, 90% of all education has been information transfer where the teachers have had to most of the talking. He described how online learning can be better because of several key factors: (a) a learner can learn during peak time, (b) a learner can learn at an optimum pace, (c) a learner can focus on specific content areas, (d) a learner can test daily, and (e) a learner can interact more with the teacher (p. 13).

The Model of Instructional Systems Design

Instructional systems design (ISD) is a model that encompasses more than just the sum of its parts: (a) instruction, (b) systems and (c) design. The term *instruction* implies a

didactic presentation, since students traditionally have learned from a teacher. The term *systems* describes a process with specified components that includes feedback. If any part of the process is left out, the system is not complete. Finally, the term *design* encompasses the initial analysis, then delivery, and evaluation. When put together, ISD describes a model that helps explain how to design and deliver courses, not why or how students learn.

Instructional design is the process of designing "the environment, methods, and resources for effective learning of specified goals and objectives" (Boettcher & Conrad, 1999, p. 49). It is a systematic approach that looks at instruction, ways to teach, and ways to evaluate. Major figures in ISD include Robert Gagné, whose work in instructional theories are the background of ISD (Gagné, 1985).

Initial ISD systems were based on the theory of behaviorism and stated that learning took place when the student made an association between a cue or stimulus and the response or the desired behavior (McGriff, 2001). The more current use of ISD systems has evolved to include cognitive theories (e.g., constructivism, social interaction, cognitive dissonance, cognitive flexibility) based on the idea that students build their learning as they are exposed to new concepts in their learning environment. One example of a cognitive theory is the social development theory in which Vygotsky (1978) stated that social interaction plays a fundamental role in the development of cognition.

Over two decades ago, Dick (1992) stated that even as a "trained objectivist instructional designer," the constructivist ideas are "extremely important if designers are to be concerned with the transfer of skills (p. 97). He continued by suggesting that

educators "stay in touch with this area of the literature, there may be some exciting developments in the future."

Many instructional design models have been developed and are often referenced in textbooks (e.g., Gagné, Briggs &Wagner, 1988; Kemp, Morrison, & Ross, 1998; Reigeluth, 1989.). The Kemp, Morrison, and Ross (1998) model contains the following elements: (a) instructional problems, (b) learner characteristics, (c) task analysis, (d) instructional objectives, (e) content sequencing, (f) instructional strategies, (g) designing the media, (h) instructional delivery, and (i) evaluation instruments (pp. 5-7).

Gagné (1985) defined instructional design as a systematic approach to designing instruction and materials to obtain specific learning objectives. In his early work, his design theories were rooted in behaviorist psychology, but in the 20 years since he first published *The Conditions of Learning* (Gagné, 1985), his theories have evolved to a more cognitive approach (Maschke, 2004). Gagné, et al. (1988) wrote extensively about the principles of instructional design and divided their writings into an introduction to instructional systems, basic processes in learning and instruction, designing instruction, and delivery systems for instruction.

Instructional design relates to learning. Gagné (1985) listed the following requirements for learning: (a) identify the types of learning outcomes desired, (b) make a learning hierarchy of outcomes, (c) identify the internal processes that must occur in the learner, (d) identify the external conditions that must occur for instruction, (e) establish the context, (f) establish the characteristics of the learners, (g) select the media, (h) plan to motivate the student, (i) instructional events are designed for each outcome in the

hierarchy, (j) formative evaluation is conducted, and (k) summative evaluation is used to judge the effectiveness of the course.

Perhaps "the most widely used" (Surray & Farquhair, 1996, p. 4) instructional design model is the one proposed by Dick and Carey (1990, 1996). The Dick and Carey model, as well as a majority of other instructional design models, include the basic stages of analysis, design, development, implementation and evaluation (Figure 1; Willis, 1992).

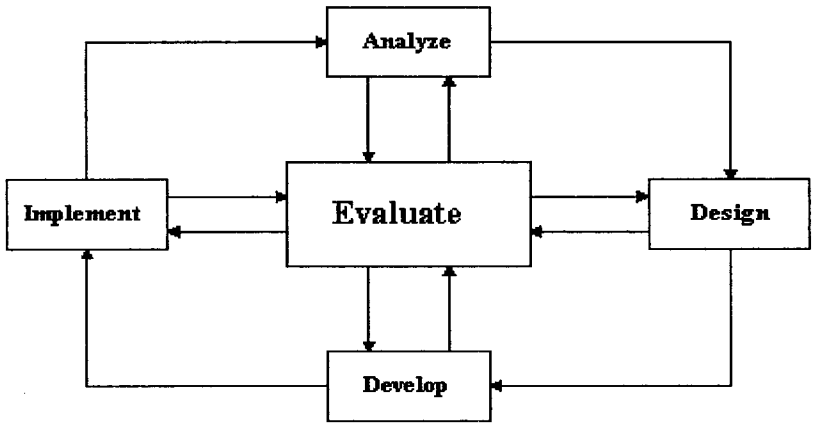

Figure 1. A basic instructional systems design model.

A limitation of the Dick and Carey model, identified by Surray and Farquhair (1996) is the lack of any mention of the social context in which the instruction would be implemented. The Dick and Carey model is widely known in the field of instructional design and is sometimes even described as the Instructional Systems Design (ISD) model (e.g., Fardouly, 1998). Dick and Carey (1996) are among the most well-known practitioners on the design of instruction; for this reason, it is their research that formed the framework for the interviews and analysis with the teachers in this study. Like other

instructional design practitioners (e.g., Gagné, Briggs & Wagner, 1998; Merrill, 1996) the design of instruction speaks more to what one should do rather than on why it works (Merrill, 1996).

Much like Gagné (1985), Dick and Carey (1990, 1996) have the following elements in their design as shown in Figure 2: (a) determine the instructional goal, (b) analyze the

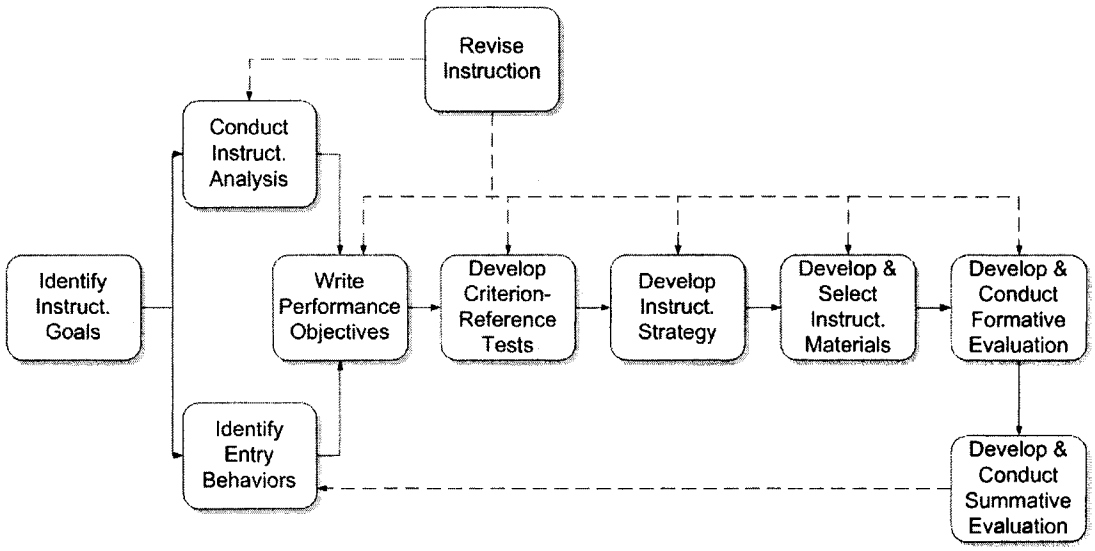

Figure 2. The Dick & Carey model of instructional systems design (1990, 1996)

goal, (c) analyze learners and contexts, (d) write performance objectives, (e) develop assessments, (f) develop instructional strategy, (g) develop and select instruction, (h) conduct formative evaluation, (i) revise instruction, and (j) conduct summative evaluation.

The United States Air Force has been interested in instructional design models for decades (Figure 3) and has written a manual that is to be followed by their employees involved in designing instruction for everything from administrative support to the latest

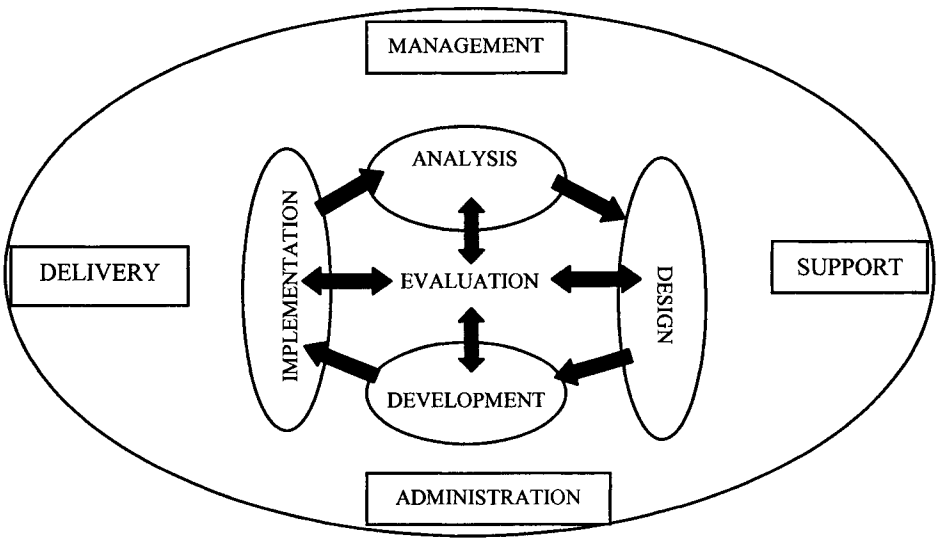

Figure 3. The U.S. Air Force instructional systems design model (USAF, 1993)

weapon systems. Air Force Manual 36-2234 (1993) defines ISD as a deliberate and orderly, but flexible process for planning, developing, implementing, and managing instructional systems. The manual listed four generations of ISD. The first generation focused on the behavioral components of learning. The second kept the behavioral patterns, but also stressed the focus of the system as developing instruction. The third generation assumed that ISD was an interactive process that could be entered at any point, rather than the linear process put forth by Dick and Carey (1990, 1996). The fourth generation began to shift from the behavioral theory to a more cognitive, constructivist

approach. The overall key to ISD in every generation was that it is intended to be a process for quality improvement of instruction.

The original Air Force model followed the model of Dick and Carey (1990) and was a linear model. The updated ISD model, as shown in Figure 3, is no longer linear, but still includes the functions of management, support, administration, delivery, and evaluation as different phases. The Air Force manual (1993) pointed out that evaluation is a central function that takes place at every phase.

Other contributors to instructional design theory included Yelon and Berge (1988) who stated that ISD principles should include active engagement of the learner, appropriate feedback, evaluation, establishment of goals and objectives, and mapping to real world performance. Similarly, Johnson (1989) stated that at least three major themes should guide decisions about using technology in teaching. First, excellent instructors, involved with traditional content and a goal of transferring the content to the student, probably do not need to worry consciously about instructional design decisions because they apply good design principles they learned when they became teachers. Second, teachers understand the structure of knowledge and know about various modalities of learning. Third, they know about the taxonomy of learning, they know how to assess the students, and they know about providing guidance and feedback along the way. Johnson's (1989) assumptions about excellent teachers are based on the study of face-to-face classroom pedagogy, not online pedagogy, where the goal is more than transferring content to a student, however. In the online situation, the ability to get feedback on design and delivery is more of a challenge.

Literature on Student Interaction

Dick, Carey, and Carey (2005) reported that a major factor in the formative evaluation of instruction was the teacher as an interactive part of the instruction. One measure of how well the teacher is meeting the needs of the student can be determined by how the student and teacher interact. If the students do not respond as expected to a particular question or exercise or do not do the required work for an assignment, the teacher may discover that these items need revision. While interaction may be readily observed in a traditional classroom, it is more difficult to ascertain in the online world. Wang and Gearhart (2006) observed that "learner response to instructional content is a direct manifestation of interactivity" (p. 107).

In an early article about online teaching, Meyen and Lian (1997) stated that keys to online teaching are: (a) the course design, (b) how the course is delivered, and (c) how the instructor interacts with students as they progress through the course. According to Anderson (2002), "no topic raises more contentious debate among educators than the role of interaction as a crucial component of the educational process" (p. 1). Similarly McDonald (2002) stated that "interactivity is considered to be a critical characteristic of education" (p. 12). Moreover, interaction between students and content are critical components of distance education (Anderson, 2002).

Anderson listed three kinds of interaction, previously identified by Moore (1989) that involved students: (a) student to student, (b) student to teacher, and (c) student to content. He also cited the classic "no significant difference" studies compiled by Russell (1999) as evidence that "there is no single media that supports the educational experience in a manner that is superior in all ways to that supported by other media" (Anderson, 2002,

p. 3). Even in the world of online education, Anderson's research concluded that when comparing synchronous, asynchronous, paced, unpaced, and various other combinations of online learning, a wide range of need and preference appeared among students, as well as a desire for exposure to a variety of different modes. In his work on transactional equivalency, Anderson (2002) said that:

> Sufficient levels of deep and meaningful learning can be developed as long as one of the three forms of interaction are at very high levels. The other two may be offered at minimal levels or even eliminated without degrading the educational experience (2002, p. 4).

Duffy (2004) agreed that distance education deprives participants of access to each other's facial expressions, gestures, and body language, all of which are considered critical devices for assisting in understanding and making meaning in conversation. Duffy and Kirkley, (2003) observed: "distance education environments are noted for the impoverished cue environment. There are few social cues, because there is no ability to look around and see if everyone else is looking puzzled" (p. 113).

Palloff and Pratt (2003) believed that promoting active asynchronous discussion was the best way to support interactivity in the online course. They stated that although students could maintain interaction with each other, the online course needed to be facilitated, or the sense of community would weaken. Active synchronous discussion was initially observed to be a crucial component of the present case study.

Salmon (2002) discussed different levels of student interaction. In the beginning stages, students started to collaborate online, and the basis for future information exchange and knowledge construction was developed. In this stage, information was exchanged so that cooperative tasks were achieved. Students could explore information at

their own pace and react to it before hearing the views and interpretations of others. Salmon (2002) pointed out, however, that if too many postings occurred without acknowledgement or summarizing by the teacher, *lurking* (i.e., reading but not posting) could develop quickly. It was important that there was not too much to read, or a student would feel that he or she was not part of the interaction.

As time went on and the students became more comfortable with the material and with each other, they took control of their own knowledge construction in new ways. In the last stage, students became responsible for their own learning and that of their group (Salmon, 2002). Salmon stated that:

> If you have engaged your participants carefully and fully at each of the previous four stages, you were rewarded by explicit evidence of metacognition by stage five and be able to promote their skills by developing very challenging activities (p. 33).

Salmon (2002) also referred to all online learners and students by the term *participants* and their trainers, instructors, facilitators, or teachers as *e-moderators*. Salmon explained that these words illustrated the different roles that each adopts online when compared to learning and teaching face-to-face. For example, the e-moderator was a process designer and a promoter and mediator of learning, rather than just a content expert. The e-moderator needed to know enough about the topic to be able to provide meaningful feedback and to be able to assess the learning effectively. E-moderators also provided direction for the online interaction.

Contrary to the expectations of this case study, Salmon (2002) contended the lack of face-to-face and visual clues in online participation is a key ingredient of success rather than a barrier. Salmon stated, "If the remoteness and lack of visual clues are handled

appropriately they can increase the comfort level of e-moderators and participants alike" (p. 20).

Simonson (2003) challenged interaction in general and pointed out the myth of interaction is "the more, the better." According to Simonson (2003) early research showed that the provision for interaction was critical, and "interaction is important, but forcing interaction can be as strong a detriment to effective learning as is its absence" (p. 78). In related findings, the North Central Region Educational Laboratory (NCREL, 2004) reported that online teaching strategies that were intended to optimize student to student and student-teacher interaction showed "limited evidence of having a positive impact on students' performance" (p. 71). Many of the techniques that worked well in a traditional classroom were not as effective online. For example, Fisher (2003) found that online teachers should avoid lecturing as long, coherent sequences of comments by the teacher often resulted in silence from the students. Instead, she advised teachers to assign articles, books, Web sites, and other resources to do the lecturing if needed. In addition, Bender (2003) suggested that teachers avoid open-ended questions such as *Who wants to start us off* or *Are there any questions*? Finally, along with an understanding of the instructor and student roles in the online course, an understanding of the nature of interaction online must occur. Regardless of the model used, an online student needs to understand that interaction is expected (Palloff & Pratt, 2003).

Collison, Elbaum, Haavind and Tinker (2000) reported that an online interaction takes on a different shape than its face-to-face counterpart. In the online world, no body language enables the teacher to gauge the interest of the participants and, consequently,

adjust the tone or pace of the presentation. Accommodations in voice, style, and expectations must be made to support online learning due to the lack of visual clues.

Moore (1989) proposed that there were 3 types of interaction needed for "successful" distance education: (a) learner-content, (b) learner-instructor, and (c) learner-learner. The first was desirable to the option of one-way communication where the student would have no interaction with the content. The second type, learner-instructor was considered to be the key to motivating students to learn. The last type, learner to learner was important because it could take place without the real-time presence of the instructor. Moore also described the importance of peer interaction for online learners in the evaluation of new content.

Moore's proposition was studied further by Smith, Ferguson, and Caris, (2001). These researchers interviewed 21 teachers who had taught online courses and found that, in general, "the learning process appears more profound as the discussions seemed to be broader and deeper" (p. 4). Smith et al. (2001) further contended that each student was more involved and could not simply sit quietly throughout the semester. They stated that "the quality of students' contributions can be more refined as they have time to mull concepts over as they write, prior to posting" (p. 4). They pointed out that this differed from the face-to-face class where only a small percentage of the students participated for a variety of reasons. They concluded that online classes were "a labor intensive, highly text-based, intellectually challenging forum which elicits deeper thinking on the part of the students and which presents, for better or worse, more equality between instructor and student" (p. 6.).

The role of the teacher in creating a more interactive environment is critical (Draves, 2000). Some tactics to improve interaction for online teachers included: (a) encourage people to interact by keeping the discussion going, (b) compliment the person who initiates a question, (c) allow others to respond before you shut everyone off with your authoritative answer, (d) make sure someone responds to every comment, (e) look for connections, (f) help with frustration, and (g) avoid negative reinforcement. For example, in a study of interaction for learning at a distance, Kelsey and D'souza (2004) found that interaction may be a "predicating factor for the success of distance education courses" (p. 1). They also found that student-to-student interaction was not considered critical to student learning. They called for more research in the direction of curriculum modification to suit student needs. The present study responds to this call.

Distance Education Standards

Most of the standards for the delivery of distance instruction were not developed with a consideration of the new communications tools afforded by the Internet. Standards and methods that have been carefully studied and listed were created to instruct students in physical classrooms; they do not necessarily translate into an online environment. In fact, a great deal of material about distance education standards at the post-secondary level is available, but relatively little has been written about standards for the secondary level. A review of the literature on standards in distance education revealed guidelines that were consistent with those expected in a traditional (face-to-face) institution of learning.

McDonald (2002) prefaced a review of standards in distance education with the insight that the American Association of Higher Education published *Seven Principles of Good Practice in Undergraduate Education* (1987) and found that distance education had

the potential to achieve all of them. The principles of good practice include: (a) encourage contact between students and faculty, (b) develop reciprocity and cooperation among students, (c) use active learning techniques, (d) give prompt feedback, (e) emphasize time on task, (f) communicate high expectations, and (g) respect diverse talents and ways of learning.

In the most recent National Education Technology Plan, the U.S. Department of Education listed several major action steps (2005). These helped set the standard for improvements in online learning. For example, one action step recommended improvement of teacher training and included the sub-recommendation to ensure "that every teacher has the opportunity to take online learning courses" (p. 40). Another recommended step was to support online learning and online schools. Other recommendations included: (a) provide every student access to online learning, (b) enable every teacher to participate in online learning training, (c) encourage the use of online learning options to meet No Child Left Behind (2001) requirements for highly qualified teachers and parental choice, (d) explore creative ways to fund online learning opportunities, and (e) develop quality measures and accreditation standards for online learning that mirror those required for regular course credit (p. 42).

The Commission on International and Trans-Regional Accreditation (CITA, 2000) developed a manual to guide distance education schools seeking CITA accreditation. In order to be accredited, each school must meet nine standards. The standards covered: (a) institutional purpose, (b) organization and administration, (c) the educational program, (d) student services, (e) staff, (f) student selection, (g) business practices,

(h) facilities, and (i) evaluation. What was missing from these standards was any mention of a curriculum that provided interaction. In addition, the need for effective instructional design to require formative evaluation was not addressed.

Palloff and Pratt (2003) stated that good online practice encompassed the following principles: (a) encourage student-faculty contact so that instructors provide clear guidelines for interaction with students; (b) encourage cooperation among students so that discussion assignments are meaningful to the students; (c) encourage active learning such that students should present course projects; (d) give prompt feedback; (e) emphasize time on task with appropriate deadlines; (f) communicate high expectations including challenging tasks, sample cases, and praise for quality work; and (g) respect diverse talents and ways of learning (p. 130).

In a face-to-face course, most elements of instruction are controlled with a great deal of attention by the teacher and with the idea that the elements occur at the same time for each student. For example, pacing is the same for everyone, assessments are administered at the same time, most students are reading the same textbook, and the information is being presented at the same time. In an online course, however, these elements are different. For instance, what one student sees while viewing a 14-inch monitor displaying at 640 by 480 pixels over a modem connection using the Netscape browser may be different from what another student sees while viewing a 19-inch monitor displaying at 1024 by 768 pixels over a cable-modem connection using the Internet Explorer browser. Because of this, online instructional design must come up with standards to account for this variability.

The Michigan Virtual University has been working on standards for over two years (MVU, 2002). The result of that work was a set of over 100 online learning standards in the areas of technology, usability, accessibility, and instruction. "Online instruction must control, reduce, or eliminate the variability of the uncontrolled and interactive online learning environment" (Estabrook & Arashiro, 2001, p. 166.) Further, according to standards established by the Illinois Online Network (2006), students should: (a) be open-minded about sharing life, work, and educational experiences as part of the learning process, (b) be able to communicate through writing, (c) be self-motivated and self-disciplined, (d) be willing to "speak up" if problems arise, (e) be willing and able to commit to 4 to 15 hours per week per course, (f) be able to meet the minimum requirements for the program, (g) accept critical thinking and decision making as part of the learning process, (h) have access to a computer and a modem, (i) be able to think ideas through before responding, and (j) feel that high quality learning can take place without going to a traditional classroom.

Several leading organizations have established standards for online courses that could be used as a starting point in developing a course design framework that would include the use of formative evaluation. One such agency is the National Education Association, which published the *Guide to Online High School Courses* (n.d.). The goals are:

1. Local school districts must identify their own goals in using online programs and must have tools to assess their appropriateness and effectiveness.
2. Teachers must know what constitutes quality in online teaching and to what standards they will be held accountable.

3. Students must become informed consumers, aware of how online courses can enhance their educational portfolios, and what is required for success in these courses.
4. Developers and providers of online education must meet identified standards to ensure delivery of high quality, relevant, and effective resources in the education marketplace.

The U.S. Department of Education (2005) also established goals for using technology as part of the National Education Technology Plan. The plan calls for districts and schools to develop quality measures and accreditation standards for e-learning that mirror those required for course credit in traditional settings (U.S. Department of Education, 2005, p. 42).

Other standards discovered through a Web search included the Sharable Content Object Reference Model (SCORM); (Advanced Distributed Learning, 2004). These are a collection of specifications adapted from best of various existing online learning standards. They provide a comprehensive suite of online learning capabilities that enable interoperability, accessibility, and reusability of distance learning content. In another case, the Information Management Services (IMS) Global Learning Consortium developed the IMS standard. It is another popular online learning standard, focusing mostly on metadata, such as metadata for tagging of learning objects. Their Web site states that several IMS specifications, such as ePortfolios, have become worldwide standards for delivery (IMS, 2007). Finally, material from the Aviation Industry Computer Based Training (CBT) Committee (AICC) indicates that it is considered the oldest online learning standard in the world, originating from the needs of the aviation

industry to create a common CBT system. Subsequently, the standard was shifted to encompass distance training (AICC, 2004).

Formative Evaluation

Like any effective teacher who designs a course, a teacher in the online environment wants to know that the course is meeting the needs of the students. An added element of teaching in the online environment, according to Meyen and Lian (1997), is that everything taught is more open to review and evaluation than it typically is in a face-to-face environment. Data that could provide teachers with information about how well they are meeting the needs of the students are best obtained from systematically gathered evidence. The means of gathering, analyzing, and interpreting such evidence are collectively called methods of formative evaluation.

One of the biggest challenges facing a teacher in the online environment is that many of the visual clues about how students are doing in the class are not available to the teacher, so alternative approaches to the ongoing evaluation of instruction must be made (Draves, 2000). The alternative approach that became the subject of this case study involves the use of evaluation.

Evaluation was defined by Stake (1975) as disciplined inquiry to determine the worth of things, where things may include programs, products, procedures, or objects. Simonson (2003) wrote about formative evaluation, stating that formative evaluation is an important part of instructional systems design. Simonson described a scenario where"...perhaps expectations were not achieved, perhaps a serendipitous event led to an altogether different, but pleasant, outcome" (p. 156). In any case, the teacher needs to find out if and/or how the technologies impacted the experience. Simonson (2003) argued

that perhaps students needed to be trained in how to use the technology better, or maybe the teacher needed to improve the interactivity. Simonson found that "formative evaluation is essential for successful interactive distance learning experiences" (p. 156).

Gagné, et al.(1988) defined formative evaluation as "evidence of an instructional program's worth that is sought for use in making decisions about how to revise the program while it is being developed" (p. 322). They described the need for a variety of evidence gleaned from questionnaires and observations that would be used to decide whether a lesson needs to be "kept as it is, revised, reformulated, or discarded" (p. 324.) Finally, regarding the use of formative evaluation as part as the systematic design of instruction, they stated that it was most concerned with determining to what extent the stated objectives of instruction had been met.

Paloff and Pratt (1999) discussed formative evaluation as an ongoing process that could occur at any point throughout the course. Paloff and Pratt said formative evaluation could show gaps in course material or in the learner's ability to grasp that material and give teachers a way to shift direction if the course was not meeting the needs of the students. They further suggested using dialogue as a source of evaluative material, just as a teacher would do in a traditional classroom, and posting questions that related the material under study to the process of the online group. In addition, Paloff and Pratt (1999) proposed that students participate in assessment and provide reflection and feedback throughout the course. Through that process, students co-create the course to meet their own learning needs. Feedback received by the instructor should be carefully considered, and changes to the course should be made as the course progresses if the

teacher feels that doing so would be beneficial and if it will improve the students' opportunity for achieving their learning objectives (Palloff & Pratt, 2003).

According to Carrick, as cited in Armstrong (2004), instructional systems design always stresses the importance of evaluation; yet, in reality, evaluation is conducted sporadically or not at all. When it did occur, it was often too late in the instructional design cycle. By that time the instructional designer, often a teacher in the distance education environment, was being asked to concentrate on the initial stages of another class and was busy with the delivery of other classes. In order to be useful, formative evaluation should examine every factor that affects the performance of the instruction, including the content, the assessment, the resources, the delivery method and the course objectives, according to Kemp, Morrison, and Ross, (1994).

According to Reeves (1989), formative evaluation is the process of providing information that would contribute to decisions about the improvement of the course. Formative evaluation involves collecting the opinions and suggestions of students and peers to revise and improve the course. Characteristics of formative evaluation are similar to those techniques used by an ethnographic researcher and include being a participant observer, asking key questions, and observing what was happening. Reeves (1989) called formative evaluation "the essence of good instructional design" (p. 164). As in other forms of qualitative study, some of the most useful information for formative evaluation data came from the simple observation of individuals or small groups using prototype instructional products.

A course designer or teacher using formative evaluation seeks to improve the quality of the activities and products of the ISD process. The U.S. Air Force uses formative

evaluation in their design of training. They further divide formative evaluation into the following stages of validation: (a) technical accuracy reviews, (b) individual tryouts, (c) small-group tryouts, and (d) operational tryouts (Air Force Manual 36-2234, 1993).

Smith and Ragan (1999) similarly discussed their own stages of formative evaluation: (a) design reviews, (b) expert reviews, (c) learner validation, and (d) ongoing evaluation (p. 339). Both the Air Force model and the Smith and Ragan model incorporated the use of design reviews and stated that these reviews should be conducted at each stage of the design. The present case study is being conducted at the first offering of the class, and is a more consistent fit with the design review stage.

According to Baker, Aguirre-Munoz, Wang, and Niemi (2003), formative evaluation efforts should be considered at the beginning of course development and should address the effectiveness of the development procedures themselves. This would aid the designers in predicting whether the application of similar approaches was likely to have effective and efficient results. In the case study described in the present study, the formative evaluation efforts were conducted during the first offering of the course.

Baker et al. (2003) listed the principal outputs of formative evaluation as the identification of the degree of success and failure of segments, components, and details of programs, rather than a simple overall estimate of project success. Evaluation also requires the generation of solutions to assure that later revisions have a higher probability of success. According to Baker et al. (2003), the prototype materials were tried one-on-one with students who were representative of the target audience. The designer could interview the learner or have him or her talk through his or her thoughts while going through the material. Baker et al. (2003) estimated that the effectiveness of instructional

materials could be improved 50% simply through the use of a few one-on-one evaluations.

Another level of formative evaluation by Baker, et al. (2003) involved the use of a small group tryout in which the materials were given to a group of six to eight students. The focus of the small group was on how the students used the materials and how much help they requested. This information could be used to make the lesson more self-sufficient. The outcome of the evaluation would also give the teacher a better idea of how well the class would work in a larger group.

A larger method of gathering data might be through a field trial in which the instruction, revised on the basis of the one-on-one and small group trials, was given to a whole class. The purpose of this formative evaluation would be to revise the instruction so as to make it as effective as possible for the targeted number of students. This stage in course design is one of the most frequently overlooked because it comes late in the design process and represents a significant effort in planning and execution (Dick & Carey, 1990). Instructional design without formative evaluation is incomplete (Gagné, et al. 1988). The formative evaluation focus of the present case study was more consistent with the field trial as the observations were made with a whole class, though the classes were low in number.

According to Dick and Carey (1990), part of the formative evaluation during the field trial is to ask students to discuss the instruction, the pretest, and the posttest. The course would be tried out with an appropriate sample of the population intended as its audience. With this larger group, a pretest and a posttest (revised on the basis of small-group testing) are given, framing the presentation of the instruction itself. Attitude surveys are

administered to learners and to participating instructors. Observations are then made during this trial regarding the adequacy of the presentation of materials and their directions. In addition, information is collected on the quality and adequacy of the stated objectives of instruction and the extent to which they had been met.

Smith and Ragan (1999) added to the study of the importance of formative evaluation. They pointed out that the evaluation of a student tells how well the student is learning. In addition, after evaluating a group of students, the teacher could tell how well the students met the objective of the lesson. Another evaluation was critical to the instructional design process, however; that was the evaluation of the instructional materials. "The designer evaluates the materials to determine the weakness in the instruction so that revisions can be made to make them more effective and efficient" (p. 138). Smith and Ragan (1999) also discussed conditions where formative evaluation was especially important to include in the instructional design process. These conditions are: (a) when the designer is a novice, (b) when the content area is new to the designer, (c) when the technology is new to the designer or team, (d) when the audience is new to the designer, or (e) when the designer is using unfamiliar instructional strategy.

George and Cowan (1999) construed evaluation as the process in which comparisons are made between aspirations, or targets or ideals, and reality; consequently, a judgment emerges as a result. They indicated two distinctly different kinds of evaluation as in: "When the cook tastes the soup, it is formative evaluation; when the dinner guest tastes the soup, it is summative evaluation" (p. 2). George and Cowan (1999) further described evaluation as formative when the intention is to identify scope and potential for improvements, as is the intention in the present case study.

George and Cowan (1999) said that iteration is at the heart of successful curriculum development. The reason is that each cycle benefits from the experience of its predecessor, and a constructive link moves the process forward and into the next development. They further called formative evaluation an iterative process by which a teacher could plan for the possibility of course improvement. Finally, they reported that formative evaluation provided an opportunity to find out how well the students were meeting the course objectives as the course unfolded, and it was the process used to find out if what was planned is what was actually happening.

Summary

Overall, the literature supported the need for additional research in online pedagogy; specifically it supported the value of formative evaluation in the process of online course design and development. The major literature on instructional systems design, student interaction, existing standards for distance education, and the process of formative evaluation shows that online education is becoming more ubiquitous at the secondary level. As a result, the need exists for additional research on the practice of online course design and delivery by teachers who are practitioners in this pioneering endeavor.

CHAPTER 3

METHODOLOGY

Problem Statement

Many teachers engage in online course development and online course delivery without any formal training in instructional systems design, much less in techniques to conduct formative evaluation of their courses. Instead, they conduct course development and course delivery activities with little or no documentation of a systematic approach to course improvement, resulting in courses that may not effectively address the needs of the learners or even meet the expectations of the teacher. The challenge for the teacher in the online environment is to gather enough feedback to make adjustments to course design and course delivery without the face-to-face feedback that traditional classroom teachers get (Benfield, 2000; Collison et al., 2000; Sherry, Tavalin & Bilig, 2001).

Purpose

The purpose of this study was to examine how formative evaluation, as part of instructional design, was used by teachers to assess the design and delivery of their courses at an online high school. Formative evaluation, as introduced by Scriven (1967), is a formal process of evaluating course design and delivery for improvement. Evaluation is the process of making a comparison to make a judgment. When the intention of the evaluation is to identify potential for improvement, it is considered formative. This study was not undertaken as a formative evaluation of the courses, but rather a study of the

teachers' awareness of formative evaluation and how they used the techniques of formative evaluation to improve the effectiveness of their online course design and delivery.

Research Design

The methodology chosen to conduct this study is an evaluative case study using a comparative model (LeCompte & Preissle, 1993; Stake, 1994). Comparison is a dominant principle of the qualitative method and was used to identify emerging patterns throughout the study. Data collection techniques consisted of semi-structured interviews (Fontana & Frey, 1994), observation (Adler & Adler, 1994), and document analysis (Hodder, 1994). Specific procedures included initial interviews with each participant, presentation of the formative evaluation methodology in a workshop, and weekly observation sessions of class recordings. Teachers interacted with the researcher and shared what they discovered about the use of formative evaluation techniques and how they thought the techniques impacted upon their design or delivery. They shared their experiences through journal entries, discussions, and a final semi-structured interview with the researcher.

Analysis consisted of reading field notes and interview transcripts, making marginal notes, and sorting and coding with the assistance of the ATLAS.ti software, then reading the field notes again with the coded data in mind. Data from the interviews, from the field notes, and from the review of course artifacts were coded into categories consistent with the instructional systems design model of Dick and Carey (1990) and with the emerging patterns discovered during the analysis.

The purpose of the case study methodology was to collect enough data to be able to "create plausible interpretations" (Bassey, 1999, p. 65) about the online course

development and course delivery by the teachers at the online high school. This was a qualitative study to determine how teachers used formative evaluation to improve the delivery and usability of the course they developed. The case study was chosen because it would draw attention to what could be discovered from a particular case of teachers designing their own courses.

The study could be further defined as an intrinsic case study because it was conducted in an attempt to determine the efficacy of online course development by the teachers on a particular project, not because the case study represented all online course development (Stake, 1994). Factors that contributed to the uniqueness of this case included its (a) historical background, (b) the physical setting, (c) the informants, (d) the use of both synchronous and asynchronous methods of course delivery, and (e) the ability to observe the classes on an archived basis using recorded classes so as not to influence or affect the class as a participant observer. The online classes were automatically and routinely recorded by the teachers so students who were not able to attend the classes could view them for make-up. The case study provided and identified areas of success and allowed the researcher to document what the teachers have done in the areas of online course design and delivery.

Two outcomes of empirical educational research are: (a) either predictions of what may happen in a particular setting or (b) interpretations of what has happened in a particular setting (Bassey, 1999). While statistical studies provide statistical generalizations, Bassey (1999) claimed that case studies may lead to "fuzzy generalizations" (p. 4). Therefore, this case study focused on the interpretations of what

happened with course design and delivery and does not provide generalizations about what might happen in future course development and delivery activities.

Yin (1993) stated that the case study could be used as a "tool for doing evaluation" and called the evaluation "a particular type of research intended to assess and explain the results of specific interventions" (p. 55). This case study then met Yin's criteria by providing a tool for evaluating formative evaluation techniques. Yin (1989) earlier suggested that one application of a case study would be to describe causal links in real-life interventions, the context in which the intervention occurred, and the intervention itself. This case study also met Yin's earlier criteria by allowing the researcher to describe real-life online classroom situations, the conditions and context surrounding the presentation of the formative evaluation workshop, and the results of the workshop.

In another report of the use of the case study, Simmons (1996) welcomed the "paradox between the study of the singularity and the search for generalization" and further stated that "paradox is the point of case study" (p. 226). The results of the proposed research, while not generalizable, do provide fodder for further research on how teachers working at an online school actually develop and deliver online courses. In addition, the present study may contribute to the growing pedagogy of online teacher practice. Moreover, because the purpose of the research was to explore the actions or behaviors of the teachers in their social setting, the focus of the study was in agreement with Guba and Lincoln (1981) who described qualitative methods as providing the best fit for all social-behavioral inquiries.

Case study has been defined by Merriam (1988) as "an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p. 21). In accordance with

Merriam's definition, this case study provided descriptive information about how the instructional design process, specifically the formative evaluation step, was carried out by the teachers and how it translated into the judgment of effective delivery during the conduct of the class. According to Patton (1990):

> Case studies become particularly useful where one needs to understand some particular problem or situation in great depth, and where one can identify cases rich in information – rich in the sense that a great deal can be learned from a few exemplars of the phenomenon in question (p.19).

Similarly, Guba and Lincoln (1981) stated that "evaluation is always dysfunctional to human performance" (p. 301) and serves as a reminder that the people involved in an evaluation must feel that they are not being judged and evaluated, that "their worth" is unconditional and not dependent on the outcome of the evaluation (p. 300). This was an important part of the present case study, and the participants were informed that this was a study of formative evaluation, not of their capabilities, nor was it an outcome-based or summative evaluation of their students' work.

Case Study Design and Procedure

Bassey (1999) suggested six stages of an educational case study: (a) identify the issue, (b) ask research questions, (c) collect and store the data, (d) generate and test analytical statements, (e) interpret or explain the analytical statements, and (f) write and publish the report. Each of these steps was followed in this educational case study.

The issue was identified as a case study of the process of formative evaluation by teachers who created and delivered online courses. The research questions were designed to: (a) explore the process of formative evaluation by the teachers, (b) look for changes in the course design as a result of formative evaluation, and (c) look for the existing

framework that influenced the design or delivery process. No specific answer was expected, as is consistent with the discovery aspect of the comparative methodology. Data were collected and stored both in the form of written notes and in data files using word processing software and the qualitative analysis software, ATLAS.ti (Muhr, 2004). Analytical statements were generated following the coding process. The analytical statements were then used to interpret the results. Finally, the report was written.

Three teachers were selected from an online high school in a large school district in the Southwest United States. The teachers represented a broad spectrum of teacher experience in online teaching and in designing online courses. Their participation was voluntary, with their informed consent, and was carried out on their own time with no additional pay. The teachers' performance was observed through Centra Symposium software and the WebCT software on a non-real-time basis (i.e., the software allowed the course proceedings to be captured on a hard drive for later analysis and playback).

Six data sources were used to support the research: (a) the initial semi-structured interview responses and final interview responses of the teachers, (b) the teachers' work as captured in their journals and discussions, (c) the interview responses of the online high school administrator, (d) qualitative description based from notes and other artifacts based on the class session observations(e.g., the teachers' directions to the students, or specific attempts of teachers to obtain feedback), (e) the classes themselves (e.g., how artifacts of the class may have changed during the observation period), and (f) the results of the ATLAS.ti software analysis based an overall collection of all other data.

The Initial Semi-Structured Teacher Interviews

Following the approval of the school principal, the school district, the university's Institutional Review Board, the research committee and upon obtaining the informed consent of the teachers, the research process began with an initial semi-structured interview (Appendix I) in which each teacher established a baseline of assumptions, values, and beliefs regarding the use of instructional systems design and, more specifically, the use of formative evaluation. Each interview was a one-on-one interview and was recorded on audio tape, then transcribed. The transcriptions were entered into the ATLAS.ti software for later analysis. Near the conclusion of the data collection process, a final semi-structured interview was conducted with the teachers to discuss issues related to their use of formative evaluation techniques.

The Teachers' Work

Following the initial interview, the researcher observed eight weeks of past classes via playback to note how the teachers previously attempted to improve classes as they were being delivered. The playbacks were conducted using Centra Symposium software for the synchronous sessions. Playbacks are accomplished using a server-side recorder that supports participant interactivity during the playback. For example, during the playback, a participant can click on links on a Web page or participate in a survey. Only the leader of the session, in this case the teacher, can record each class meeting. An advantage of the playback process was that the researcher could be a non-participant observer. The asynchronous sessions published on WebCT were downloaded and reviewed to create field notes. In addition, emails between the students and teachers were reviewed for evidence of formative evaluation.

The teachers met with the researcher as a group for three hours and were presented the formative evaluation techniques that they could use in order to improve their classes. Each teacher was given a handout with a list of techniques based on a collection of techniques by a number of authors. The researcher and participants discussed the methods of the formative evaluation techniques. A detailed list and description of the techniques is found in Appendix II. The teachers were told that they could decide which techniques best applied in their classes based on the type of feedback they were looking for. They were also told that their classes were being observed specifically for methods teachers used to change the course. The choice to use them or not use them was entirely theirs.

The spring semester of classes was observed for a total of 18 weeks of class sessions for each teacher. The observations were made through the use of Centra and WebCT, and data were recorded in the ATLAS.ti program (Muhr, 2004). During the second 9 week observation period, the teachers kept a journal and made weekly entries regarding their formative evaluation efforts. At the conclusion of the observations, another structured interview with each teacher was conducted to see what changes, if any, occurred in their assumptions, values, and beliefs about formative evaluation.

The Interview of the Administrator

An administrator who worked with course design was interviewed to establish the administrative expectations for the framework of course design and for course improvements during the design or delivery of a course. The questions (Appendix III) focused on design and delivery expectations, teacher training, and course evaluation. Questions included a variety of topics including, but not limited to course standards, the

role of instructional systems development, teacher training on course design, the method used for course improvement and the framework for any use of formative evaluation.

Qualitative Description Based on Notes

A description of the course design and delivery process was written using the data collected at every point. The protocol for the written description included: (a) describing the setting, (b) identifying the characteristics of the teacher being observed, and (c) reporting the content of the formative evaluation method or other feedback mechanism used. The description was factual and not judgmental to the highest degree possible.

The narrative provided a realistic description of the events that related to course design and development and provided a source of data for formulating useful illustrations of the case. For example, one teacher described the course design process as "pretty much a trial and error proposition." The teacher stated that when they were assigned a course topic, they usually spent from 6 months to a year designing the course before it was initially presented. One person was designated as an instructional design assistant, but that person was also a teacher and was developing another online class at the same time. Each teacher who designed a class was responsible for finding another teacher certified in the curriculum area who then reviewed the course. The reviewer was an employee of the school district, but did not work for the online high school. The review was based on the curriculum standards set forth by the district--standards designed for the traditional classroom. No specific online course design standards exist at the school, district, or state levels. The concept of formative evaluation was not addressed, though the teachers did

say they were all interested in obtaining feedback about the course, and they did experience difficulty doing so in an online environment.

The Classes Themselves

The course material included:(a) the curriculum posted on the WebCT site, (b) the material the teacher sent to the students at the beginning of the class, (c) the archived data uploaded from every Centra session (i.e., the playback file), and (d) the course outlines that were submitted to the administrative offices for review. Coursework was gathered at the beginning of the observation periods and again at the end. It was then compared for any changes.

The ATLAS.ti Analysis

Data were collected and transcribed into the qualitative software, ATLAS.ti (Muhr, 2004). Data were continually entered into the software and were analyzed at the completion of observations and field note taking as an additional data source to support the research conclusions. The data were linked to codes established during open coding and axial coding (Goetz & LeCompte, 1984).

A container called a hermeneutic unit (HU) was created as the first step in the application of the ATLAS.ti software. The HU served the purpose of organizing the total number of findings, codes, memos, structures, and data within a research task as a name and registered a main file around it. Next, all *data* files were linked to the HU so that all data could be opened through this single HU file.

Entering Data

The next step was entering data, marking or quoting interesting sections, as well as assigning codes and memos. The semi-structured interviews were transcribed and entered

into the HU. Data from field notes taken during the class observations were also entered into the HU. The data were then analyzed for patterns, themes, and categories and were termed *elements.* A further step was to organize the various elements into groups or families (e.g., to organize the entire observation protocols, all interview transcripts, and all field notes), which were then analyzed and coded. Figure 4 depicts a family of elements called Communication elements, derived during axial coding, that are associated with terms that were derived during the open coding of the data.

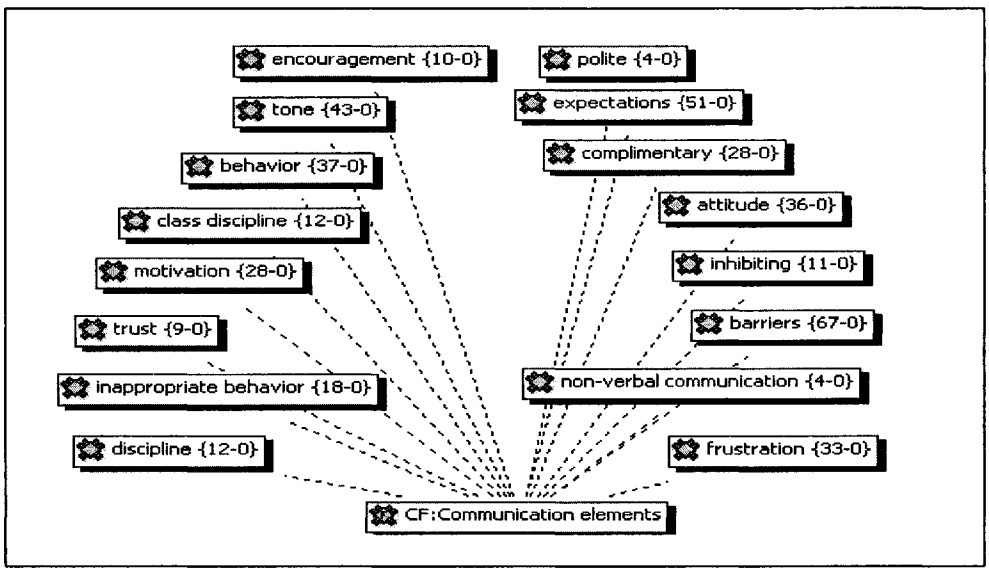

Figure 4. A concept map representation of an element of a hermeneutic unit (HU) generated by the ATLAS.ti qualitative analysis software.

Research Questions

Three research questions were created to guide the analysis. The questions were designed to allow for the discovery process suggested by the process of the comparative model; and therefore, expected or hypothetical answers were not proposed.

1. To what extent was the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school?
2. What changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who designed and delivered online courses at the secondary level in an online high school?
3. What standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating teachers?

Data Collection Procedures and Tools

Data were collected through a combination of semi-structured interviews, artifact analysis, field note analysis with the assistance of the ATLAS.ti software, questionnaires, and observations of class sessions. Specific data sources included: (a) an initial semi-structured interview, (b) transcripts from synchronous class sessions, (c) field notes, (d) a second semi-structured interview, (e) artifacts from the conduct of the classes, (f) transcripts of semi-structured interviews with cooperating teachers, and (g) data from teachers on an evaluation rubric used to determine the level of interactivity during the formative evaluation phase of instructional system development.

Table 1 shows a summary of the sources of the data, from whom it was collected, and the rationale for the use of the data. Data gathering began by providing each participant a copy of the case study proposal and obtaining informed consent from each participant (Appendix IV). Semi-structured interviews were the primary method for gathering the initial data. Interview questions were carefully selected to avoid implying a response. All

interview sessions were audiotaped and transcribed. Guba and Lincoln (1981) reported that interview notes should be completed as soon as possible after the interview is complete, and that host verification or member checks should be conducted as soon as possible after the analysis to find out if the presentations made represent the "reality"

Table 1

Sources of Data and Rationale for Data

Data Source	Provided By	Rationale for Data
Semi-structured interview	Teacher Participants	Establish initial baseline of understanding of purpose
Teacher's Journals & Discussions	Teacher Participants	Additional feedback, source of formative evaluation data
Semi-structured interview	Curriculum Administrator	Insight into existing framework of course design.
Qualitative description of field notes	Researcher	Observations of actual classes as source of field
Class artifacts	Teacher Participants	Web pages, emails, course outlines
ATLAS.ti software	All participants	All data to be entered into this qualitative software to assist in analysis

(p.186) intended. The participants were given an opportunity to review the transcript as a member check for accuracy.

Analysis of the records such as lesson plans provided examples of how the teachers had applied skills learned during the formative evaluation technique workshop. Additionally, field notes of events observed during class were compared to answers of the semi-structured interviews to aid in the analysis. Field notes were transcribed and entered

into the ATLAS.ti software for analysis. The teachers reviewed the instructional content for accuracy of curriculum, considered the necessary prerequisites, the appropriate use of media, and the effectiveness of visuals. Pretest and posttest materials as well as other assessment tools to diagnose weaknesses in the course were also considered by the teachers. Teachers kept a weekly journal regarding course delivery and course design during their formative evaluations. Journal entries were emailed to the researcher at random times by the participating teachers. The teachers were requested to consider their course design and delivery decisions and were guided by questions such as:

1. Did the instructional content need improvement?
2. Did the media selection and utilization need improvement?
3. Did the learner achieve the lesson goals?
4. What were the greatest strengths of the lesson?

The same questions guided teachers on how the teacher interacted with the students, and the teacher sought feedback on the course content and delivery. Debriefing interviews/discussions were conducted with the teachers after portions of instruction with some representation of the instruction available such as the Centra Symposium session or WebCT page as a reference during the discussion of suggestions for improvement.

The observations took place through the use of playing back the recorded online synchronous sessions using the Centra Symposium software and reviewing the threaded Web discussions that took place on the asynchronous platform, WebCT. The playbacks captured most of the class communications conducted synchronously, though the software did not allow for playback of text chat between the teachers and the students.

When the teacher made an error in the publication of the recording, which happened on two occasions, the classes were not available for playback. Since most teachers taught a morning and evening session of the same classes, both were observed for field notes.

WebCT

WebCT provided an online environment where students could combine course experiences with the real-world communities of work and play (Johnson, 2003). The software provided a collection of instructor tools to facilitate course design and course management, while the students had access to tools that allowed them to manage their courses and monitor their progress. Figure 5 shows the screen students saw when they logged into the online high school and had to choose the software application they used.

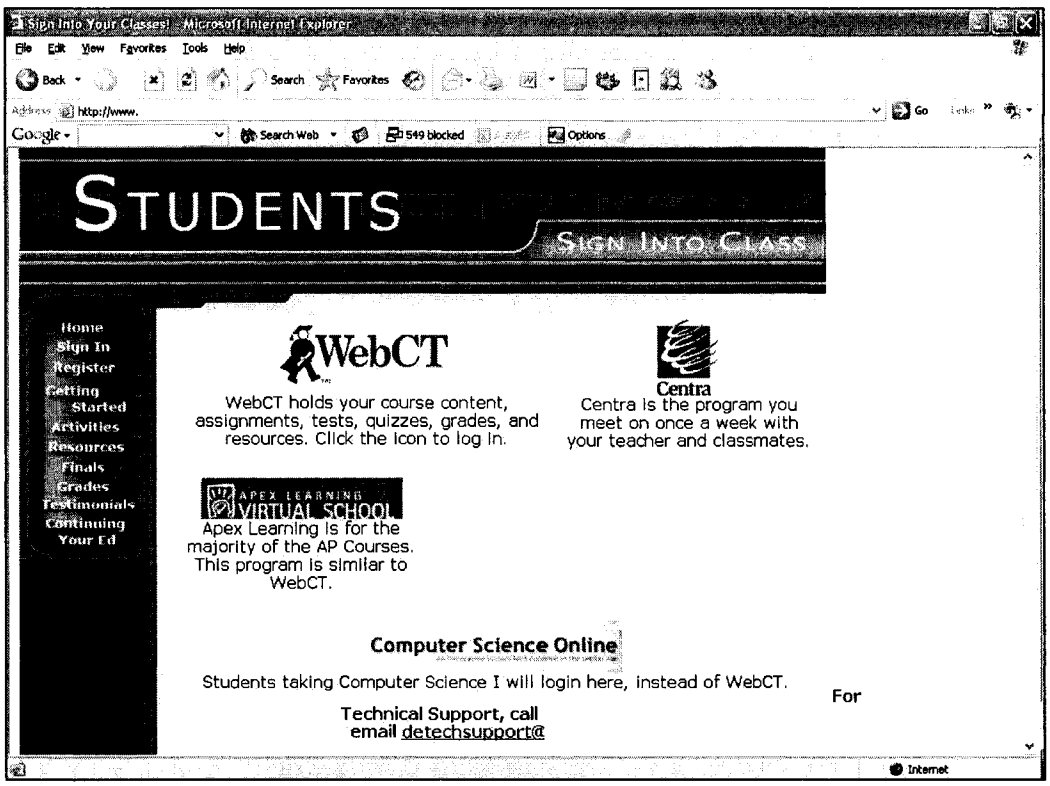

Figure 5. A screenshot of the student tools sign-in Web page.

The online high school teachers used WebCT for a real-time chat by using the "who's online" selection and started an immediate textual conversation. This was used rarely, and when used, was used between students and not recorded. Most feedback provided in WebCT occurred when the teacher and student were not online at the same time, which is also known as asynchronous communication. Curricular content was organized by topic, and learning modules were created that included sequenced content and activities. All of the course links were presented on one resource page, and customized content was sent to students. Navigation of WebCT showed frames that included course tools, course content listing, announcements, assignments, discussions, mail, syllabi, and Web links. The teacher and students made use of threaded discussions that provided the student time for reflection before posting their next response. Threaded discussions provided a way to capture and record the proceedings of the course, and material could be reviewed periodically whenever the student needed it. The WebCT software was provided by the district for each student and teacher.

Figure 6 shows the homepage of a course on WebCT taught by one of the teachers in the present case study at an online school. The homepage was used as an example, and is representative of the other teachers' homepages. This is where the teacher posted course content, calendars, and assessments. Additionally, by clicking on the communication tools, the students and teacher had an asynchronous forum for feedback regarding assignments and course content that could be accessed any time, day or night, and gave the students and the teacher time to reflect on the posting. This was the main WebCT forum studied and was analyzed for data regarding the teachers' online course design and delivery. It was comprised of the following elements: (a) teacher comments, (b) teacher

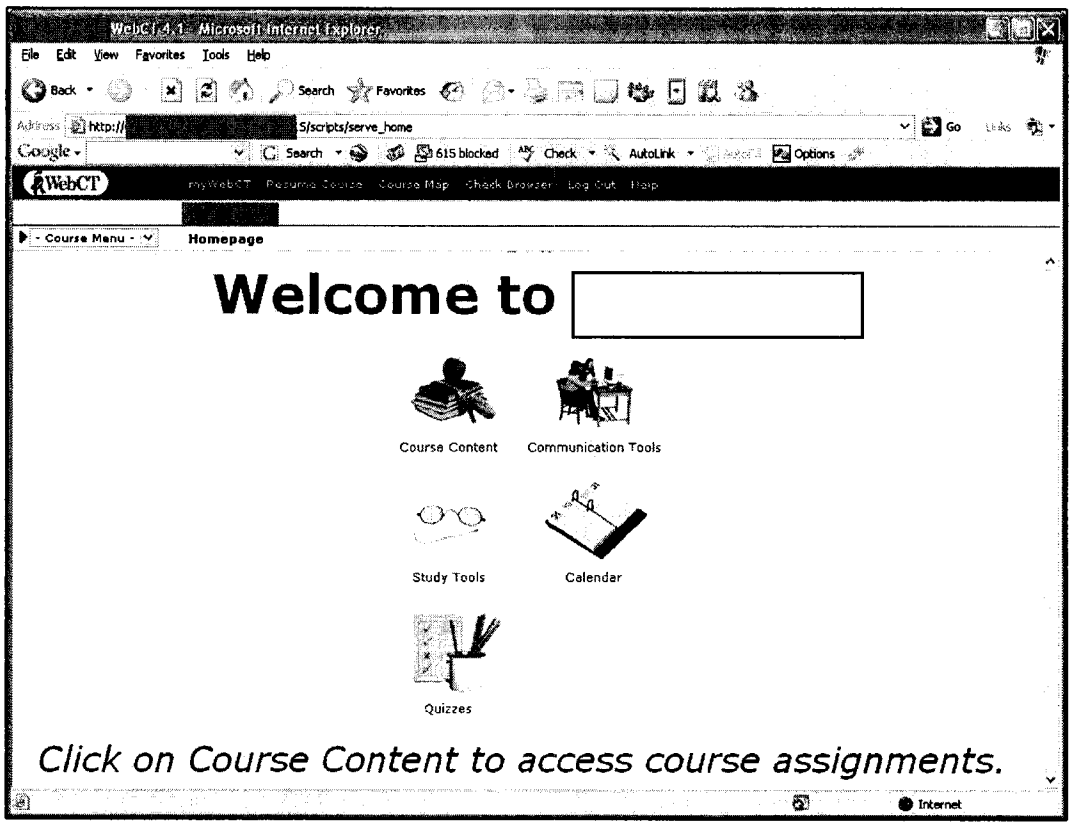

Figure 6. Screenshot of a WebCT homepage.

postings, (c) student comments, and (d) required student postings.

As an example of source data and limited analysis of the data, Figure 7 shows what a teacher posted on August 30, 2005 to generate discussion based on a story students were reading. The teacher posted an assignment that said, "Describe a time where something turned out quite different than you expected." No particular deadline or guide for what was expected as an appropriate response was evident. For two weeks, the students responded and discussed the responses with each other. During this two week period, synchronous discussion occurred once each week using Centra software.

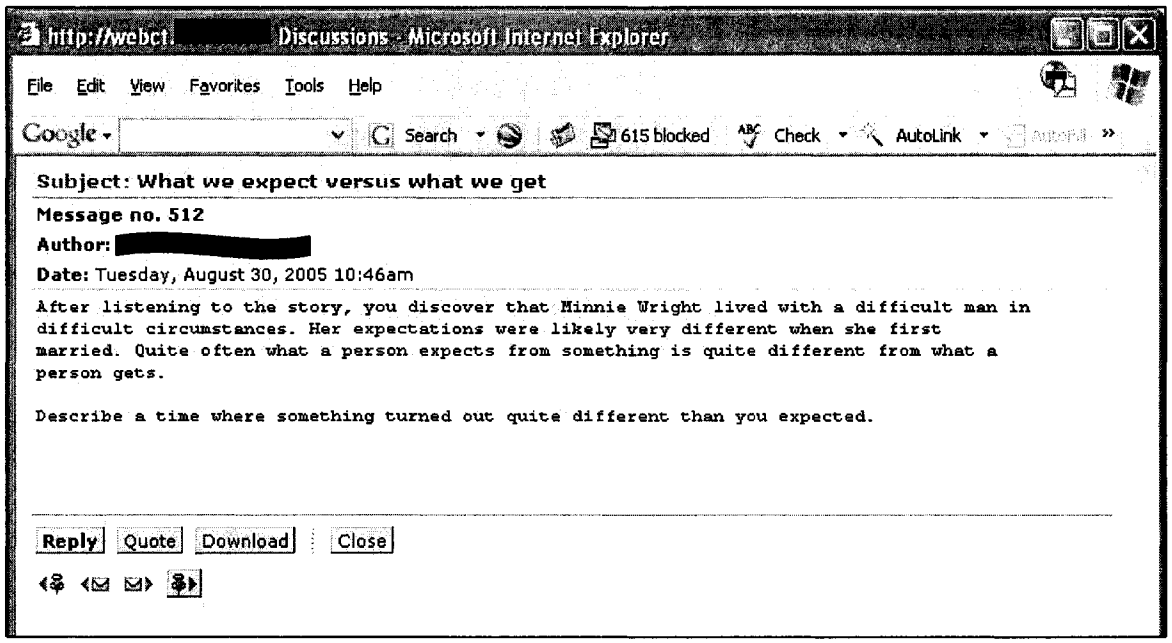

Figure 7. WebCT discussion question from a teacher.

Figure 8 shows the response a teacher made to the students after reading the feedback from the students. Here, one of the participating teachers titled this "a reply to discussions so far," implying more was to come. The response was made on September 13, 2005, two weeks after the initial posting. It provided an acknowledgement of the student responses and allowed the teacher to add his own thoughts and answer without adding additional requirements. The teacher's comments were written in a manner that indicated a response to the question and were similar to what was expected from the students. The language of the teacher, not the students, was analyzed for evidence of formative evaluation and for any changes to the curriculum or delivery. Following the presentation of formative evaluation methods to the teachers, it was expected that observations of the class through the WebCT software would reveal more formalized attempts at course design or delivery alterations.

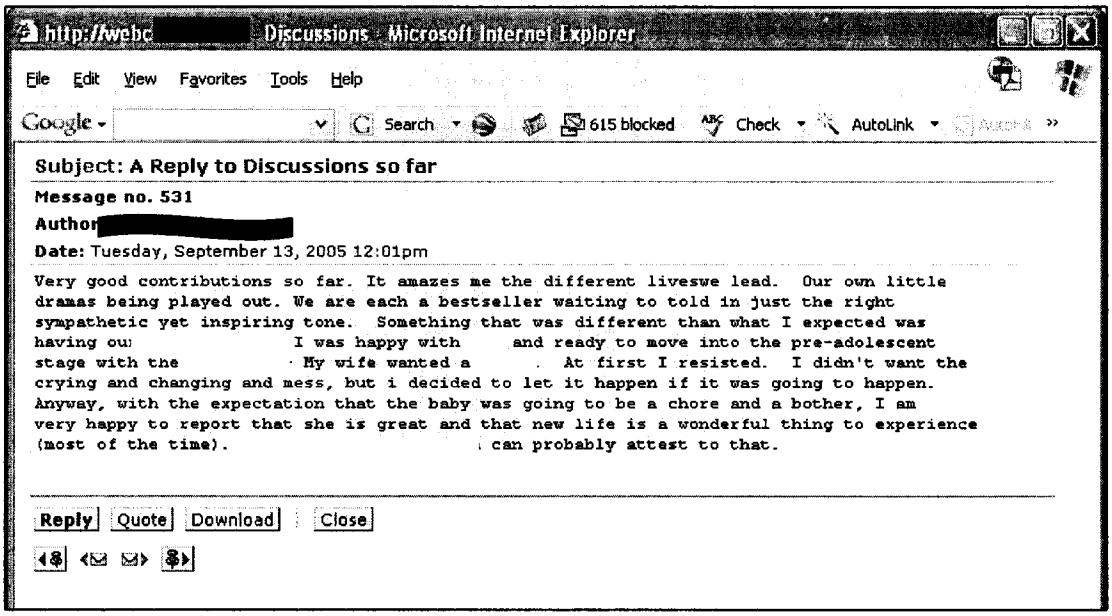

Figure 8. A teacher's reply to discussions using the WebCT software.

Centra Symposium

Centra Symposium is the required software that facilitated real-time or synchronous communication in the online high school. According to Fisher (2003), "real-time discussions are becoming one of the most popular teaching methods for encouraging online interactions between students" (p. 48). Through the Internet, a teacher scheduled a course and enrolled the students. Figure 9 shows the layout of the Centra screen for a social studies class. The social studies class screen shot is representative of the classes that were observed for the present case study, and is shown for illustrative purposes. The curriculum content is shown in the largest window where software applications by the teachers or by the students were displayed. The agenda for the class is shown in the lower left window, and the participants names are displayed above that, but masked out in this figure.

The students were given the times to log on to the course and join the instructor for a class session. The interface screen provided an interactive environment for the class and included frames that showed the name of the instructor, the names of the students, an agenda, and a larger area that displayed a virtual white-board or a presentation from a computer program application being shared (i.e., a PowerPoint presentation). The application-share feature allows the display of presentations and real-time interface with

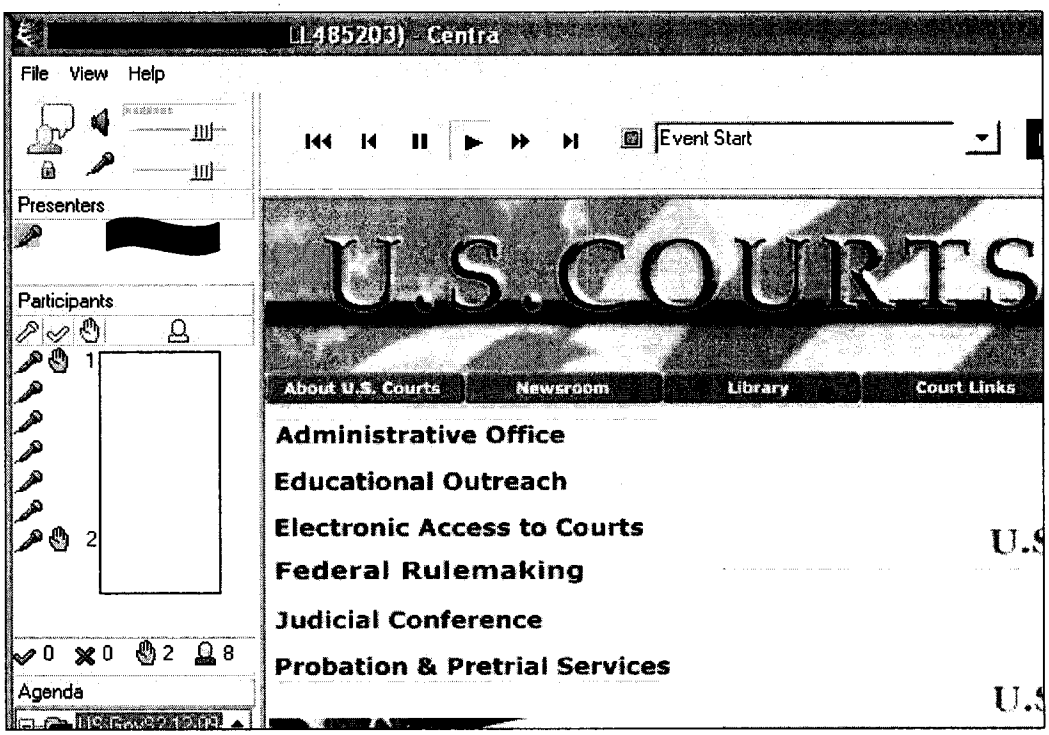

Figure 9. Screenshot of a Centra class.

the Internet. Students could ask for attention of the teacher by raising or clapping their virtual hands, provide yes/no feedback, and indicate laughter through a laughing *emoticon*. The teacher could set up breakout rooms where students were divided into working groups for working on online surveys and evaluations.

Each session is recorded and published through the Centra system so that enrolled students could play back the session later on. This is used as a study aid and as a review for students who were not able to attend the real-time session. It is also used for the teacher to be able to review the session as feedback to help the process of formative evaluation. Figure 10 illustrates a Centra session that a teacher had with students on the same day as an asynchronous assignment on WebCT. Through Centra, the teacher held a 1.5 hour session about the short story they were reading. In this slide, the teacher sought

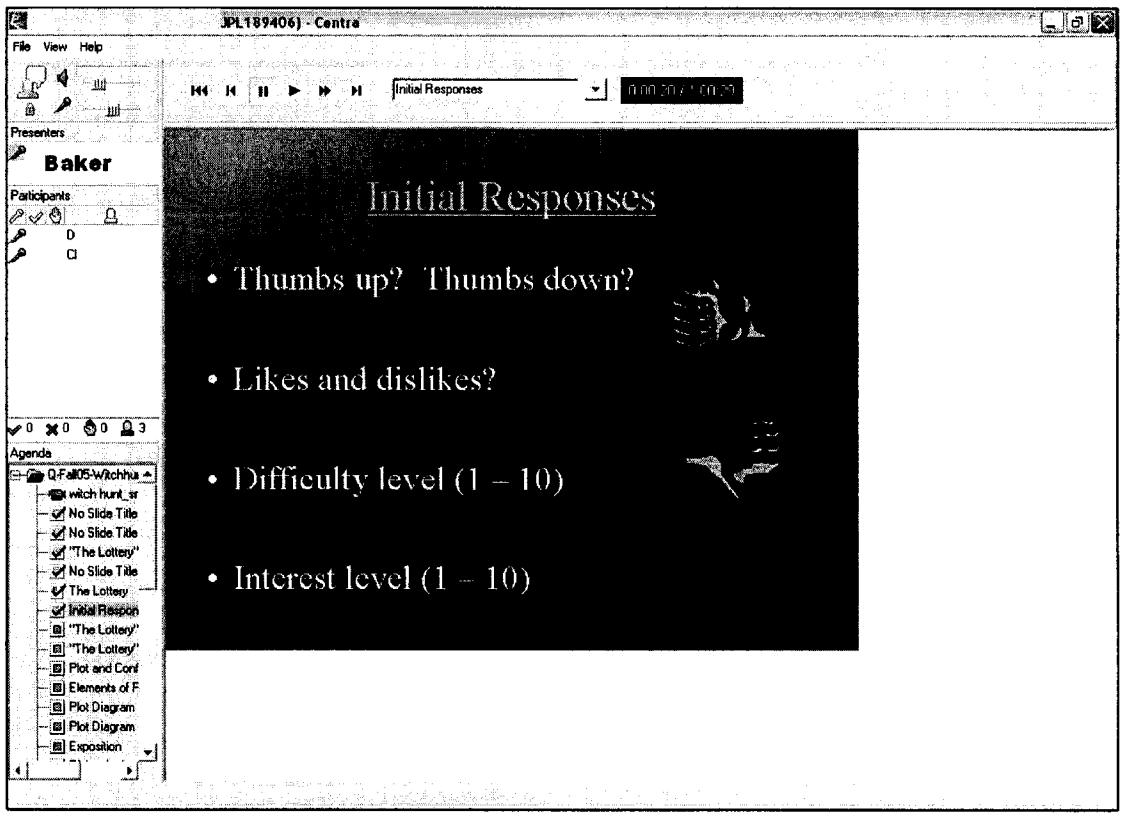

Figure 10. Screenshot of Centra Symposium polling students.

the feedback of the students by asking them to rate the story with a thumbs-up or thumbs-down emoticon to discuss their likes and dislikes.

Figure 11 shows the teacher asking the students to share the stories they have written with each other. The teacher tells the students to open the InterAct account, which is the school district's email platform. The students were told to send a courtesy copy to the teacher as well. There was no access to the email account for the purpose of this study, but a discussion of feedback the teacher received through that medium was conducted. This archived Centra playback was over 90 minutes and could be fast-forwarded so

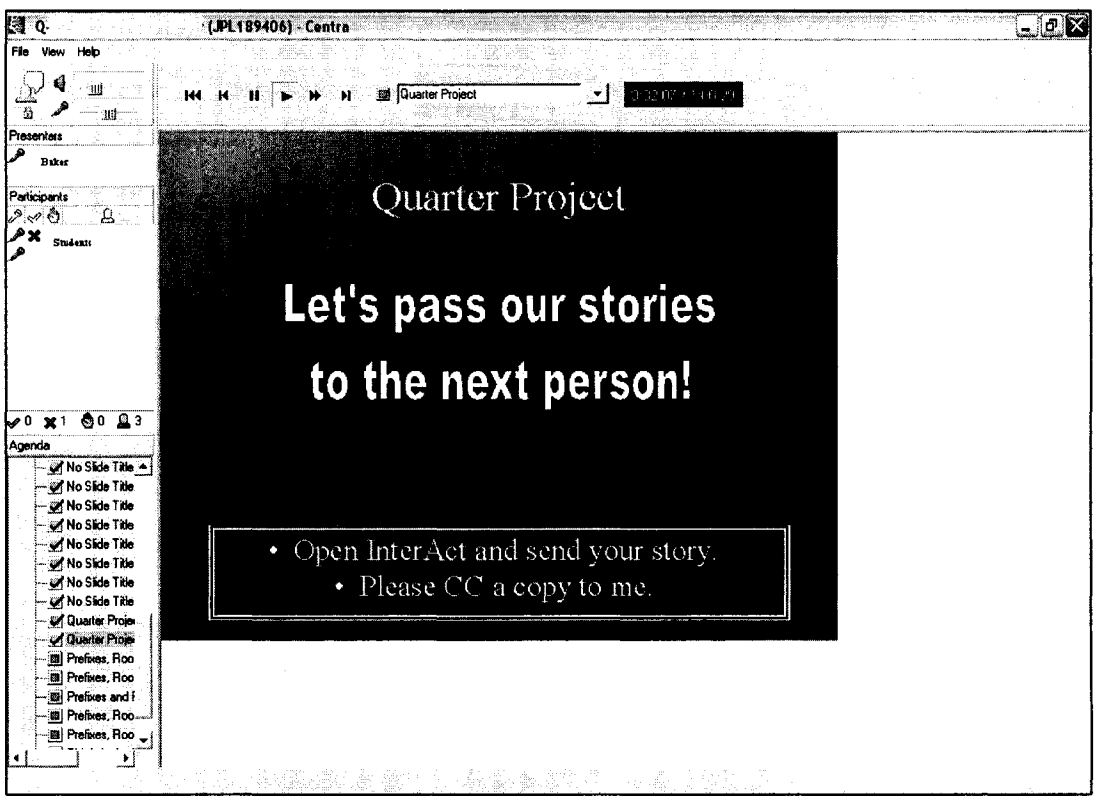

Figure 11. Screenshot of Centra Symposium seeking feedback.

the class could be carefully analyzed to gain an idea of what the teacher was covering. The portions that were included in the data for formative evaluation were transcribed with only the teacher's comments.

Formative Evaluation Techniques

The three teachers were instructed together in a workshop on techniques of formative evaluation. A course outline of the material covered can be found in Appendix II. The training was conducted for 4 hours and served as an introduction to formative evaluation techniques the teachers could use in the evaluation of their online course. The teachers were instructed to avoid beginning with a predetermined purpose to find fault with their courses and to try to observe without being influenced by preconceptions or assumptions.

The teachers maintained a log and updated it on a weekly basis. Items to be recorded included: (a) attendance, (b) curious or unexpected behavior or responses, (c) apparent successes, (d) feedback, and (e) the amount of time students and teachers spent on certain components of the program. They were also asked to provide information about their thoughts and feelings during the event. They were instructed to make their journal entries objectively and descriptively, without expressing initial judgment. Reactions to the learning experience were important data for formative evaluation. Teachers were also shown the effective use of questionnaires, interviews, and the Delphi technique. In the Delphi technique, teachers ask students to note the strengths and weaknesses of a presentation or unit, then the teacher develops a summary of the comments. The summary is then given to each student for changes and then revised and sent back to students.

Another technique the teachers were shown was to have the students write a single letter of advice to the next class, telling the new students what mattered most, how to approach the class effectively, and what was good or bad about the course. Finally, they were told about a method called Stop, Start, Continue (SSC). In the SSC method, students

prepared a list of items the class should stop, start, and continue. For example, a particular exercise that the students found interesting, relevant, and useful might be identified as one that can be continued with the next class offering. An assignment that was too confusing to be useful might be identified as one that should be stopped.

Data Analysis

Tellis (1997) described the data analysis step in case study methodology as "the least developed and hence the most difficult" (p. 8). This realization is one factor in the decision to use an analytic software program (i.e., ATLAS.ti) to assist in the process. Although Denzin and Lincoln (1998) reported that "an insistence on the ultimacy of theory building appears to be diminishing in qualitative social science" (p. 91), the ATLAS.ti software was used to assist with coding in which relevant features emerge, with axial coding to refine the themes. Axial coding is the second look at the data following initial analysis and open coding (Goetz & LeCompte, 1984). Table 2 shows a linear progression of the method and sequence of data analysis.

Initial Semi-Structured Interviews with Teachers

After obtaining IRB and school district approval, a semi-structured interview was held with the three teacher participants. The interviews were transcribed and entered into the ATLAS.ti program. The interview was conducted to establish the assumptions, values, and beliefs of the teachers regarding the use of formative evaluation as part of instructional design. Even though it was established that the teachers did not know what formative evaluation was during the interview, each of the three teachers did say they had previously attempted to obtain feedback on their design and delivery. Field notes were written during the observation and subsequently entered into the ATLAS.ti program.

Table 2

Linear Progression of Data Collection and Analysis

Data Source	Timeline	Relevance
Semi-structured interview with teachers	February 21, 2006	To gain insight into training/support of formative evaluation and understanding of formative evaluation prior to training
Observe archived class sessions using Centra/WebCT	From February 16, 2006 —from classes recorded between September 2005 and January 2006	To observe teachers' deliver prior to training in formative evaluation
Semi-structured interview with administrator	May 21, 2006	To provide insight into possible framework for implementing formative evaluation as part of instructional design
Provide training to teachers on formative evaluation techniques	February 18, 2006	To show teachers formative evaluation techniques that they may apply in their classes and in other course development
Observe class sessions using WebCT/Centra	Beginning February 25, 2006 for classes recorded between February 20 and June 8, 2006	To observe actual classes as source of field notes, looking for examples of formative evaluation by the teachers
Semi-structured interview with teachers entered into ATLAS.ti software	February 16 to June 11, 2006	To explore differences between the first and second interviews and to enter all data into computer using appropriate software that will assist in coding and grouping of data
Weekly journal	Submitted each Sunday from February 19 to June 4, 2006 using questionnaire as guide (Appendix II)	To examine reflections regarding formative evaluation processes that will provide insight into teachers' assumptions, values, and beliefs regarding formative evaluation
Discussions	Ongoing with teachers via email from February to June 2006	To gain additional feedback as a source of formative evaluation data
Course artifacts	Ongoing from February 16 to June 17, 2006	To gain insight into responses to the research questions
Triangulate data/member checks	From June 17 to September 28, 2006	To provide information for the trustworthiness of the analysis

Observation of Archived Classes

An observation of eight weeks of classes followed looking for evidence of formative evaluation prior to formal training in techniques of formative evaluation. This observation period was designed to establish how much these three teachers used formative evaluation before the training. Observations were made using the WebCT and Centra Symposium software allowing an observation of archived class presentations.

Semi-Structured Interview with an Administrator

An interview with a school administrator responsible for overseeing curriculum was conducted to learn if any framework or requirement existed for the use of formative evaluation in the instructional design phase. Additionally, the importance of formative evaluation in the design phase was explored. Data from this interview were transcribed, then entered into ATLAS.ti to be coded.

Training of the Teachers

Next, the training session with the teachers was conducted to let them know what kinds of formative evaluation methods were available. The training was a 4 hours face-to-face session with the teachers as a group. They were presented with a variety of formative evaluation techniques and participated in a discussion about why formative evaluation was part of a systematic approach to instructional design. The material provided to the teachers is shown in Appendix II. During the training, the teachers were requested to keep a weekly journal to provide reflection on their use and understanding of formative evaluation. The analysis of this training would be accomplished through the observation of the teachers' design and delivery efforts following the training, as observed in the next

step, and during a second semi-structured interview that would be transcribed and entered into ATLAS.ti.

Observation of Classes

Class observations, using Centra and WebCT, continued through the end of the semester to ascertain how the knowledge of formative evaluation techniques had an impact on how the teachers designed or delivered their classes. Discussions, using email between the researcher and the teacher, provided another source of data. All data were entered into ATLAS.ti to aid in the analysis and subsequent coding.

Second Semi-Structured Interview of Teachers

After the teachers were observed and data analysis began, the teachers were again interviewed. The focus of this interview was on the experiences of using formative evaluation techniques during the observed term, and their assessment of the framework supporting the use of formative evaluation at the school. The results of those interviews were transcribed and entered into the ATLAS.ti software.

ATLAS.ti Software

All data were entered into the ATLAS.ti qualitative analysis software. The software assisted in the reporting of the data by allowing the researcher to link the data with open coding and axial coding elements established by the researcher. Journals, discussions, and course artifacts such as teacher expectations and course development rubrics were analyzed, and course changes were documented in ATLAS.ti. Upon completion of the coding, the software was used to generate reports that listed the frequency of codes, and was used to establish the overall hierarchy of codes that identified emerging patterns and themes, and was ultimately used to support the narrative description of the case.

The field notes were analyzed through a process of reading and re-reading, then coding the data. The advice of Berkowitz (1997) was followed during the coding by considering his six questions:

1. What common themes emerged and how did the themes illuminate the research question?
2. Were there deviations from the patterns?
3. How were participants' experiences related to their behavior and attitudes?
4. What interesting stories emerged from the responses?
5. Did any of the central study questions need to be revised?
6. Were the patterns that emerged similar to the findings of other studies on the same topic?

The analysis was directed at uncovering patterns, themes, and categories in a process that required "making carefully considered judgments about what is really significant and meaningful in the data" (Patton, 1990, p. 390). The patterns, themes, and categories were used to identify codes that were then used to categorize the data. After the conceptual relationships were established, the software was again used as a content filter where the frequency of events was tabulated. In this way, the data drove the organization of the analysis.

Triangulate/Member Checks

Before answers to the research question were written, the findings were submitted to the teacher participants as a member check, and the findings were submitted to the participating administrator for triangulation to aid in the trustworthiness of the conclusions. Feedback was elicited from the participants by first letting them read the

transcripts of the interviews, then by letting them analyze the lists of codes that were used. The participants then looked at printouts of the data coded in ATLAS.ti. Finally, participants reported their questions or comments to the researcher during individual face-to-face meetings.

Limitations and Assumptions

According to Yin (1989), many potential limitations of evidence appear during a case study (p. 80). Among those limitations identified in the present study were: (a) biased selectivity, (b) privacy, (c) bias due to poor questions, (d) incomplete recollection by the participants, (e) reflexivity in answers (when the subjects might have said what they thought the researcher wanted to hear), and (f) the limited availability of artifacts, documents, and records due to the relative age of the courses. Tellis (1997) described the potential of investigatory subjectivity or bias. To counteract the possibility of this bias, Yin (1993) proposed using multiple sources of evidence, establishing a chain of evidence, and having a draft of the report reviewed by key informants.

Certain assumptions that could influence the outcome of the research were:

1. The technical skills of the teachers in the study were assumed to be of sufficient level to be able to use the tools.
2. The three classes that were studied were assumed to include students of similar characteristics.
3. All participants understood that reputation and integrity had to be observed to help avoid ethical improprieties to which case studies are susceptible.

4. This study did not attempt to determine if online education was comparable to face-to-face education. Other studies have reported no significant difference in the achievement of students based on the modality of delivery (Russell, 1999).
5. Data collected through interviews were limited by the participants' honesty or accuracy of their responses, and interviews are difficult to replicate since the interviewer often influences the outcome of an interview by the subtle cues transmitted (Guba & Lincoln, 1981).
6. Each participant's schedule dictated the interview activity as well as subsequent discussion and observations (Stake, 1995).

Trustworthiness

The research standards of reliability and external validity are vital to the acceptance of quantitative research findings, but they are not as vital for findings of qualitative research (Bassey, 1999). In case studies where variables are not controlled and experiments are not conducted and the case itself is not represented to be a typical example of others like it, external validity issues are not as important (Bassey, 1999).

Lincoln and Guba (1985) instead proposed the concept of trustworthiness. They offered a series of questions to be answered during each stage of the research that would support such a concept (Lincoln & Guba, 1985). The questions used to support the concept of trustworthiness, modified to fit this research, are shown in Table 3. Guba and Lincoln (1981) stated that the triangulation of data was the "best means of ensuring that one were able to make sense of data collected through interviews" (p. 155). Though a certain amount of subjectivity inherent is in a case study, triangulation was conducted in an effort to reduce the likelihood of misinterpretations. Triangulation involves

Table 3

Questions Used to Support the Concept of Trustworthiness

Questions	Data Gathering	Data Analysis
Has there been prolonged engagement with data sources?	yes	yes
Has there been persistent observation of emerging issues?	yes	yes
Have raw data been adequately checked with their sources?	yes	yes
Has there been sufficient triangulation leading to analytical statements?	yes	yes
Has a critical colleague thoroughly tried to challenge the findings?	yes	yes
Is the account of the research sufficiently detailed to give the reader confidence in the findings?	yes	yes
Does the case record provide an adequate audit trail?	yes	yes

using a variety of data sources and includes printed matter, interviews, and field notes of observations (Lancy, 1993; McEwan, 2003; Stake, 1995; Yin, 1989).

Multiple sources of data were used and included documents, records, interviews, direct observation, and physical artifacts (Merriam, 1985; Stake, 1995; Yin, 1989). Cross checking data from multiple sources helped provide a "multidimensional profile of composing activities in a particular setting" (Merriam, 1985). Merriam (1985) further suggested checking, verifying, testing, and confirming data as an ongoing process that will save data gathering in later phases of the study and will help provide more confidence in the analysis.

Triangulation was an ongoing process as interviews were compared to observations, and observations were compared to field note analysis. Member checking is a process defined by Stake (1995) where material is given to participants for comment and review. Yin (1993) stated that three conditions would impact the design and trustworthiness of a case study: (a) the type of research questions posed, (b) the extent of control the researcher has over the actual events, and (c) the degree of focus of contemporary events. To this end, triangulation was accomplished through the cross-referencing of participant interview statements and evidence from the transcriptions of the Centra sessions. Two other online teachers and the researcher analyzed the notes and ATLAS.ti data to locate similarities and differences. Additionally, a doctoral student reviewed the data and analysis to provide additional triangulation verification.

External validity deals with generalizability. According to Merriam (1988), the reader of the research is the one who determines how generalizable the research is to another setting, but Bassey (1999) argued that in a case study, the research is not intended to be generalizable.

Setting and Subjects

The setting for this study was an online high school in a large school district in the Southwestern United States. The school served approximately 150 full-time students each semester and over 4,000 part-time students during a full academic year which included summer school. Nine full-time and approximately 40 part-time teachers taught in the program. All the teachers were fully licensed by the state and were considered highly qualified to teach under the provisions of the No Child Left Behind Act (U.S. Congress, 2001). A comprehensive catalog provided sufficient courses for students to graduate and

included honors and advanced placement courses. The courses offered included those completed by video or DVD, television broadcast, or online. This study investigated only the online courses designed by the three participating teachers.

Participants

Three teachers were selected to participate in the case study. They were selected with purposeful sampling (McMillan & Schumacher, 1997) to provide some stratification of experience in online teaching. To provide a level of anonymity, the participant teachers requested their identity be disguised. Mr. Able had been designing and teaching online classes for one year, Mrs. Baker had four years of online experience, and Ms. Charley was in her eighth year of teaching online. The different levels of experience in online teaching and instructional design provide some stratification of the participants. Participation in the case study was voluntary, and all participants signed an informed consent form. The three teachers volunteering for the study were all licensed in the state they teach, and all designed the courses they were teaching. The teachers participated in online instructional design training conducted by the school prior to taking on the design task.

Mr. Able had been a licensed secondary level teacher for 12 years and had been teaching online for one year. He was in his second year of online teaching and had already developed an online course that was categorized as mandatory for graduation. The name or topic of the course was not important to the case study. Mr. Able had also revised and taught an existing course and taught another course online as well. Mr. Able had some in-service training on instructional design, but had never conducted formative evaluations for any classes.

Mrs. Baker had been a licensed secondary teacher for 15 years, but had begun her fourth year of teaching online. During the semester under study, she taught both elective and required classes. Mrs. Baker had extensive online course development experience and had developed many other courses including honors level courses.

As shown in Table 4, Ms. Charley has been a licensed secondary-level teacher for 36 years. Ms. Charley had the most experience in the district as an online teacher, with more than eight years of involvement. The synchronous session of her course was presented each Monday evening for a period of three hours. The asynchronous portion, conducted using WebCT, was accessible to students seven days a week, 24 hours a day. The teacher generally logged on to the program and conducted course maintenance activities each day at 11:00 a.m. Ms. Charley conducted summer training sessions on online course development for teachers, but had not included the topic of formative evaluations in past trainings. Ms. Charley was also certified as a WebCT designer and conducted teacher training in the use of Centra. Teachers were asked to participate in the semi-structured interviews to begin the research process. Questions were asked regarding the expectations of the participants about their involvement and their expectations, as well as any concerns they had.

Teachers were also surveyed in an attempt to establish a baseline on their beliefs regarding student interaction with the curriculum. Following the analysis of the interviews and the surveys, the selected teachers were observed in class and during classroom practice. After all class observations were made and field notes were initially

Table 4

Participating Teacher Demographics

Teacher	Online Experience in Years	Total Experience in Years	Type of Course
Mr. Able	1	12	Required
Mrs. Baker	4	15	Required
Ms. Charley	8	36	Elective

analyzed, another round of semi-structured interviews took place. All references to names and schools were kept confidential in order to protect the anonymity of all participants.

The Researcher

McEwan (2003) stated that research can be "rendered nearly worthless" if researchers fail to disclose their biases, predispositions, and connections to the subject of the study (p. 84). The researcher must share personal biases, suggest alternative hypotheses, and "leave no stone unturned" to increase the believability of the explanations (McEwan, 2003). The researcher had no predispositions to the answers to the research questions and no supervisory connections or other professional connections that would render the participants' work "worthless." Any biases or other predispositions as discovered or revealed during the collection or analysis of data are described in Chapter 5.

The researcher, according to Guba and Lincoln (1981), functions as the data collector, the data interpreter, the data analyst, and the study administrator (p. 128). The researcher does not attempt to manipulate the environment, but wants to understand it. Guba and

Lincoln (1981) pointed out that the researcher must be responsive to the environment and to the people who create it. The researcher should be familiar with the environment, understand what is going on around him or her, and be able to speak and understand the language of the environment.

To this end, the researcher had previously worked with the participants and had been employed as a curriculum administrator in the online school; therefore, the researcher understood the environment. The researcher had also had experience as an online teacher an online student, and an online course designer using the instructional systems design process.

CHAPTER 4

FINDINGS OF THE STUDY

Purpose of the Study

This study examined the practices of three secondary education teachers who designed and delivered online instruction to ascertain the extent of their use of formative evaluation. The teachers selected represented the widest range of experience available at a virtual high school in the Southwestern part of the United States, from the one with the most experience, to the one with the least experience. Qualitative data were gathered from various sources: (a) interviews with the teachers, (b) an interview with an administrator, (c) observations of each of the teachers' classes over the length of a semester, and (d) from a review of artifacts from both synchronous and asynchronous class sessions including emails and teacher journal entries.

Research Questions

Three research questions guided the study.

1. To what extent was the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school?
2. What changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who

designed and delivered online courses at the secondary level in an online high school?

3. What standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating teachers?

Data Collection

Merriam (1988) described a case study as an intensive, holistic description of a social system or phenomenon emphasizing how people make sense of their experiences and the interpretations of the experiences. In the present case study, the phenomenon being investigated was how teachers conducted formative evaluation of the online courses they designed and delivered. An initial assumption made before the study was that the teachers were interested in improving both their design and delivery and would use feedback from actual classes they taught. What was not known in advance was the extent to which this would happen or the methods that might be used by teachers to obtain feedback in an online environment. The extent of their use of formative evaluation techniques if given specific training on such methods was also unknown.

In order to make sense of the experiences of the teachers and to provide interpretations of the procedures, a variety of data collection measures were used. The three primary data collection modes were: (a) semi-structured interviews with the teachers, (b) observation of their synchronous and asynchronous course delivery, and (c) an analysis of course artifacts. Course artifacts included Web pages, student work, online chat discussions, teacher journal entries, and emails.

Following the approval of the school principal, the school district, the university's Institutional Review Board, the research committee and upon obtaining the informed

consent of the teachers, a semi-structured interview was conducted with each teacher. Each participant was given a description of the study.

Initial Interview with the Teachers

The interview was conducted at a mutually agreed upon neutral site not on school district property. Each interview was conducted face-to-face with only the researcher and the participating teacher present. Each person was informed that the interviews were to be recorded on audio tape, and each was allowed to ask any questions before the recording started. Each interview took approximately 60 minutes.

The initial interview questions were designed to find out how much the participant knew about formative evaluation and determine what initial framework existed for the design and delivery of their courses (Appendix I). The questions varied only slightly with each participant to allow for exploration of information that the participating teacher wanted to provide. Each interview was audio-tape recorded, then transcribed into the ATLAS.ti qualitative analysis program (Muhr, 2004). The transcripts were printed and then read for initial analysis. Margin notes were entered on the transcripted pages. The participants were offered a copy of the transcription for member checking.

The findings from the interviews revealed that the teachers did think they were following an instructional systems design approach to course design, but they were not aware of the term *formative evaluation.* They also were not aware of any standards, framework or checklist that existed that would encourage the use of formative evaluation. Each teacher believed that obtaining feedback was essential to improving their design and delivery, but were not aware of any specific techniques that could be employed for such feedback. Each was an enthusiastic teacher, and said they put in more hours in their

online assignment than they had as a face-to-face teacher. Finally, each teacher believed they could benefit from additional training and standards in instructional systems design, and the specifics of formative evaluation.

Centra and WebCT Playback Analysis

Playbacks of classes from the third quarter of the 2005-2006 school year were observed via the Centra software program for the synchronous sessions and from the asynchronous sessions captured by the WebCT program. The school year is defined as a two-term system, and each term or semester has two quarters. Field notes were taken during the observation of over 40 class sessions and the three participating teachers during both the third and fourth quarters. The focus of the observations was on elements that would impact the use of formative evaluation in any way. Other than the assumption that teachers wanted to improve the design and delivery of instruction in their classes, no other expectation regarding the use of formative evaluation was made. The field notes were then entered into the ATLAS.ti qualitative analysis program and printed out for analysis by the researcher.

At the end of the third quarter of the 2005-2006 school year, a workshop was held with the teachers, introducing them to the formal process of formative evaluation and to specific techniques they could use to obtain feedback during their classes (Appendix II). Each teacher was informed that the use of any technique was entirely up to him or her as they were the owners of the course. The researcher would be looking for evidence of these or other techniques as they sought feedback, however.

Over the course of the fourth quarter, teachers communicated with the researcher via emails and through occasional journal entries reflecting on their practice. At the same

time, the researcher observed the Centra sessions and analyzed the WebCT sessions for evidence of formative evaluation or framework that influenced the use of formative evaluation. Field notes from these sessions were entered into the ATLAS.ti software, and printed for analysis.

The practice of open coding was used to begin the identification of recurring events. Coding, as described by Miles and Huberman (1994), is a way to assign categories of meaning to the information collected during a study. Miles and Huberman further described codes as being either descriptive, interpretative, or pattern based. Open coding elements are listed alphabetically in Appendix V. This list represented the first phase of coding.

Next, axial coding was used to identify common themes and to categorize the open coding. Axial coding is the second look at the data for the purpose of coding. In axial coding, the researcher begins with the organized set of initial codes developed during the open coding process. In the second pass, the focus was on the initial themes more than on the data itself, which was the focus in open coding. During axial coding, the researcher "asked about causes and consequences, conditions and interactions, strategies and processes, and looked for categories or concepts that cluster together" (Neuman, 2003, pp. 322-323).

The results of the axial coding process were labeled as "Families" in the ATLAS.ti software in which the data could be categorized. The patterns identified were determined by the researcher to be descriptive of the data collected. The actual content of either an observation, a response to an interview question, or other field note was then assigned to one of the patterns.

The families identified were: (a) tools/procedural elements, (b) communications elements, (c) instructional design/formative evaluation elements, (d) teacher elements, and (e) student elements (see Table 5). Following the establishment of the conceptual relationships through axial coding, the software was again used in the analysis to determine which codes were used with the most frequency in each family. The analysis then became a blend of both pattern analysis and content analysis. In pattern analysis, the content of the interviews and the data from the field notes were analyzed to discover and assign patterns. The codes were entered into a database in the software, and the field notes were then coded by creating a hyperlink to the appropriate quotation or statement. The results of the analysis of each of the five families along with the most frequently assigned codes to each family make up the framework of the findings of the field notes and other data entered into ATLAS.ti.

Table 5

Top Five Axial Families with Open Codes

Family 1 Tools/Procedures	Family 2 Communication	Family 3 ID/FE	Family 4 Teacher Practice	Family 5 Student Performance
technological-efficacy	barriers	FE technique	expectations	questions
tools	tone	Design	self-efficacy	reluctance
procedures	confusion	Delivery	exemplary	inappropriate
access	behavior	framework	practice	behavior
why FE	attitude	FE Evidence	questions	responsibility

Family 1: Tools/Procedures

The family of tools/procedures represented the collection of elements that framed how a class was run on a day-to-day basis and what routines and tools were used by teachers and students in reaching the objectives of the course either synchronously or asynchronously. The elements of tools included breakout rooms, emoticons, chat, playback, software application tools, and technological efficacy. The procedures included collaboration, group work, role playing, individual learning, class procedures, and exemplary practices. The most frequently occurring elements identified were technological efficacy, tools, procedures, and *why formative evaluation.*

Technological Efficacy

The technology used for both design and delivery of the classes impacted the results of the study in several important ways. While it enabled the possibility of online education to start with, it also created barriers to effective design and delivery as well as to the use of any formative evaluation process. Valuable classroom time was used in each session addressing the shortcomings of the technology. "Can you hear me now?" was a frequent phrase used by students and teachers. Audio problems were routine and included intermittent or complete drop-outs of voice due to network problems. Voice and sound from videos were heard in a variety of volumes depending on individual settings, resulting in a great deal of repetition or the abandonment of microphones in a switch to communication via the text chat mode.

The technological efficacy of online courses continues to improve, but it is not quite as reliable as it should be. The school dedicated several employees to the technical support department, and these individual were working with students, parents, and

teachers on a daily basis to keep the system running. An exacerbating factor was that each and every computer used may have had unique settings that needed to be configured or changed. The computers used by the students were not provided by the school or the district, but were the responsibility of the student.

The computers used by the students were sometimes the family computer, and the student competed for applications and settings with the rest of the family. During the semester, more than one student would exclaim, "Will you please wait a minute while my dad fixes my computer?" When the technology did work, which was the majority of class time, it still was not perfect. Downloads were slow for some students, video clips may have played or not, some students' screens were blank, while others saw what the teacher wanted the students to see, and both students and teachers found themselves exiting the program and reconnecting in an effort to get the job done.

Tools

The tools used in the conduct of an online class were different from those used in a traditional classroom. Bells, hall passes, chalk boards, overhead projectors, pointers, teacher and student desks, books, paper, and pencils were not used and could be considered relics to the online students and teachers. In their place were Internet connections, virtual white boards, computers, monitors, productivity applications, and the World Wide Web. Both teachers and students were still learning how to most effectively use these tools, and the introduction of the formative evaluation process was yet another complicating factor in how the tools could best be used.

The teachers in this case study used a variety of tools including:(a) writing and drawing on the virtual whiteboard, (b) PowerPoint presentations, (c) Web safaris (where

students and teachers explored World Wide Web programs), and (d) the icons that included a raised hand (i.e., so students could get the teacher's attention), a green check (i.e., so students could indicate agreement or understanding) and a red x (i.e., so students could indicated disagreement or a negative response). The three icons were the most used tools (see Figure 12). Students were directed to click the raised hand icon whenever they wished to speak up. A number was assigned by the student's name indicating which order they would be allowed to speak. Some teachers would use this tool to make every student raise his or her hand to compel him or her to make comments in the order hands were raised. Procedurally, it took some time for students to understand that once the teacher asked for comments, the students could respond in the order shown on the screen without having to wait for the teacher to call on them personally. This was used as a time saver. Students' participation was often measured by how many times they raised their hands and talked in class, not so much on what was actually contributed. Some students discovered a method of virtually waving the hand to get attention by toggling the raised hand on and off repeatedly.

The other frequently used tools in each class were the green check and red *x*. Teachers would use these tools to seek instant feedback. For example, Mr. Able would ask his students to "put a check when you feel confident you can list at least one fact." All the teachers would use the tool to find out if the technology was working. In each class a common phrase was, "Give me a check if you can see this slide." The red *x* was used to convey the negative answers to questions such as "Does anyone have any problem understanding this concept?" This was also a way the teacher periodically checked to see if a student was even online. When teachers called for a check or an *x* and

did not see any student response, they warned the student, and if there was still no response, the student was often electronically ejected from the class by the teacher, who essentially logged them out from his or her computer. The red *x* was also used as a non-verbal form of communication for objection or dislike in general, while the green check was used for approval and agreement. One teacher told the students, "If I start babbling too much, put a red *x* up so I'll know to shut-up."

Two other tools for the Centra software designed to aid in providing feedback were the laughter icon and the applause icon. By clicking on the laughter icon, a teacher or student demonstrated how he or she felt about the concept, statement, quote, or other communication made. The laughter icon did not appear frequently in any of the classes. The applause icon was a similar tool used to provide feedback usually following a presentation or at the end of the class.

Figure 12. Icons of the Centra Symposium application.

Procedures

Procedures were used to set up boundaries and rules for routine class management. Many procedures were standard in each class, but many others were specific to the teacher. For example, one teacher posted this request: "PLEASE!! Don't send unnecessary emails!" This exclamation was based on the sheer volume of emails the teachers dealt with on a daily basis. Teachers sometimes received hundreds of emails a

day. Unnecessary emails were defined as those that simply stated things like "Thank you for the quick response" or "Did you get my other email yet?" Students learned a number of procedures such as "You need to get permission before you step out" or "technological problems must be on file with the technology office or they will be counted against you." A specific format for email required the student to put the name of the course on the email, or the teacher might not open it. A procedure was in place regarding when an assignment would be available on WebCT for the students to do and when it would no longer be available. Students were instructed to post comments to the WebCT site at least five days each week. One procedure that seemed to contribute to overall student performance and motivation was that in order to be counted as present for the week, the student must communicate at least once a week with the teacher. This was most easily accomplished by attending the synchronous session. Some students would continue to login to each class in order to meet attendance requirements, but would still not do the required course work.

Why Formative Evaluation

This code was initially included in the family of instructional design, but it contained so many connections to procedures and tools that it was reclassified. The notes relating to this code show how the question *why* is important to the teachers and to the students as they negotiate the procedures that will be followed in an online class. The beliefs of the teachers regarding formative evaluation are a significant part of this element. For example, during the initial interview when asked for the meaning of formative evaluation, responses included, "If I could remember what you have told me before, it is a way of trying something out before it becomes permanent, but we don't have a chance to do

that." Another response was simply "I don't know what formative evaluation is." Finally, the third teacher stated, "I think I have used it, but I've never used educational jargon in my life, so I'd think you'd have to explain it to me and I'll tell you how I use it. How's that?" While each teacher had a varying understanding of the term, all understood why it was important to course design and delivery. Comments made during the second semi-structure interview of the teachers such as "It is valuable" and "A course is always evolving" demonstrated an understanding of the need.

Another belief of the teachers regarding the use of formative evaluation included "I don't think the course itself is evaluated by administration" or "I evaluate it, but I don't think anyone else does," and finally, "I've got a feeling most supervisors don't know what formative evaluation is." This is an indicator that the teachers might appreciate and value the process even more if someone else were involved in it. One teacher remarked, "It would be nice if someone else could actually take a look at my course." Another teacher thought so much of the process that she made a suggestion that "Teachers should have feedback surveys built in to get information from the customer just like businesses do." As one teacher explained in a post-interview response to why students should be involved, "How else are you really going to find out about your class?"

Family 2: Communication

Although each teacher spent a great deal of time and effort attempting to motivate and compel the students to have an active voice in class, both synchronously and asynchronously the students were often silent. Benfield (2000) summed up the challenge of online communication by stating that in the face-to-face environment, "the students' body language, the expressions on their faces, the direction of their gaze, the physical

agitation or lack of it, their under-breath muttering" (p. 4) gives meaning, and those cues that are taken for granted are absent in the online environment. From the student's point of view, the easiest thing to do, according to Benfield (2000), is nothing, which accounts for most of the silence in computer-mediated classrooms, including the ones in the present case study.

The creation of the communications elements as a theme was therefore based on the codes that influenced the ability of the teacher to establish meaning, understanding, and consistent communication. Among the elements were humor, discipline, frustration, motivation, encouragement, expectations, trust, and politeness. The five communication elements coded most frequently were: (a) barriers, (b) tone, (c) confusion, (d) behavior, and (e) attitude.

Barriers

The data representing barriers described how difficult formative evaluation could be in an online environment for a variety of reasons. The premise that communication could be more difficult online than in a face-to-face environment was reinforced by the many barriers that existed. For example, the barriers included equipment failure such as microphones or headphones as well as network issues that contributed to voice dropouts and slow downloads. Throughout the semester, it was common to hear statements such as "Centra is being a little wiggy today" or "Would you please repeat the question because I can't hear you?" Each teacher experienced network dropouts of varying length in every class session. In addition, while the WebCT software was more reliable, a number of barriers appeared regarding when assignments could be completed, when assessments were available, and how many and what quality of posts were expected from the students.

Sometimes the barriers also existed in the form of Internet browser issues such as a page not loading, or loading slowly, or having a pop-up blocker blocking course content. One student signed into class late and said, "Sorry I'm late but the Internet was down until my dad fixed it." Mrs. Charley often used the technique of calling the student on a regular telephone because the computer connection was not working. While this created a solution for the one student, it created another barrier while the other students waited online for the teacher to rejoin the session. Additionally--and frequently-- when a student would have an issue with the microphone or the transmission or reception of voice, the teacher would often resort to the use of text chat. The text chat was not generally visible to the other students and was not available for playback; thus that communication was essentially private, resulting in the withholding of feedback for other students.

Another barrier was simply stated by Mr. Able, "Time is the big thing." Each teacher stated that the large amount of content to cover took most of the time. Mrs. Baker said that "It (formative evaluation) takes an awful amount of planning, and there is simply not much time to do this sort of thing." Ms. Charley stated that "Not only are you struggling to decide just what to teach, trying to motivate the students to interact with me or with the content takes up so much time that there is little opportunity for formative evaluation."

Tone

An important aspect in collecting feedback from students for the purpose of formative evaluation is establishing some level of trust. The students are going to want to know that what they say is not held against them and that there should be some good reason for the student to want to provide such information. Without the benefit of other parts of face-to-

face communication, such as body language or eye contact, communications online, spoken or written, are not always received as intended. Many of the statements of the teachers were colored by the tone, though it was not always the color intended, according to the teachers. The tone of communication was selected as a frequent code to the communication family in the literary sense of conveying the mood or feeling, not in the linguistic sense of pitch in language.

The tone of many of the comments made by teachers and students alike indicated evidence to suggest a need to build trust and rapport. Even without hearing these statements or knowing the context, the tone of some of these statements indicated how communication impacted the use of formative evaluation. Appendix VI contains data derived from over 1500 WebCT and email postings provided by the teachers, and they are representative of written statements that convey a sense of mood or feeling. For example, one teacher wrote the following to a student:

> I am excited about the effort you are making in this class. I noticed that you were last in WebCT on May 3, 2006 2:28pm, keep up the good work! If you need any help let me know ASAP. Remember get into WebCT every day and keep posting your ideas/research in a timely manner.

Another teacher communicated the other end of a spectrum in this manner: "We have spent a great deal of time discussing how to be a successful online student and you seem to understand what it takes and have chosen to not be successful."

Some of the verbal comments included, "I'm not going to answer text questions; you are going to have to talk." When talking about the use of writing tools in Centra, a teacher stated, "Show some restraint using the markup tools. The administration was observing some of the classes and was not happy." That was followed up on another day

with "Remember they are still watching, they could look in at any time, so be careful what you write and what you are saying." In addition, the occasional, but infrequent use of humor included "Maybe you are not posting because you like this class so much you want to continue to hang out with me in this same class next year."

Tone was not reserved just to the teacher domain. Students were able to convey their feeling and mood clearly in comments like, "I have nothing to say, I have already said everything I've thought about." In one written posting, a student summed up a feeling with "I am just getting this. OMG I'm so lost."

Confusion

Confusion can be a normal part of some high school students, at least in the first few days of a class. In an online environment, however, the amount of confusion does not seem to decrease much as the class progresses. One explanation may be that these students have at least nine years of face-to-face classroom experience and know their way around the classroom, but they are still learning to navigate the online environment. Further, even the teachers who have a few years of online experience are comparing their experiences with a career of traditional classroom experience. Confusion impacts the process of formative evaluation with a student because it is hard enough to figure out what is expected in the online class without having to add the complexity of providing feedback on its effectiveness to the teacher. In addition, confusion impacts teachers as it keeps them from moving on to higher levels of learning with the students until it is addressed and resolved.

Evidence of the confusion element in communication was abundant throughout the semester. From the start of the class to the last class before the final examination,

students would make statements such as, "I still have no clue of what we are doing" or "I don't get the question" or "Where is the assignment in WebCT?" In some instances, the teacher and student both found themselves perplexed. For example, one student announced (during the first day of class) about an hour into the class that "I don't even have this class on my schedule." In addition, without a set time and a bell to announce the end, one student stated in the Centra session, "Is this like the end of class now?" Confusion is an indication that communication can be improved, and it is also an indicator of a need for formative evaluation as a solution to find and eliminate the points of confusion.

Behavior

Behavior is an element of communication that teachers seemed particularly ill-equipped to handle in the online environment. Some behavior impacts the use of formative evaluation and is not considered bad or inappropriate, such as the silence of students or the reluctance to be the first to talk or post or a tendency to procrastinate. Other behavior was inappropriate, such as when a class refused to raise their hands when requested, or they would leave the synchronous sessions without permission. The classroom management techniques of an online class are different from those of the traditional class and are still evolving.

One problem with Centra was that students could write on the virtual whiteboard space, and the teacher would not be able to identify which student made the comment. In two out of the three classes, students would occasionally challenge the teacher by making inappropriate comments or drawings. This behavior resulted in having those tools removed for all students for the duration of the class. A workable but time-consuming

solution was to give each student the tools on an individual basis when they needed to write. The problem with this solution was that it also required taking away the microphone from each student, so it further inhibited communication. Positive behavior was evident as well such as when a student commented, "I understand my project a whole lot better than I did when I first started." It was also evident by the number of students who were cooperative, responsible, motivated, and ultimately successful.

Attitude

The element of attitude related closely to tone and behavior, and it resulted in many similar codings. The attitude of a student would matter when he or she was being asked to provide feedback for the purposes of formative evaluation. The element of attitude had more to do with how just a few students approached their classes with a negative attitude, however. Most of the students exhibited a positive attitude in spite of not doing as much coursework as expected. The few who showed evidence of a more negative attitude may have influenced their classmates more than those with a positive attitude. It was noted that in the classes where one or two students actively confronted the teacher, an element appeared that affected the feeling of community. Some of the representative comments included, "I'm still trying to wake up and see things, can you give me a minute?" Another was," Why are we making this so complicated?"

On a few occasions, a teacher might make a statement that was intended to convey a sense of attitude that might also impact how formative evaluation might proceed. For example, one teacher announced to the class that more than 75% of the students were failing because they were not doing the required work. One student then clicked the laughter icon. On the other side, the teachers made many more comments to the students

that praised their work, encouraged them to continue their level of effort and participate actively. Their patience with the students was evident on such occasions when the honesty of the student was reflected in feedback to the teachers by statements such as, "One thing we talked about is things that don't interest me. Like to be honest, if it has to do with the government, I don't like it."

Family 3: Instructional Design/Formative Evaluation

The heart of this case study is the introduction of the process of formative evaluation as part of an overall instructional design and delivery system to online teachers who know they need feedback, but have not developed a process to obtain it. The analysis of the interviews, field notes, and other artifacts revealed several elements that connected either generally to instructional design or specifically to the process of formative evaluation. Some of these elements included teacher change, changes in practice, class awareness of formative evaluation, interaction, constructivism, and content feedback. The elements that were most frequently coded and thus reported in the data results were: (a) formative evaluation techniques, (b) course design, (c) course delivery, (d) framework, and (e) formative evaluation evidence.

Formative Evaluation Techniques

How teachers sought the feedback they needed to improve the course design and delivery was a focus of one of the research questions. It was determined that even though none of the teachers knew exactly what formative evaluation was, they all expressed support for the process. One teacher observed, "I realize I have practiced some sort of formative evaluation without knowing it was formative evaluation."

During the course of the observations, a variety of techniques used by the teachers was noted and ranged from informal questioning techniques to more formal use of written assignments. Additionally, a few evaluation tools were provided by the WebCT course design and delivery software.

WebCT provided a tool that kept a count of how often a student accessed certain pages: the homepage, contents pages, calendar, goals, and mail pages. While a simple count alone did not indicate how long a student spent on the page or how much information was absorbed, it was a valuable indicator of attention. Over time, this information helped teachers determine which pages were more useful to students. A comparison of these counts with other teachers indicated differences in design and suggested areas of improvement.

The technique of questioning the students directly to determine their understanding of material was an often used method, as it is during a traditional classroom setting. The difference was that the teacher could not see the student, nor could any of the students see each other. The result was often silence. Teachers would ask, "Do you feel kind of comfortable navigating around the area?" or "Let me know what your expectations are" or "I'm looking for ways to improve the class," or even "What did you like, what didn't you like, and what could be changed for the better?" The last question was notable because it occurred following the workshop on formative evaluation techniques that was held at mid-semester. Nevertheless, students were not enthusiastic about providing any response to the questions.

Prior to the workshop, the formative evaluation process was not formally used, but all three teachers attempted to obtain feedback. Mrs. Baker was particularly interested in

getting feedback when she asked her class in only the fifth meeting, "Did you like it, if so why? If didn't like it, if so why?" On another occasion, she asked her class, "Did you think it was fun, or did you think it was a lot of work?" Following the workshop, Mrs. Baker successfully used the one minute paper technique, described in Appendix II, as a way students could quickly list the main topics they understood during a class. One reason this process worked while others did not was that it became something that was graded. Mrs. Baker had previously offered extra credit for students completing formative evaluation techniques, with limited success. For example, she asked her students to write a letter to future students telling them how to prepare for the class, but because it was for extra credit, only half her class completed the project. Mrs. Baker stated that she later tried several other techniques without much success.

Each teacher experienced difficulty in getting the students to participate in the process of formative evaluation unless it was an actual part of the graded material. Ms. Charley began using a technique called Cornell Notes (WCU; 2006), which helped the students organize the content material and was considered by the teacher to be useful in promoting learning, but it provided little in terms of formative evaluation. At the end of the semester, Ms. Charley also held individual interviews with the students to help determine what could be changed in the course to make the students more successful. Again, the students were reluctant to provide that kind of feedback.

Design

Throughout the observation of both the synchronous and asynchronous sessions, it was apparent that a lack of standardization of design contributed to impeding the use of formative evaluation. Course design resulted in instances when a Web page would not

appear for one student, but would appear for another, for instance. To correct this design aspect, a teacher could have tried to view the page in a variety of Web browsers such as Netscape or Firefox to make sure the page would show up on the typical student's computer. Course design also resulted in the overabundance of material in the synchronous sessions of several courses so that there was not time to cover it all. To contrast, sometimes a normal 65-minute class ended in under 40 minutes. One teacher even mentioned that one of the main purposes of formative evaluation would be to help ensure the proper pacing of the course while making sure a variety of materials was available for different learning styles along with clear instructions.

Course design decisions in some sessions resulted in more student engagement and interaction. One teacher used a software application during course development to animate song lyrics and she combined the animation with audio in a short presentation that students watched again and again. This represented a level of effort that every teacher might not be willing to make, but it demonstrated how the effective use of audio and video could make a difference in the attention of some students. Mrs. Baker stated that she spent about an hour a week on the WebCT design and around seven hours each week on the Centra design. This was while the course was being presented. This degree of effort represented additional weekly commitment by the teacher.

Teachers who design courses at the online high school teach the courses they design as well as courses designed by other teachers or commercial firms. Preparation for developing courses came from professional development offered by the online high school. One course was offered in the philosophy of distance education by the instructional design department of the school, which consisted of one teacher and one

administrator. The administrator's primary focus at the time of this study, as explained during the interview, was on the design of videotaped classes.

Teachers were paid extra for developing courses. Either they got paid for an extra preparation period, or they were paid by the hour. On the average, a teacher earned about an additional $5,000 during a contract year for developing a course. This is in sharp contrast to the money paid to a private firm that develops courses. For example, a modern literature course was developed by a firm for the online high school at a cost close to $20,000. The online high school also purchased courses from Apex and from Class.com at a cost of approximately $100 per student enrolled in the particular course.

Delivery

Some differences of philosophy in the delivery style of the participant teachers was reflected not only in their design, but in their delivery. One teacher believed that freshman students would benefit more from lecture because they needed the foundational information that only the teacher could provide. The delivery via WebCT, though time consuming when replying to postings, was content-oriented, but generally consisted of trying to motivate the students to complete work. The WebCT application was where most of the assignments were found, as were most of the written student assessments. Though some threaded discussions and postings were required, the performance of the students was minimal. All three teachers tended to include a great deal of content in the Centra sessions as well, and their delivery style often reflected the need to include curricular material as evidenced by the observed frequent use of lecture.

The practice of course delivery online amplifies transitions from one point in a lesson plan to another. Evidence of this came from all three teachers when nothing was being

said by either the teacher or the students at certain times during the class. Using jargon of radio transmissions, this was referred to in the field notes as *dead air time*. Such silence in the face-to-face classroom is not as noticeable because other activities and non-verbal communications occur. In the online environment, however, silence was quite apparent. At times, dead air time exceeded several minutes. Dead air time might be considered time for reflection or simply wait time, but it came as often from the teacher's side as it did from the students' side, and students did not always have something else to do. The use of text chat during the synchronous session by the student and by the teacher took up some of this time, but the text chat was not recorded, nor was it seen by other members of the class. The teacher could easily get involved in addressing the needs of one student in the text mode, while the rest of the class sat idly. Other idle time was apparent when one teacher consistently used a 4-question true/false assessment at the end of class that would take an average of five minutes each class session. In 15 class sessions, this amount of time added up to another entire class period.

Framework

When these courses were designed, only limited guidance on the standards and expectations of the online course was available. The only clear documented standard was a course design rubric provide by the district and an expectation sheet the teacher signed at the beginning of the year that called for an annual review of course content. The expectations also required that the teachers make contact with each student at least once a week, but that was for attendance purposes, not for soliciting formative evaluation feedback. The expectation sheet given to the teachers by the school is shown at Attachment IV. Ms. Charley, the teacher with the most experience in online design and

delivery explained the process from several years ago, and how the teachers learned by listening to the other teachers' classes:

> I listened to their sessions, tried to develop a philosophy and from there it was just trail and error because there weren't any set materials on how to develop and teach a course that has synchronous and asynchronous activities in class, and I think it is still a work in progress.

During the administration interview, Dr. Delta talked about design standards and said that "we are working on one, but we haven't published it. Video is well documented, but due to a lack of staff, we just haven't got to the online courses." Dr. Delta indicated that some changes in the framework over the year deemphasized course design. The training had focused on how to use the online tools, not what was good for course design, and the latest changes focused more on content. Instead of having single teachers develop on their own as the three participant teachers had in this study, the school began assigning teams as course developers, consisting of a lead teacher along with several other teachers. They were considered content specialists, however, not instructional design specialists. The change resulted in an expectation that teachers would not make recommendations regarding course design or delivery.

Mr. Able noted the changes in the second interview when he said, "I'm not sure exactly where it came from, but every home page looks essentially the same and that is good, and it looks like they are making the look of the WebCT the same for every class." These are the kinds of changes that new teachers might not even recognize. For the three participating teachers, course design continued to be important. Ms. Charley stated, "Regarding design, I want to make sure I pace it right, and I have to include more materials for the different learning styles and I want to make the instructions more clear."

Formative Evaluation Evidence

To address the second research question of what changes occurred as a result of the use of formative evaluation, a code was needed: (a) to link to evidence of when formative evaluation was used, (b) to determine what evidence existed, or (c) or to figure out what evidence indicated a change. Though the field notes indicated several occasions when no evidence of formative evaluation was apparent, at other times, the teachers clearly attempted to gather feedback. This element was associated with an attempt to distinguish the actual technique used from the actual evidence it was used or needed. A code titled *change* had been used, but was not coded as frequently as this one.

The most commonly observed evidence of the use of formative evaluation was through questions and assessments. One of the teachers, when talking about one of the first courses she designed said, "I only had a short time to develop the course, from October to January. When I taught the course, every student failed. We knew that some changes needed to be made in the course design." Assessment of learning was accomplished through many of the same means as in a traditional classroom. Multiple choice tests, true/false quizzes, and both written and oral presentations were used. The tests were usually administered via the WebCT program and were available online only for about a week. Since students would take the examination online at different times, students had the opportunity to share information with each other regarding the test material; however, no evidence documented this occurrence in the field notes. In addition, for the final examination, students were required to be physically present and to present picture identification. To pass the class, a passing score was required on the final exam, regardless of the level of effort before the final.

Family 4: Teacher

The ways teachers attempted to motivate students, the time teachers spent on class design and delivery, and the methods they employed to adapt to different learning styles were among the elements coded as teacher elements. The elements that were coded most frequently were:(a) teacher practice, (b) expectations, (c) self-efficacy, (d) exemplary practice, and (e) teacher questions. Each of these elements could impact the use of formative evaluation and the framework of course development which was the focus of two of the research questions.

Teacher Practice

The *practice* code was selected to identify the specific practice of the teachers as they conducted their classes. The notes and quotations were often similarly coded under teacher beliefs. Teacher practice was coded based on a combination of observations and journal entries; of specific concern was what the teacher did in the delivery of an online class that he or she would not necessarily do in a traditional classroom. Additionally, differences in teacher performance in both the synchronous and asynchronous sessions were explored, and a few differences in practice were observed. For example, one teacher reported in a journal entry, "I don't feel that asynchronous discussions are a great way for students to learn much from each other." Another said the asynchronous discussions were not as interactive as were expected; he commented, "More often than not, the students are simply doing the minimum without any real interaction or learning." This statement was in stark contrast to many of the reports on the benefits of asynchronous sessions (Bourne, McMaster, Rieger, & Campbell, 1997; Palloff & Pratt, 2003).

The existence of both the text chat feature and the synchronous voice communication at the same time resulted in some teacher practices that could influence the use or results of formative evaluation. During an observation of a Centra session, while all the students were logged in, the teacher was heard answering questions with "yes" and "absolutely," though none of these students had been talking. It was determined that this teacher was responding vocally to written text questions. The other students would not have been able to hear the student side of the conversation. For this reason, all three teachers tried to establish procedures that required students to raise their hands virtually and speak their comments so they would be heard by the rest and recorded. The same teacher who was responding to text chat had warned the class two sessions earlier, "I'm not going to answer text questions; you are going to have to talk. Having a working microphone is a requirement of this class."

The practice of communication with the student takes on an additional dimension for a teacher in this online education program as it is not always clear when a student is actually engaged in or with the class. In the traditional classroom, a teacher can simply look around the class to make a quick survey of who is on task, but in the online environment it sometimes took a great deal of time to determine who was on task and who was not. With WebCT, it could have been a week before the teacher discovered that a student was not doing the expected work. Using Centra did not always reveal who was on task either, but did reveal who had at least logged in. One teacher said that an advantage of synchronous sessions was that a student could not hide in the back of the classroom as is sometimes done in a traditional classroom. Evidence showed otherwise, however, as sometimes the only interaction required was to put a green check or red *x* on

the screen. One of the teachers would verify everyone was present at the beginning by asking each student to say something, but after the initial check, most of the students would not say anything else. Another teacher would ask everyone to clap if they were there, and in one session was heard to say, "Well, that's most of you."

When a student did not respond to a request such as "clap your hands," the teacher would connect with the student via text chat or even a phone call. The ultimate consequence for a student the teacher could not connect with was to be ejected from the class. This practice was adopted following several experiences by teachers who found out through parent conferences that a student would log in at the beginning of the class and subsequently go do something else, maybe even on the same computer. If a student was ejected from class, the parent would have to be notified, and a face-to-face conference would be held with the parent, the student, and the teacher.

Parent conferences were another practice that differed for a teacher online, and may have affected the use of formative evaluation. All three teachers generally did not look forward to parent conferences over the phone. While it was apparent during some of the class observations that parents often monitored their child's class based on questions and comments from the students, not one instance was observed in which a parent attempted to communicate with the teacher during class. Some questions from students were prefaced with, "My Mom wants to know...," and sometimes an adult voice could be heard in the background when a student was attempting to answer a question in the synchronous environment. The preferred method of communication with the parent was through email. When discussing phone calls to parents, one teacher stated, "I just don't like to do that because sometimes you end up talking for 20 or 25 minutes, and while I

care about the student's work, I have so many parents to talk to and it ends up taking so much of my time."

Expectations

The expectations coding reflected a combination of both the expectations the teachers had of the class and of how the teachers conveyed their expectations to the students. Some instances of student comments that reflected the expectations as well. Expectations were important as they could have influenced the outcome of formative evaluation practices. Positive expectations were made by all three teachers from the start of their classes. In his first session, Mr. Able told his students, "My goal is to have you learn the material." Mrs. Baker told her class that she was interested in helping the students develop higher order thinking skills, and Ms. Charley told her students that "you will get out of this class what you put in to it."

As the course progressed, the expectations of the teachers about the students reflected a change. For example, in a journal entry made at mid-semester, a teacher wrote, "More often than not, the students are simply doing the minimum without any real interaction or learning." This had an impact on how the teachers conducted their courses as evidenced by the statement, "I found I became more involved the less prepared the students were."

Expectations of the students reflected this change, as stated by a teacher who was providing feedback to the students about their test scores. The teacher said, "The good news is that I did not record these scores because I figured most of you would not do well, and I was right." Another teacher told the students, "It's important that you keep up and understand what we are doing but I have no information from any of you." One teacher ended a course near the end of the fourth quarter by playing a song file and telling

the students, "This one is for you." The lyrics of the song said, "I don't want to work; I just want to bang on the drum all day." Trying to convey to the students that it was never too late to give an effort, one teacher said, "It may be impossible to pass at this point, but you may still show what you are capable of."

Self-efficacy

How the teachers felt about their own practice, especially regarding course design and delivery, was another element that was considered to have a possible impact on how they used formative evaluation or how they may or may not implement changes based on the use of formative evaluation. A teacher who believed he or she was strong in one particular area may not have been as receptive to the feedback in that area as he or she would have been if it was about an area that he or she perceived as a weakness. This coding attempted to identify instances where teachers revealed elements of their self-efficacy.

As part of the second interview, teachers were asked to identify what area or areas they thought needed improving. One teacher stated, "The asynchronous discussion portion of my classes is where I feel I have always come up short." Another stated, "I feel like my discussions have improved over the last year, mostly because I am monitoring and responding more frequently. Nevertheless, I think I could definitely improve in that area." In recognition of a need to be student-centered, one teacher stated, "I'm trying to get away from the sage on the stage stuff that doesn't always work in a bottom level class."

The three teachers all exhibited pride in their course design and delivery and were able to express when the class did or did not measure up to their own expectations. After

reviewing one class, a teacher said, "Sometimes when I go back and look at them, I think, well, this was just boring and didn't motivate the kids." Pride in the work they were doing was evidenced by comments such as:

> I try to get good backgrounds and pay attention to the font that I use and colors I use, stuff like that. I never hear that these are so much better that the other teachers, but I basically structure all my classes the same. Maybe my courses aren't going to win any prizes, but they aren't bad.

It was one thing to reveal shortcomings to a researcher, but some teachers also shared some of their self-efficacy feelings with their students. One of the teachers stated that "some teachers are simply afraid of asking the students about their teaching style and take the safe way out by not asking." Following a particularly long lecture, Mrs. Baker once told her students, "Whew, that's a lot of talking." On another occasion when Mrs. Baker was asking questions about the course design and was not getting any response from the students, she said, "I have to know better than to ask open ended questions like that." During an early course session, a teacher using some of the application sharing tools asked the students, "Can you see what I wrote on the bottom of the slide?" When the students responded that they could, the teacher wrote, "Good, I wasn't sure if I could actually write notes below it or not." Ms. Charley, the teacher with the most experience stated, "I did way too much talking tonight." On another occasion while Ms. Charley was having some difficulty using an application online, she told the students, "I will try to find out how to manipulate this better, so please be patient with me."

Exemplary Practice

The coding for exemplary practice was discovered as a means for identifying some of the particular activities regarding design, delivery, or framework exhibited by the

participating teachers. Each teacher added some elements to the conduct of formative evaluation that were not among those covered in the workshop. For example, Ms. Charley incorporated the use of video summaries made by the students as a means of getting student feedback about the course. She also instituted the use of Cornell notes (WCU; 2006) as a process so students could make marginal notes that would reflect not only on the curricular material, but on the students' impression of design and delivery. Mrs. Baker developed a class project that involved the creation of a Web site that would include the elements of the course. The site was developed by students in a collaborative effort. Mr. Able and Mrs. Baker both made changes in their student assessment strategies based on the feedback they received from students, and they made it clear to the students that the changes were a result of their comments. Making sure the students knew that their feedback was valued was presented as a critical factor during the workshop. Ms. Charley's ideas of having other teachers involved in the formative evaluation process instead of relying just on students came out at the second interview. She stated, "I think teachers should have other teachers look at their class for strengths and weaknesses." Collaboration such as that would have an impact on the use of formative evaluation.

Questions

The questions posed to the students by the teachers that were not directly related to the curriculum revealed a concern for the kind of feedback that formative evaluation could provide. In an early class, Ms. Charley asked her students to talk about why it took longer for students to express their ideas in the first original post in the threaded content of WebCT. The intent was to get the students to think about the communication process. She also asked her students to "think of a question you've always wanted to know the

answer to." Teachers asked the students to think of how they could be successful in the class, how students could be motivated, what the students' expectations were, and what questions they had about using the tools. The most frequent line of questioning for the teachers had to do with student performance, such as "Is this really how you want to represent yourself?" or "Why aren't you doing the required work in WebCT?"

One question that demonstrated how loose the feeling of control could be at times was when a teacher asked, "Are you still with me?" In some instances, the Internet connectivity was so poor that the teacher would log out and log back in. The teacher could get an idea of exactly what the student was seeing by using another log-in and enrolling as a fictitious student, but since so many different Internet providers were used, one student could have a clear connection while another struggled to stay online.

Family 5: Student

Though the case study focused on the design and delivery of online courses by the three teachers, student elements influenced the teachers' use of formative evaluation, thereby influencing the outcome of the study. The role of the student was crucial to the methodology chosen by the teachers to obtain formative evaluation feedback, as they were not relying on other sources such as peer teachers. The student elements that demonstrated evidence of impact on the research questions were: (a) performance, (b) student questions, (c) reluctance, (d) responsibility and (e) inappropriate behavior.

Performance

This element was used to code evidence of how student performance connected to the use of formative evaluation. The results of these observations showed a few positive notes related to performance, and a majority of notes demonstrated more a lack of

performance. On the positive side, one class, made up of honor students, demonstrated how collaborative effort, community building, and commitment to success could result in every student's earning an *A* at the third quarter break. This class provided the most input regarding formative evaluation and needed the fewest requests or additional direction from the teacher to do the required work. The class met the graduation requirements, so it was valued by the students. A class taught by another teacher was also a requirement for graduation; however, the majority of the students in that class did not earn a passing grade. The one class that was an elective had a mixture of grades approaching a normal distribution.

Student Questions

No student questions were noted that dealt directly with feedback on course design or delivery. Only an occasional question dealt with trying to understand curriculum material. Most student questions reflected their desire to be told what do to and what to know. Ms. Charley reflected that it was difficult to seek feedback about course design and delivery from students who were more interested in their own performance. Even the students enrolled in the honors course asked questions that had to do with where last week's assignments were found, when assignments were due, what was missing, and how they should send an email. Students were also occupied with their grades, even if they knew they were low. Nearly every session had questions about grades such as, "Does that mean we won't get our points for the day?" An abundance of questions reflected confusion, such as "What was the question?" Students wanted to know if they could still make up work, could get extra credit, and could learn the playbacks worked. It did not appear to make any difference if the environment was synchronous or asynchronous

regarding the nature of the questions. A theme of "What am I supposed to be doing?" was common.

Reluctance

The reluctance of students to participate in the formative evaluation process was expected by the teachers after their realization that the students were reluctant to participate in class at all. Even when compelled to talk for class or post to the threaded discussions, the students were reluctant to comply. Mrs. Baker stated that "it seems the students aren't as willing to give feedback as they are to receive it." The reluctance took several forms, mostly as passive reluctance in the form of questions such as "What do you mean, what do you want me to do?" Often a teacher would ask a question and silence would ensue for two minutes until a student would raise his or her hand. The raised hand, perceived by the teacher and the rest of the students with anticipation as it was by the researcher during the playback, disappointed everyone as the student would just ask, "Can you repeat the question?" Two of the teachers were observed in several class sessions repeating the questions as many as three times. At one point, a teacher said to the class, "I see a lot of good questions on text chat. Why don't you raise your hands and ask them out loud?"

Inappropriate Behavior

This code is distinguished from the earlier code of behavior as this category captured specific behavior that required some form of corrective action. As one might expect, classroom management has been an important factor to consider in the delivery of online courses. Though one of the teachers said that an advantage of the online environment was

that fewer discipline problems occurred, the inappropriate behavior of some students had an impact on the use of formative evaluation for the participating teachers.

As a condition of enrolling in the virtual high school, each student had to sign a document called the acceptable use policy (AUP), which specified expected online behavior such as polite and respectful communications and prohibited use of the district network for commercial purposes, and sending or receiving inappropriate messages or images. Students who violated the AUP, as a few did during the semester observed, were subject to the disciplinary action of the teacher or administration. Though not apparent during course playbacks, an occasional absent student might have been because the student was suspended from class for a session. Continued flagrant misbehavior resulted in expulsion or in a prohibition from returning to the virtual high school for courses. Only a few instances of violating the AUP were observed, and, with one exception, involved the behavior of an isolated student or two, not the entire class. On one occasion, profanity was written on a whiteboard application, but the student who wrote it could not be identified. This was a shortcoming of the Centra Symposium software. On one other occasion, a student argued with another student during class, and the student said, "He is nitpicking everything I said." The teacher handled it, and no other incidents of that nature occurred. During parent conferences, it was revealed that often the students who were referred to the office for misbehavior were referred by more than one teacher, and they had a history of such behavior in the traditional classrooms as well.

Responsibility

The last code defines what all three teachers described as one of the most important traits of a successful online student--student responsibility. As evidence in the present

case study showed, if formative evaluation is to be accomplished with the assistance of student feedback, the results will be influenced by the level of student responsibility. Each teacher made clear to his or her students the burden was on the student to get things done--and done on time. Many comments were made such as, "You have an individual responsibility to get things done," or "I see that some of you have not been going into WebCT everyday as you should," or "You are responsible for your own learning."

Ineffective time management was often cited by the teachers as a reason students did not participate in class and as a result, in formative evaluation activities. Consequently, teachers who had to spend more time on getting the students motivated to do the curriculum work had less time to concentrate on improving course design or delivery.

Research Question 1: The Extent of Use of Formative Evaluation

The first research question was: To what extent was the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school? Table 6 presents a summary of data used as evidence of the use of formative evaluation. Although the teachers and the administrators acknowledged they did not previously know about formative evaluation until this research project began, the participants all agreed on its value. Based on observations of classes conducted prior to the formative evaluation workshop, teachers only occasionally took specific measures to obtain feedback from the students about design and delivery. Even then, the measures were limited to questions posed by the teacher, and the response from the students was quite often silence.

Table 6

Summary of Sample Data as Evidence of the Use of Formative Evaluation

Number	Code	Teacher Quote or Note
1	P38:1	Teacher has the tools in WebCT to check how often students access certain pages.
2	P41:6	I will sometimes use the technique of class discourse when we need to gather a lot of information about an event or concept.
3	P44:1	Please give me a check if you have access to the Learning Channel.
4	P43:1	WebCT also has a self-test evaluation tool that could be used to solicit feedback following a unit.
5	P54:1	If I start babbling too much, put a red *x* up so I'll know to shut-up.
6	P63:1	The teacher covered how to use check marks, red *x*, laugh icon, applause.
7	P74:11	The teacher asked the student to bring up his text comment to the rest of the class as everything is debatable in the class.
8	P81:13	The teacher asked a student who had not been participating to give her impression of the day's lesson.
9	P81:15	After thanking class for participation, all students applauded.
10	P90:2	Would you rather review on the 25th, if so give me a green check.
11	P92:2	The teacher gave extra credit to students who would write a letter to future students about the class.
12	P94:2	A student reported that the text on a web site was too small to read.
13	P102:7	Sometimes some of the links don't work. A student has to speak up.
14	P103:11	If you can't use WebCT, we need to find an alternative.
15	P110:10	I want to stop for just a minute and give you a chance to ask questions.
16	P112:1	The teacher started class by asking each student to raise his or her hand and give a statement about what they learned last week.
17	P117:15	The teacher put students in groups called breakout rooms to discuss questions about the day's lesson.
18	P82:8	Does anybody have any other ideas about that?
19	P84:5	We will have to make up some things as we go along.
20	P97:9	I've always encouraged students to give me feedback.
21	P97:32	It is valuable. Most teachers must do some form of formative evaluation.
22	P110:13	I want to stop for just a minute and give you a chance to ask questions.
23	P127:44	I think formative evaluation is a good thing to go through.
24	P127:50	I think it is a powerful force in what we do, you just need the time to get it done.
25	P114:3	In response to a query to look at a slide and tell what they find interesting, a student said, "I'm not sure what you mean by something interesting."
26	P127:10	If the students were not very active in the amount of work they were doing, there is no sense in asking them what they thought could be improved or to give an evaluation of something they didn't even do.
27	P127:13	Sometimes you don't get good feedback from the students.
28	P97:13	I think I need to give them more chance to give me feedback during the class.
29	P97:15	I'm thinking about using Centra to explore instead of content delivery.

Following the formative evaluation workshop and the initial interview process, the teachers and administrator had a greater awareness of the system of instructional design and a realization that formative evaluation was a critical piece of the system. The evidence of this was in their responses to the second interview and, to a limited degree, their actions to try specific formative evaluation techniques during the second half of the semester.

Research Question 2: Changes in Practice or Design

The second research question was: What changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who designed and delivered online courses at the secondary level?

The answer to this question was based on an analysis of interview responses, journal entries, emails, course artifacts and class observations via Centra and WebCT. Table 7 presents the data supporting the findings and shows there were several changes in practice and changes in design that took place during the semester. The design and delivery of online courses seemed to take a great deal of the teachers' time.
Every teacher indicated that he or she worked more hours than were expected. Every teacher also indicated that time was the major barrier to making changes to the course

One benefit for the teachers who participated in this case study was the opportunity to reflect on their own practice. As indicated by the field notes, each of the teachers had opinions about his or her own efficacy, and all were willing to acknowledge areas in course design or delivery that they wanted to improve. The process of formative evaluation not only forced the teachers to be more reflective about their practice, it also

left an audit trail of their accountability for the success of the student. This may prove to be of use as the exploration of incentives such as merit pay continue to be explored.

Research Question 3: The Framework for Course Design or Delivery

The third research question was: What standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating teachers? The framework of course design continued to improve as the research project progressed. Because the school was so new, emphasis had been placed on the video courses that had been the staple of the district's distance education program. As more and more online courses were offered, however, the school began to strengthen the course design process. The framework that makes up the conditions in which courses are designed and delivered is made up of policies, procedures, practices, attitudes, and beliefs. The virtual high school in this study had an instructional design department that had been working on the development of several comprehensive lessons to cover the design and delivery of both video and online courses. Two courses that were completed and presented to teachers prior to this study were Introduction to Distance Education and Introduction to Centra . Many more courses were in the planning stages including: (a) Conducting Asynchronous Online Discussion, (b) Course Development for Distance Education, (c) Full-time Teaching for Distance Education, (d) Part-time Teaching for Distance Education, and (e) Introduction to WebCT.

The interview with the administrator revealed that most course design up until the time of this study had been focused on video courses, not the online courses. The school was working on course design standards for online courses but had not yet published them. The teachers in this study did not have formal training from the district in course

Table 7

Summary of Sample Data as Evidence of a Change in Practice/Design

Number	Code	Teacher Quote or Field Note
1	P41:12	I don't feel that asynchronous discussions are a great way for students to learn much from each other.
2	P:84:1	Maybe I'm making this project too difficult, so let's talk about it.
3	P84:3	We are doing this instead of multiple choice tests and other more basic tests.
4	P97:17	I wonder if they might be better off if they had just one activity to do.
5	P127:20	I'm making video summaries of material that I will begin to include.
6	P127:26	I've tried to have everybody post on WebCT and everyone raise their hands.
7	P127:45	I think teachers should have other teachers look at the class for strengths and weaknesses.
8	P41:10	The asynchronous discussion portion is where I feel that I come up short.
9	P41:13	I feel like my discussions have improved, mostly because I am monitoring and responding more frequently.
10	P97:14	I've been doing better on wait-time.
11	P97:42	Maybe mine aren't going to win any prizes, but they aren't bad.
12	P127:1	Student surveys on the ways students learned best might help to get an idea of their learning style.
13	P127:27	I tried to get them to ask questions about other students' projects, but it was difficult for them.
14	P41:7	I found I became more involved the less prepared the students were.
15	P41:8	If a student seems to have a good handle on the situation, I am more likely to sit back and monitor.
16	P41:11	More often than not the students are simply doing the minimum without any real interaction or learning.
17	P112:2	Most students said they really didn't remember what was covered.
18	P43:2	I did not see any topics in the discussion forum of WebCT that related specifically to formative evaluation.
19	P49:11	I change my information often because I want to keep it current for you.
20	P95:3	I always go back through my course slides to see what I want to change.
21	P96:3	Sometimes I'll take out an assignment that didn't work that I really didn't care for.
22	P96:4	The course is still a work in progress, so every week I'm adding things to it to make it better.
23	P96:6	Because it's a new class for me, I spend four hours a week doing the Centra presentation for this course and an hour or two on WebCT.
24	P126:12	Across the board there has been improvement because they are making the look of the WebCT the same for every class.
25	P126:18	I increased the use of discussion.
26	P127:16	I tried some new strategies to make sure if the students were having problems
27	P127:17	I could find out what the issues were.
28	P127:22	I will also work on more mastery, and we'll see if that works.
29	P127:41	I'm also giving more points for asking questions in the class and for participating.

design, but one of the teachers had completed an instructional design course for face-to-face classes at the local university. In discussing the course design framework for the virtual high school, the administrator said that no emphasis was made on formative evaluation, and he acknowledged that without it, the system was incomplete.

The teachers corroborated the interview answers of the administrator regarding the state of course design standards and their framework. All of them agreed with one teacher who said, "We were pretty much on our own for course development, but now I hear they have a team approach." The administrator said that the team was comprised of content experts, but not course design or delivery experts. Many members of the team were not even distance education teachers, but took the part-time jobs to help create new courses while they worked full-time at a traditional school.

The artifact shown in Figure 13 is a concept map of the course design and delivery process formulated by the virtual high school during the conduct of the research for this case study. The figure indicates that, while a framework for instructional design was considered, the framework did not include the process of formative evaluation. The framework mainly covered curriculum content and technology tools, but was evolving to include instructional design and delivery training.

The course titled Introduction to Distance Education was the one course required for newly hired teachers to complete in order to teach at the virtual high school. The existing framework for course design and delivery had its roots in the introductory course. The course was a hybrid of face-to-face meetings, Centra sessions, and WebCT materials. The overall course outline included the mission and vision of the virtual high school,

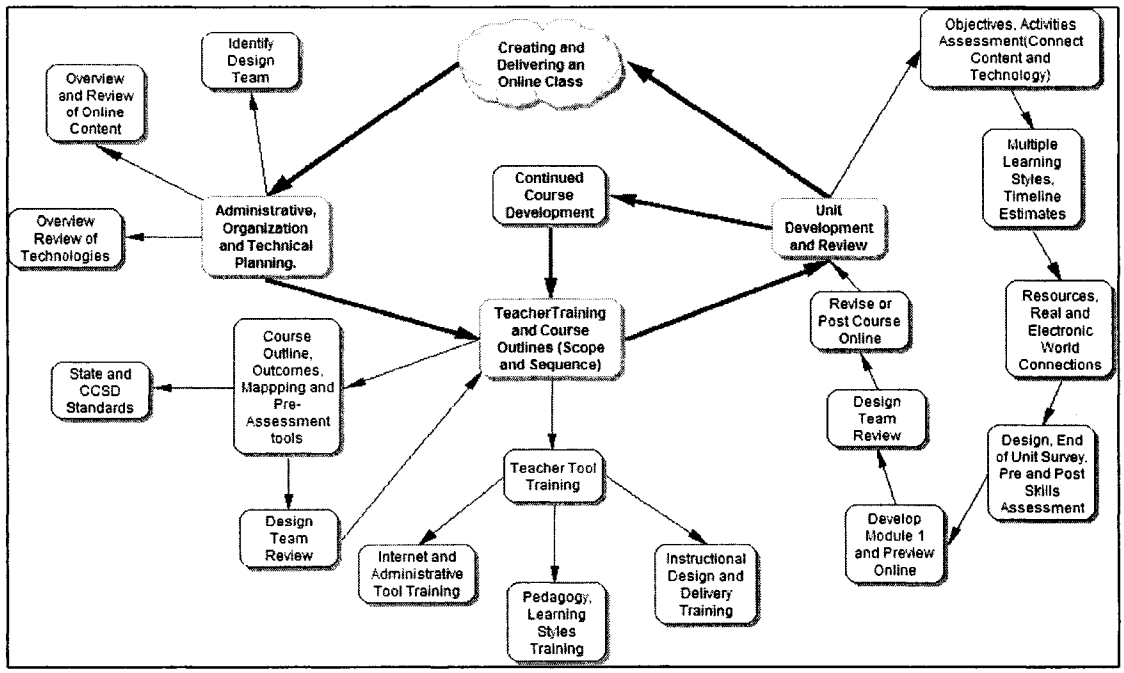

Figure 13. Existing framework for creating and delivering an online class from the school in the present case study.

computer fundamentals, teaching methods, and teacher evaluation. The design and delivery of online courses was primarily covered in the teaching methods and teacher evaluation modules.

The teacher methods topics included articles and Internet links on topics that included interactive learning, online community building, planning, clarity, timelines, and basic web design elements. Each module included assignments for the teachers to get them immersed in the topic to the degree that they could participate in discussions and build presentations to the other teachers in the class.

The teacher evaluation module covered the evaluation phase, but it did not include a description of the different forms of evaluation--either formative or summative. The

intent of the course was to introduce teachers to some rubrics they could use to help evaluate the courses they were either teaching or developing.

In addition to the professional development courses, occasional presentations on teacher practice were conducted during the annual staff development days during the academic year. One related subject was called Facilitating Online Discussion. The limited training included how to set up groups in WebCT and how to use PowerPoint files in both the Centra Symposium and WebCT applications.

Table 8 presents a summary of data considered indicative of evidence of what framework existed to influence the use of formative evaluation at the online high school. Statements made by the teachers regarding the lack of a framework included, "I've got a feeling that most supervisors don't even know what formative evaluation is." Another indicator of a lack of framework was in the statement, "We never had formative evaluation as part of our teacher preparation even when I was learning to be a teacher." The results of this study of the formative evaluation practices of online teachers indicated that, while teachers agreed on the value of formative evaluation, it was not a high priority for them at the course delivery phase. As such, very little formative evaluation was conducted even following the training of the teachers on specific formative evaluation techniques. Inhibitors included the lack of time, the lack of professional development on the subject, the lack of a formal framework for course improvement, and a lack of motivation from the students.

Table 8

Summary of Sample Data as Evidence of a Framework that Influenced the Use of Formative Evaluation

Number	Code	Teacher Quote or Field Note
1	P45:1	Both a.m. and p.m. classes could not be played back.
2	P46:1	I'm not going to answer text questions, you are going to have to talk. Having a working microphone is a requirement of this class.
3	P48:6	A student noted that the teacher was cutting in and out of the network.
4	P48:7	If your microphone is cutting out, we can always use text.
5	P48:11	Kill the popup, nothing I can do about those, I get them, too.
6	P49:13	A page was blocked and a student asked if her stepdad could unblock it for her.
7	P50:5	The teacher suggested she wait until after class.
8	P64:22	Are you guys seeing anything?
9	P67:9	The teacher responded to students with their hands up, but did not call on a student who did not raise his or her hand.
10	P71:13	The teacher tried to play a wave file, but there was a black screen.
11	P71:14	You guys couldn't see the video at all?
12	P102:6	The teacher told them to watch it on replay, but it didn't work there either.
13	P108:1	Sometimes things don't show up when they should.
14	P95:8	Even on the last day of class, students had trouble connecting.
15	P95:9	We never had formative evaluation as part of our teacher preparation even when I was learning to be a teacher.
16	P95:17	I've got a feeling most supervisors don't know what formative evaluation is.
17	P96:8	Students are not geared for feedback, just for giving answers.
18	P97:6	But yeah, I don't know what formative evaluation is.
19	P97:8	I think the students would rather the teacher just tell them what they need to do.
20	P97:11	I realize that I have practiced some sort of formative evaluation without knowing.
21	P97:12	There are students I wouldn't ask because they would not give honest feedback.
22	P97:45	Also, sometimes they just don't have enough experience or knowledge about a process to give feedback.
23	P98:17	More training of formative evaluation could be useful for us.
24	P99:24	To be honest, there was no process on how to teach students online.
25	P126:8	They don't like it, so they don't really want to give more information about how the class is conducted.
26	P126:22	Students don't like to work so they are going to tell you what is easier for them.
27	P127:37	The school does not like change.
28	P127:38	Sometimes you don't get good feedback from the students.
29	P96:23	Some teachers are simply afraid of asking the students about their teaching style.
30	P97:37	I'm pretty much on my own when I'm developing that stuff.
31	P97:38	Now teachers are not having access to the course, so they can't edit it.
32	P99:3	They are no longer getting training in the tools to do the editing.
33	P99:7	Previously, a course was designed all on their own, but a lot of it in previous years was trial and error.
34	P99:12	Design standards, I don't think we have them for online courses. We've been working on one, but we haven't published it.
35	P99:16	Most of their training was in how to use the online tools; it was not in what is a good design for an online course, we don't get into learning styles. We are not doing design well at this point.

Summary

When used, the results showed formative evaluation resulted in numerous course changes not only in design, but in delivery as well. Some differences in the amount of formative evaluation attempted appeared after the workshop. The awareness of formative evaluation as a process caused the teachers to think more actively about it, as evidenced by their discussions.

The framework for the use of formative evaluation was non-existent. Teachers and administration agreed through their interviews that the process could add value to the design and delivery, and were all eager to use formative evaluation as a tool.

CHAPTER 5

DISCUSSION

Purpose

The purpose of this study was to observe the extent to which the techniques of formative evaluation were used by teachers who designed their courses and delivered them as part of a virtual high school in which all classes were delivered online. These three questions guided the study:

1. To what extent was the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school?
2. What changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who designed and delivered online courses at the secondary level in an online high school?
3. What standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating teachers?

Summary of the Study and Findings

Three over-arching findings emerged from the analysis of the data. Addressing the first research question regarding the extent of the use of formative evaluation by the teachers, all the teachers and the administrator acknowledged that the use of formative

evaluation was beneficial to improving the design and delivery of the class, but their practice demonstrated that it was not a priority and was seldom used. Regarding the second question on what changes took place in design or delivery following the application of formal instruction in the process of formative evaluation, several minor design changes were made to courses as a result of the formative evaluation that was conducted, but the primary change was in the realization by the teachers that methods were available to aid them in obtaining feedback on design and delivery from students. In a search for standards, checklists, or frameworks in support of the use of formative evaluation posed by research question three, the findings suggest no standard, checklist, or framework was in place that encouraged the use of formative evaluation, but there was some limited framework guiding course delivery. A proposed framework including formative evaluation as a routine part of course design was a result of this study.

Methodology

A full semester of courses designed and delivered by three teachers at an online school were observed via Centra Symposium software, as were the class contents of 18 weeks of asynchronous sessions and threaded discussions via WebCT software. Over 2,500 emails were reviewed for evidence of data pertaining to the research questions. The first of two semi-structured interviews with the teachers was conducted to establish their baseline knowledge of the principles of formative evaluation and were recorded on audio tape. Following the individual interviews, a workshop was held with the teachers to introduce the concept of formative evaluation and to teach them a variety of specific formative evaluation techniques they could use as part of the instructional design

approach to their classes. Appendix II is the handout used by the researcher to conduct the workshop, and given to each of the three participating teachers.

Classes were observed using WebCT files and Centra sessions that had been recorded during the third quarter. The research focused on the extent to which formative evaluation was used prior to the workshop, and the framework that existed guiding the use of formative evaluation. As the teachers conducted the fourth-quarter classes, the rest of the semester courses were observed via software playbacks. During the fourth quarter, teachers communicated with the researcher via email, and included occasional journal entries. After the course was completed, a second semi-structured interview was conducted with the teachers to explore their experiences with the use of formative evaluation. The final interview was with an administrator, to gather information related to the framework of course development. The interview was audiotaped, transcribed, and transferred to the ATLAS.ti software, along with the field notes from the observations, as a database for later analysis. The data were carefully read and analyzed for common themes or patterns, and the process of coding the information was begun.

Research Question 1

Question one investigated the extent to which the process of formative evaluation used by teachers who designed and delivered online courses at the secondary level in an online high school. Very little evidence of the use of formative evaluation either before of after the workshop was apparent, even though the teachers and administrator voiced a belief that the use of formative evaluation would improve course design and delivery. While the teachers believed they were using a systematic approach to instructional design, the case study data revealed that the teachers did not know about the formal

process of formative evaluation. Consequently, the introduction of a new process as part of an already complicated and time consuming instructional design activity did not mesh well at the time it was introduced. Though each teacher was an enthusiastic participant in the beginning of the research, there were indications that the teachers realized that it would be hard to implement a new classroom process in an environment that was already very much in the beginning phase of delivering a new course. Frustrations with their students not doing the required work showed in occasional comments to the class; forcing the process of formative evaluation to take on less of a priority. As evidenced by their behavior, attitudes, and general non-compliance, students were not interested in providing the formative evaluation feedback that the teachers attempted to obtain.

While each teacher understood the need for formative evaluation, as evidenced by his or her interview responses, all believed they were getting sufficient feedback in other ways, such as through assessments. Additionally, the teachers worked hard to get the students to communicate with each other about course improvement, both synchronously and asynchronously, but they were not satisfied with their success in this area, especially in terms of student performance. In addition, while evidence was sought that would demonstrate student and teacher interaction as a feedback measure, little was discovered. This finding supports the North Central Regional Educational Laboratory (NCREL; 2004) report indicating that online teaching strategies were intended to optimize student-to-student and student-teacher interaction showed "limited evidence of having a positive impact on students' performance" (p. 71).

In summary, formative evaluation was not a practice regularly exercised by teachers

at this online school, though once it was discussed with the teachers and curriculum administrator; they acknowledged that it was an important part of instructional design that should be implemented at the school. This finding supports prior research addressing the process of instructional design (Dick & Carey, 1996; Draves, 2000; Merrill, 1992). Additionally, a primary source of formative evaluation data may lie outside the classroom with peer teachers, as the students at this school appeared to be reluctant to participate in the process. This indicates that additional professional development on techniques of online course design to other teachers at the school may benefit the teachers who will continue to design and deliver courses in the online environment.

Research Question 2

The second question asked what changes in online teaching practice or course design resulted following the instruction and application of formative evaluation procedures by teachers who designed and delivered online courses at the secondary level. Several demonstrated uses of formative evaluation that were introduced in the workshops were observed during the course of the study. However, these seemed to result in minimal changes. For example, all three teachers successfully used a 1-minute paper technique, in which students were asked to write a paragraph or two about their understanding of the content of that class and about their impression of how the class was conducted. The actual time of the activity was more than 1 minute, but did not exceed 5 minutes. This activity was able to provide more feedback in that short time than the administering of a short true/false quiz had been able to do.

Mr. Able used a post-class examination at the conclusion of every Centra session to

assess how much of the curriculum material was learned by the students. Mrs. Baker had her students write letters to future students to tell them about the class and how to prepare themselves. She also took plenty of time during the synchronous sessions to try to get feedback from the students regarding design and delivery. Ms. Charley demonstrated the most frequent use of formative evaluation, and though acknowledging she was not familiar with the concept of the term prior to the research, she clearly demonstrated that she used the process to get feedback from her students from the first day of class.

One teacher found that the planned use of lecture was not as effective in the online environment as it had been in the face-to-face environment. In an online world, the dialogue contained few, if any, non-verbal clues, making it a different form of communication in which it was more difficult to establish that information exchange had occurred. This type of information exchange Salmon (2002) involves interactive discussion between the student and the teacher, promoting a dialogue necessary for learning.

In summary, data in support of the second research question indicated that teachers did make minimal changes in delivery methods, assessment methods, and course design based on feedback they received from their students. Teachers were willing to change their course design and delivery depending on the feedback they received, but they found the process difficult due to a variety of limitations and barriers, most notably the reluctance of students to participate.

Research Question 3

The third question asked, what standards, checklists, or other instructional design framework existed that influenced the use of formative evaluation by the participating

teachers. Evidence collected during this case study revealed no framework that specifically addressed formative evaluation, but evidence existed of practices that might have influenced its use, such as a desire on the part of the participating teachers to systematically gather feedback. No specific course evaluation phase was found during the review of course artifacts or during the observation phase. This could be related to the fact that the virtual high school for this study was in its first year as a choice for full-time secondary education students in the district. By the time the study was conducted, the online high school was in the middle of its second year, but the design and delivery of the courses were still evolving. Though the design actions of the teachers generally supported Dick and Carey's (1990) model of instructional design, the absence of the evaluation phase was evident and was not a strong point of the program. In support of this finding, a proposed framework for formative evaluation was composed and is shown at Figure 14.

Another factor influencing the framework of using formative evaluation was the limited amount of contact between the student and the teacher. The three participating teachers maintained contact with the student through email, WebCT discussions, Centra sessions, phone calls, and occasional face-to-face visits. The face-to-face visits occurred at the beginning of the school year during orientation, during an open house, and during the final examinations and state-mandated examinations. The teacher expectation sheet given to the teachers at the beginning of the year by the administration (Appendix VII) required teachers to contact the student once a week, but it was for purposes of meeting the state attendance requirement, not for soliciting student feedback. This lack of frequent contact could have been an important part of building a community that would have helped provide the trust element to facilitate formative evaluation (Palloff & Pratt, 1999).

A Framework for Formative Evaluation		
Name of Evaluator:	Date:	
Learning Styles Considered	Evident	Not evident
Visual		
Auditory		
Kinesthetic		
Curricular Materials		
Variety		
Currency		
Media choice		
Accessible		
Encourages discussion		
Clear instructions		
File sizes considered		
Interactivity		
Student to student		
Student to teacher		
Student to curriculum		
Visible in Centra and WebCT		
Course Delivery		
Inquiry/Project Based		
Student Centered		
Group work		
Teacher Prepared for Online Management		
Course Design		
Students needs were analyzed		
Meets state/district curricular standards		
Objectives stated		
Content is well-organized		
Appropriate use of technology		
Online navigation is apparent or easily explained		
Course templates are standardized		
A variety of assessments are used and are linked to objectives		
Assessments guidelines in the rubric		
Peer feedback is required		
Clear guides for communication with students		
Tasks result in graded products		
Grades depend on participation		
Evaluation based on quality of postings		
Students present course projects		
Assignments have deadlines that are upheld		
Course expectations are high		
Exemplary work is praised and posted		
Students have a choice in projects		
Identification information published (email, phone, etc.)		
Links are active and current		
Comments:		

Figure 14. A proposed framework for formative evaluation.

Results of this case study indicated no adequate framework for formative evaluation was present at the school that would help standardize processes in both design and delivery. Due to the lack of standardization, the level of effort on the part of the teachers varied by teacher, depending on how he or she chose to design and deliver their class. Additionally, the level of effort exhibited by the students appeared to be less than was needed for success. Similar research has reported that student perceptions of teacher efforts are the same for face-to-face and online classes (Salmon, 2002). Salmon also believed the lack of face-to-face and visual clues in online participation was a key ingredient of success in the distance education classroom rather than a barrier. According to Salmon (2002), "If the remoteness and lack of visual clues are handled appropriately they can increase the comfort level of e-moderators and participant alike" (p. 20). Other studies report that there is no significant difference in online versus face-to-face learning in the area of student achievement (Russell, 1999).

Teacher Workload at an Online School

Another factor that was affected by the lack of standards or framework related to teacher workload. The number of courses taught at the virtual high school in this case study was about the same as in the traditional classroom (i.e., an average of five courses), but the number of students taught by the participating teachers was fewer. For the three teachers involved in this study, the class size averaged 15, less than half of that in a face-to-face class in the rest of the school district. Through the discussions with the three participating teachers, it was clear that they chose to spend more hours each week preparing, delivering, and managing courses than their contract stipulated (i.e., two of the teachers reported spending more than 60 hours on teaching related tasks each week). The

U.S. Department of Education (2006) reported that in the post-secondary environment, teachers who taught a distance education course taught an average of four different courses a semester, while those who did not teach online taught an average of only two different courses (2006). The initial implication for formative evaluation was that fewer students suggests more time to conduct formative evaluation.

The disparity in actual work by these teachers in the present study and contracted work is not solely in their domain, as every traditional classroom teacher knows. The added demand of instructional design and improvement without the benefit of standards or framework, however, strains an already fully occupied teacher's time. Dick, Carey, and Carey (2005) pointed out that "formative evaluation of teacher led instruction almost never allows enough time for one-to-one or small group instruction" (p. 295). Merrill (1992) may also have foreseen the continued lack of formative evaluation at the secondary level when he stated, "we cannot afford well-designed effective instruction because of the tremendous cost of developing it" (p. 112). The challenge, as extended by Merrill, is to make effective learning environments available to all learners most of the time. An effective framework could help streamline the process and reduce the cost.

Centra Symposium as Part of the Framework

Another valuable tool that aided in the collection of formative evaluation feedback for this case study, yet contributed immensely to the teacher workload, was the Centra Symposium software. It could become an integral part of a formal framework, as it provides the ability to record the class sessions and save the asynchronous files for later review. This was also reported to be an advantage for the student, according to Fisher (2003), who found:

> The recording capabilities of the communications tools cut down on cognitive overload because these environments can act as external memories that keep the information most useful to productivity activity readily available and can replay the past activity (p. 2).

In summary, the framework, standards, or checklists that encouraged the use of formative evaluation were not apparent at this online high school, though the participating teachers and administrator did acknowledge that they would be useful. To that end, a proposed framework in the form of a checklist compiled by the researcher was compiled by the researcher.

Implications of the Findings

Evidence obtained during this case study showed the participating teachers: (a) did not use formative evaluation procedures extensively; (b) made only minor changes to their course design or delivery as a result of formative evaluation, due largely to the reluctance of the students to participate; and(c) did not have a framework for instructional design that influenced the use of formative evaluation. The implications are that if formative evaluation is to be used as a tool to improve course design and delivery at this virtual high school, changes need to be made in several key areas including: (a) the systematic design of instruction, (b) teacher practice, (c) student practice, and (d) administrative support. These four factors which formed the framework for the implications of the present case study were included in the National Education Association's Distance Education Quality Checklist (NEA, 2004), which was designed to provide guidance both for those who design online courses and those who evaluate the quality of existing courses.

Systematic Design of Instruction

During the interviews, the teachers and the administrator acknowledged they were designing instruction using what they regarded as a systematic approach. The curriculum administrator made the connection during the interview that unless feedback was sought, the system was incomplete. In support of that connection, contemporary models of instructional design (e.g., Dick, Carey & Carey, 2005) include formative evaluation as an integral part of the system. The formative evaluation of systematic instructional design, as recommended by the NEA (2004) would provide feedback regarding a variety of activities in the course schedule, both online and offline; different learning styles of students; regular, sustained, and guided student-to-student discussion and collaboration that the three participating teachers took so much time to prepare and moderate. And though the teachers had not received any professional development about formative evaluation until the present case study workshop was held, they all were aware of important elements of course designs such as students using writing to reflect on readings, and including student opportunities for multimedia presentations, products, and reports (NEA; 2004). What they need is a framework to guide their use of formative evaluation and an administration that requires the complete use of an instructional systems design model.

Teacher Practice

The results of this case study demonstrated the challenge of describing the effectiveness of a teacher when limited to the design and delivery of an online class. The three participating teachers all stated that their intention while designing the courses was to make sure the students achieved the academic objectives, which is often measured by

the grades a student earns. The implication that formative evaluation would result in more effective course design and delivery is that it would also improve student achievement, and that such an increase would reflect on the practice of the teacher. In the present case study, grades of the students did range widely in the classes. In one class, every student earned an *A*, while in another class with a different teacher; every student got a *D* or an *F*. While the research did not attempt to identify reasons outside of formative evaluation for the grade differences, the implication is that teacher practice may have had an influence.

Teacher practice depended upon many factors including the quality of online design and delivery professional development the teacher had received, which was very limited at the virtual high school. The training offered by the virtual high school was usually offered during the summer, and focused on the philosophy of distance education, and the technology tools needed to design an online course. According to the NEA (2004), training should include strategies for engaging and involving students in the online environment, appropriate use of online voice, use of the technology involved, and the ability to access the support systems available to students and teachers.

Defining a teacher's performance without using a measurement of a student's performance is challenging. A growing awareness of the impact of data-driven decision making was apparent in the school district and at the virtual high school in the present case study. The three participating teachers all stated that they felt like the success of their practice was reflected by the success of the student. According to Stronge (2002), "teacher success equals student success" (p.65). In addition, Reeves (1989) supported the participating teachers' assertions in his statement that the teacher is proving to be among the most influential factors in the success of the student.

Student Practice

Introducing the use of formative evaluation at the virtual school in the present case study gave the students a unique opportunity to provide feedback. This is something they had likely not encountered in their face-to-face classroom experience. But for students who had attended at least 8 years of face-to-face only classes before attending the virtual high school and were not familiar with the environment, being asked for their opinions about course design and delivery was not something they were used to. During most class observations students were reluctant to give feedback to the teacher. One teacher speculated that the reason was the student did not want to face any possible repercussions from the teacher if the feedback was negative. The students' reluctance to participate, however, indicated that additional strategies are needed to motivate the students to partake of the opportunity, and demonstrate that there is a benefit to the student as well as to the teacher. Students who take on the challenge on online learning also take on a new and unfamiliar role as an active participant in their own education. "When an online facilitator invites learners to be part of the process, more often than not, learners rise to the occasion" (Conrad & Donaldson, 2004).

Administrative Support

The curriculum administrator stated that the school in the present case study had been focused on video course development, but was planning on developing new standards for online course design and delivery. The participating teachers stated they expected the administration to evaluate them based on the same standards established by the school district for all teachers, and did not expect to be evaluated on their ability to specifically design online courses. The implication for this study is that if formative evaluation is to

be an effective tool, the administration at both the school and district level, and perhaps the state level, should emphasize the importance of formative evaluation by including it in the standards or expectations governing teacher practice. Two strategies that the administration of an online school could take to enhance student achievement and promote the use of formative evaluation include: (a) providing teachers quality professional development opportunities to assist them in improving their online design and delivery practice and (b) requiring that the courses be evaluated on a regular basis and improvements be made based on those evaluations. In addition, administrators could promote the establishment and use of a formative evaluation framework, such as the one proposed in the present case study. Administration at the state, district and school level should recognize that teaching online courses is not the same as teaching face-to-face. Teachers at an online institution need "more planning time, more instructional support, and additional training to modify courses" (Cyrs, 1997, p. 18).

Recommendations for Improvement of the Formative Evaluation Process

The following five recommendations, if implemented at the virtual high school, could contribute to a more effective use of formative evaluation: (a) teacher training and licensing, (b) online visits by guests, (c) peer teacher observations, (d) state and district standards for online courses and (e) a framework for course design and delivery. Based on the findings of instructional design experts such as Dick, Carey, and Carey (2005) and Merrill (1992), effective formative evaluation can improve the design and delivery of a course.

Teacher Training and Licensing

Before being assigned the responsibility of designing an online course, teachers and administrators should be provided sufficient training in formative evaluation techniques as well as all other aspects of course design. Additionally, specific requirements should be established for licensing an online teacher. The requirements in the state where the present study occurred to be an online teacher were the same as for being a traditional classroom teacher. No additional endorsement was needed to be hired, nor was any additional training mandatory. The school district had no specific training in course design for the three teachers in this study. A professional development course was taught called The Philosophy of Distance Education, but it did not address design issues as much as it addressed delivery issues and student criteria. The school offered another course as part of summer training, but it was primarily about how to use a variety of software tools to design graphics.

Although initial training on how to construct a Centra class and how to use the WebCT software was offered, ongoing staff development had not covered course design. The major teacher preparation university in the school district did offer courses on instructional design, but they were not specifically for online design. Courses were available at the university on the use of distance education, and two of the three teachers in this study took a distance education course from there. They said it gave them an appreciation of how hard it was to be an online student. One teacher had never completed an online course as a student.

Online Visits by Guests

Class visits by administrators and other online teachers during the synchronous sessions would show students that not only is there interest in their academic achievement but there is also interest in their participation in the formative evaluation process. Inviting guest teachers from traditional high schools to join a class could offer a different perspective for both teachers and students; it might also encourage participation. This could be extended by inviting parents to attend as observers or even requiring their attendance when the student performance warranted it—either positively or negatively.

Peer Teacher Observations

Teachers may benefit by having other online teachers observe the playbacks of recorded classes with the intent of providing the primary teacher feedback on design and delivery. Administrators would need to include paid time to the teachers to conduct this class and make it part of the course development process. This shift of obtaining formative evaluation data from the students to peer teachers may improve the quality of the feedback.

State or School District Standards for Online Courses

No evidence of state or school district standards specific to online courses was discovered. The teachers and the curriculum administrator also were not aware of any such standards. The online classes designed by the three participating teachers in this case study were approved locally at the Curriculum and Professional Development office based on the curriculum content, not on the course design itself. The primary means of checking the course to ensure it met district standards was to send the course materials to a content subject matter expert who would review the course content only. Once that was

completed and the administration reviewed the course, the final step was to send the course title, the name of the textbook, and the name of the teacher to the State Department of Education (DOE) for approval. The DOE did not have any specific standards for online classes other than the titles and names. One standard for the structure and another for the content evaluated by other online teachers are needed to ensure high quality education. The Joint Committee on Standards for Educational Evaluation (1981) stated that standards can help define good educational evaluation and not only legitimize quality practices, but thwart poor practices.

Several states have recently enacted legislation to establish state standards. The state of Alaska proposed that the distance education curriculum be submitted to the state for approval, and that if not approved, funds should be withheld (NEA-Alaska, 2002). The state of Colorado has also recently established online curriculum standards. Michigan now requires every high school graduate to complete at least one online course which is developed under a state standard.

In summary, if the formative evaluation steps are to be taken on by teachers at the secondary level, it is recommended that the teachers receive some central support to assist in the ongoing collection of feedback for course improvement. A team of subject matter experts could get together to evaluate each class formally and provide the feedback to the teacher and to the instructional design office. Ongoing professional development in the areas of formative feedback could emphasize and narrow down the techniques that work best for a variety of students or subjects. Recommended course design standards, as well as an agreed upon formative evaluation program, could be

instituted at a secondary high school as part of a school improvement plan, and the teaching practices and student achievement could be reevaluated based on new findings.

A Framework for Course Design and Delivery

Observation of the teachers' practice in design and delivery indicated the skills and efforts required are not the same as in the "brick and mortar" school. To help identify areas the teachers could focus in on during formative evaluation, a proposed framework to assist this process was compiled and shown in Figure 14. The framework, in the form of a checklist was compiled with the influence of the instructional design model of Dick, Carey, and Carey (2005), and considered the following five questions from their work: (a) Were the materials appropriate for the type of learning desired? (b) Did the materials include adequate instruction on prerequisite skills or content? (c) Were the materials clearly understood by the learners? (d) Were the materials relevant and was there motivational value? and (e) Could the materials be managed efficiently? (p. 280).

The framework could be used as an aid to the instructional design process in an attempt to provide feedback, and could be used by a peer teacher or an administrator to provide an objective view. Observing the difficulty the three participating teachers had in obtaining feedback from the students showed that without such a checklist, the process could be time-consuming and non-productive. The participating teachers at the school in the present case study would benefit from such a framework that takes into account the unique instructional demands of online courses as outlined by Graham, Cagiltay, Lim, Craner, and Duffy (2001).

Other research that supports the use of a formative evaluation framework is abundant. The North Central Regional Educational Laboratory, NCREL, (2004) advised that, in

schools they studied, the instructional design model used to develop the courses should be more thoroughly documented and described (p. 73). In the National Educational Technology Plan, schools were encouraged to develop quality measures, such as the proposed framework, and accreditation standards for e-learning that mirror those required for course credit (U.S. Department of Education, 2005, p. 42). McDougall and Squires (1995) reported that checklists can provide an important role in the formative evaluation of courseware.

Limitations of the Study

Several limitations were considered during the analysis of the case. Among the most limiting factors was the number of teachers studied. A longer study with the assistance of several researchers would be needed to explore additional practical lessons that would benefit instructional design and delivery. Another limiting factor related to teachers was their lack of specialized training as an online course developer.

Online course development by the teachers in this case did not include the formal process of formative evaluation. The concept was generally unknown to the teachers, to the administration at the central office who evaluated the courses, and to the students, though each teacher and the local administrator thought it was important and could influence the success of a class. In addition, the teachers in this case study did not have background knowledge in the area of formative evaluation when they began their course design process. Even following the workshop at mid-semester, only a few of the skills needed in the short time the course was being offered were put to use.

Parts of the technology used at this school became a limitation for the success of the teachers and the students. It was apparent during each class session that improvements

were needed in the software, the hardware, and the variety of application interfaces. Garner (1996) stated that good technology is more or less invisible. By this she meant that the technology should not be the focus, nor should it be noticeable. With good technology, the communication should take place naturally. To hear the same question over and over again such as "Would you repeat the question because you were breaking up" did hinder the communication and interaction. While Centra Symposium was designed for online learning, the limitations of the system in terms of dropouts, delays, poorly modulated voices, inconsistencies in playbacks, blank screens, and more made its use frustrating for both the teacher and the student. Each teacher and just about every student experienced similar technical problems throughout the course. Until specific pieces of the technology become more reliable, the educational experience will not be of high quality.

Another limitation was the timing of the study. Since each course was into its second semester, teachers may have been more resistant to adopting new processes that might improve their design or delivery than they may have been before or at the start of the semester.

The lack of participation in formative evaluation on the part of the students was a limitation as the efforts of the teachers to obtain constructive feedback was hampered. Though other techniques were tried with limited success, it was the online discussion that was missing. Some teachers expressed their dilemma of whether or not they should grade the formative evaluation exercises, give extra credit for them, or even seek the feedback anonymously. Bender (2003) described several possible reasons that students might not participate in online discussions. For example, the students may not be motivated, or a

specific student might be experiencing time constraints, laziness, discomfort, or lack of inertia. Bender (2003) also suggested that some mechanics of a discussion, such as trust, might not be present, especially if the teacher or the class has not engaged the student, or the class does not yet feel safe to the student. Finally, Bender (2003) posited that an artificial element might be present in the normal evolution of conversation if students are required to respond.

The final limitation noted was that the formative evaluation in the present case study was restricted to student feedback only. This decision was based on the model of Dick, Carey, and Carey, 2005) and on specific techniques presented to teachers that focused on student feedback. Thus, peer feedback was not sought.

Recommendations for Further Research

The pedagogy of online course design and delivery is evolving rapidly. As students and teachers gain experience in the unique online environment, improvements on both sides will be made. In an effort to encourage continued research to promote the practice, four recommendations of areas for further study are proposed based on the evidence supporting the research questions of this study: (a) a study on the qualities of an effective online student and what motivates them, (b) a study on the differences in student perceptions of tasks in the online class compared to the face-to-face class, (c) a study of how pre-service teachers are instructed in the field of online course design and delivery, and (d) a study on the validation of formative evaluation frameworks, standards, and checklists such at the one proposed in the present case study.

Qualities of an Effective Student

Each of the three teachers in this study believed that online education is not for every student; however, additional study is needed to determine the criteria for student success. The three teachers agreed that there were qualities such as being organized that would benefit a student, but were hard to measure. One example of differences in the qualities of students in the present case study was shown when a class of online honor students each earned a grade of *A*, while in another class with no honor students, not only did no student earn an *A*, but more than 80% failed the class.

Student motivation may be one of the most important determinants in the success of the class and in the success of formative evaluation if student feedback is used. Each of the three participating teachers put effort into attempting to motivate the students with varying degrees of success. One teacher observed that getting the students involved in the feedback process for design and delivery might motivate students. Further research is needed in determining what motivates students to take a course and succeed online.

Differences in Student Perceptions

One of the problems associated with online learning is the student's conditioning to face-to-face classes, though further study will be needed to verify this conclusion. This is based on the observed behavior of the students, even though the performance of the teachers was the focus of the study. The students seemed to have a great deal of difficulty with the concept of having a role in the determination of grades, assignments, and general direction of the class. Faced with these difficulties, participation in formative evaluation practices were not likely as important to the student.

Pre-service Teacher Preparation

Since none of the teachers or the school administrator in this study knew what the term *formative evaluation* meant, this indicated a lack of course design preparation in the teachers' and administrator's past. Research on the preparation of pre-service teachers to be licensed as online teachers, as well as research into the preparation of school administrators in the online environment, may produce results beneficial to university teacher preparation programs as well as to online programs at the K-12 level.

Validation of Framework Instruments

The framework proposed in this case study to help provide for more use of formative evaluation in online course design needs to be rigorously tested to determine how effective it would be for an online program and for its validity as an effective instrument. If it proves to be effective, then this framework might benefit online course designers to improve the quality of such courses. Additionally, it may encourage administrators to take a more active role in requiring formative evaluation.

Conclusion

While it is acknowledged that the results of this case study are not generalizable to all online high schools, these results suggest that if instructional design decisions continue to be made at this school, the element of formative evaluation should not be ignored. The interview responses of the three participating teachers and the administrator indicated they valued formative evaluation as part of the systematic approach to instructional design. To be more effective and to make the greatest impact on student achievement, both students and teachers should have a role in the formative evaluation of new online courses, and frameworks should be established to facilitate and standardize its use.

Many variables relate to student achievement, and some may depend on the steps of course design including formative evaluation. Data in this study indicated a strong desire on the part of the participating teachers to include formative evaluation as part of their process, but a lack of standards, a lack of training, and a lack of student motivation represented significant barriers.

Other specific barriers noted in this study impacted the online environment; they included problems with hardware and software, reluctance by students to participate, a lack of training in techniques by the students and teachers, and a lack of a requirement to participate in formative evaluation. These barriers added on to already existing barriers to traditional and online student achievement such as socioeconomic factors, course design, teacher talent, and student motivation.

Some parts of the instructional technology were quite reliable, but others were still not as reliable as they should be for daily use. Power outages, microphone problems, network downtime, and software crashes all contributed to the problems faced by some students and teachers in nearly all of the classes in this study. In some instances, student achievement was put at risk because of the medium.

The teacher's role in the design and delivery of online instruction can help ensure that the learning style of the student is addressed and that the choice made by the student to be a pioneer in this new kind of school is one that will lead to lifelong learning. Formative evaluation allowed the participating teachers to move beyond the theoretical constraints of instructional design into the actual testing of the approach with real learners. Without the feedback provided by the process of formative evaluation, the design and delivery of

online instruction becomes a hit or miss approach, and may not reflect the best that either the teacher or the school can present.

APPENDIX I: INTERVIEW QUESTIONS AND SOURCES OF DATA FROM THE TEACHERS

Interview One Questions:

1. For the record, will you please state what subject you teach, how long you have been a teacher, and how long you have been an online teacher.
2. How would you describe your teaching job?
3. Please describe your general understanding of the instructional design process.
4. How many hours a week do you spend on course design and delivery?
5. Describe what your understanding of formative evaluation is?
6. Can you describe any formative evaluation techniques?
7. What is your general description of how you obtain feedback from students since you cannot see them?
8. What is your attitude regarding online learning?
9. What are some problems associated with obtaining feedback from students?
10. What would you change about the course you have designed if you had the time to change it now?
11. How do you know when something you are teaching needs changing?
12. How were you prepared to develop online courses?
13. How were you prepared to teach online courses?
14. Describe the general planning that goes into the organizational scheme of your WebCT course and your Centra sessions.
15. What resources are available to assist you in your course development and course delivery?
16. How is your course evaluated today?

Interview Two Questions:

1. What activities or tasks did you undertake this past semester to address the topic of formative evaluation?
2. Why might you choose to ask a student about your teaching practice?
3. Why might you choose not to ask a student about your teaching practice?
4. What do you think needs improving the most regarding your delivery?
5. What do you think needs improving the most regarding your course design?
6. Motivation seems to be an important element of student success. What do you do to motivate the student?
7. How did you ensure that interaction was taking place?
8. What did you change during the course?
9. Do you see any problems in using formative evaluation techniques to help improve your course design or delivery?
10. What is your overall recommendation to other practitioners regarding the usefulness of formative evaluation as a part of the course design process?
11. Is the online high school program stronger with or without the synchronous portion and why?

Data Collected from WebCT Observations:

1. Screen shots of sessions, with names edited out.
2. Curricular changes, teacher discussion regarding attempts at getting feedback on delivery or content, teacher discussion regarding the use of a formative evaluation technique.
3. Threaded discussions about course content were reviewed, but no student information was collected.

Data collected from Centra session observations:

1. A short transcription of the teacher's conversation as it related to formative evaluation.
2. Curricular changes, teacher discussion regarding attempts at getting feedback on delivery or content,
3. Teacher discussion regarding the use of a formative evaluation technique.

APPENDIX II: FORMATIVE EVALUATION TECHNIQUES PRESENTED TO THE TEACHERS

Evaluation is the process of making a comparison to make a judgment. When the intention of the evaluation is to identify potential for improvement, it is considered formative. When the evaluation is used to make a concluding decision, it is considered summative. A classic statement about the difference between the two is attributed to Michael Scriven (1967): When the cook tastes the soup, it is formative evaluation; when the dinner guests taste soup, it is summative evaluation.

Formative evaluation is an iterative process so that each time it is accomplished, it provides a link to the next improvement. Effective teachers are on the lookout for ways to improve their courses, and it is particularly challenging for online teachers. It is the way to find out if what you planned for is what is happening. It is the way you check on your own effectiveness as a teacher and as a course designer. According to George and Cowan (1999), it is the way you move your practice from unverified and unsystematic into the realm of well-founded professionalism.

Objectives of Formative Evaluation:

It should provide you as a course designer and as a teacher, meaningful feedback you can use to improve the course. It will assist you in determining:

What is the general level of acceptance of the materials by the students?

What are the particular areas of strength of the course?

What are the areas of weakness that need immediate improvement?

Are there discrepancies between the value judgments between you and your students?

Does the process enhance your course development of other classes?

How to choose a method:

A variety of methods are presented to allow you to choose an appropriate technique for your instructional design. It will be completely up to you to translate the techniques presented into the formative evaluation you find you need to apply to different learners and to different teaching methodologies. You may already have techniques that you use that you may continue to use. It is recommended that you do not try to use all these techniques in one year, as you will find yourself spending all your time on formative evaluations.

The purpose is to provide a level of understanding on the part of all the participants about the purpose of formative evaluation, and that the case study will involve an observation of the course delivery to determine how you determine that the course needs to be changed.

There is a slight but important difference between feedback and formative evaluation. Feedback usually leads to changes that immediately benefit a student, while formative evaluation usually leads to benefits that occur later, perhaps even for the next class.

Some first questions to consider during your formative evaluation:

1. Does the evaluation effectively address elements of the course objectives?
2. Do any student performance assessments convey an accurate message to the learners about what they have to learn, and standard they should reach?
3. Are the learning outcomes realistic and appropriate?
4. Are the learning activities in the plan appropriate to the aims and outcomes that have been adopted?
5. Does the teaching activity support learning of the type and direction specified?
6. Have adequate arrangements been made to gather information about all these matters, and to analyze the outcomes for presentation in a form that was helpful to those responsible for the next development?

It is an assumption of this study that current practice is deficient in methods that teachers use to answer these questions and that the application of such methods will help make the online courses more effective.

You are welcome and encouraged to share your findings with the students. Sometimes the process of seeking formative evaluation data opens up discussions about the process of learning and results in a strengthened relationship and understanding between the students and you. Also recognize that you may be criticized by the students for things in the course about which you have little or no control, so you may want to make that clear if you know of such constraints before you begin.

Before you seek any data, here are a few cautions:

1. Try not to put too much reliance on students' input about areas that you have already made clear to them that are important to you, as well as being aware of their opinions about areas you did not emphasize.
2. Try not to direct the evaluations to concentrate on areas you think are important or else you may not find out about things you did not think of.
3. Questionnaires are useful but often have low return rates unless there is some motivation to turn them in.
4. Carefully weigh the amount of time you commit in terms of the usefulness of the data you will acquire.
5. Formative evaluation will not necessarily identify what is wrong, but may lead to decisions about what is right or what can be improved.
6. Some data is already available and does not require a specific activity. Items such as portfolios, journals, and examination scores are readily available for analysis.

<u>The weekly journal entry</u>:

As a participant in this research project, I am asking each of you to keep a journal that you use to document the formative evaluation techniques you use. It is an opportunity to reflect on what seems to work for you, and what doesn't, and why. The journal will be turned in at the end of the 16 weeks and will become source data for the qualitative analysis I conduct. Please consider the following questions for your journal entries:

1. What was being evaluated (content/delivery or both)?
2. When did the evaluation occur?

3. How was the evaluation conducted?
4. Did the evaluation effectively address the course objectives?
5. Could some information or activities be eliminated or added?
6. Did the instructional sequence need improvement?
7. Did any assessment convey an accurate message to the learners about what they had to learn, and the standard they should reach?
8. Did the instructional strategies need improvement?
9. Did the media selection and utilization need improvement?
10. Were the objectives realistic and appropriate?
11. Were the learning activities in the plan appropriate to the objectives that were communicated?
12. Did the teaching activity support learning of the type and direction specified?
13. What were the greatest strengths of this program?
14. What were the areas that needed the most improvement?

In addition, I will occasionally observe playbacks of your course via Centra, and will also view class progress through WebCT. I will not log on during the conduct of the course so as not to inject an unusual element in the regular conduct of the class. This will help to ensure some level of unobtrusiveness and non-interference. I will be gathering data to help bring about information to be used in improving online learning and pedagogy, not to make a judgment on the quality of the teacher. I will note evidence, but will not form or volunteer an opinion on the following:

1. clear and sound objectives of the course.
2. learning outcomes achieved through the appropriate teaching method.
3. assessment method actually assesses the objectives.
4. adequate resources and materials motivate and support learning objectives.
5. adequate student workload in relation to the objectives of the course.
6. available support for students.

Techniques for your consideration:

1. The one-minute paper: A very short, in-class writing activity in response to your question, which prompts students to reflect on the day's lesson and provides you with useful feedback. Minute papers can help your students identify what was the most important idea or message you wanted them to think about before they exited the Centra session.
2. A dynamic list of questions: The students are asked to determine their perception of the effectiveness of the class in meeting their expectations as they participate in the class. Dynamic because the questions change as the class progresses. They begin by listing some questions they have before the class even begins, then either add or delete the question as the class session progresses. At the end of the class, they submit their list, including the ones that were answered.
3. A closing activity in class where students are asked to develop advice for the person who teaches the course next year, listing what not to do next year, what to retain, or what to add. The primary purpose is to identify areas of strength in the class.
4. The critical incident technique: Students may be asked at intervals to recall times during the course when they felt pleased, when they didn't, which activities provided a good experience, which seemed pointless, when they felt effective, and when they felt ineffective.
5. Journals, diaries, logs, and blogs: If there is a factual and detailed record of what is being done everyday, it is a log. If it is less factual without detailed timings, it is a diary. And if the writing is more reflective, analytical, and an emphasis on the implications rather than the events, it is a journal.
6. Self review: Systematic collection of data in the form of comments, observations, and suggestions recorded at the time the class is presented. It includes the analysis of the data, and the reaction to the data.

7. Collecting comments from student groups: students are divided into small groups, then the teacher takes a comment from each group in turn until there is nothing new to add.
8. Interpersonal process recall: After a class session, ask for a couple of students to view a playback of a class with you just for the purpose of looking at the effect of the teaching, not of the learning. Pause occasionally and ask what feeling or thoughts the student was recalling. It is time consuming and should be used sparingly. A five minute class session could take 25 minutes to analyze.
9. Concept mapping: Set aside the last 15 minutes of a class session and draw a concept map of what has been covered. Then give the students time to draw one of their own. Allow them to use the app share feature to show their map to the other students. This method favors visual learners.
10. RSQC2 : Recall, summary, question, connect, comment - at the end of one class, or the beginning of another, ask the students to make notes of what they can recall about the class. Then get them to summarize as many of the important points as possible in one sentence. Next get them to write a question that was left unanswered. Then they should connect what was learned to the content of the course as a whole, and finally they should comment on what they found positive or negative about that part of the class. It can take about 10 minutes, and will provide a large amount of data.
11. Questionnaires: The questions should be short and deal with a single point. They should be clear and not lead to an expected answer. The answer should be written in a positive form, and should be able to be answered independently of other questions. They may elicit feedback that is not useful if not worded carefully. For example, you may hear praise for an event which tells you nothing about the teaching, or you may hear insults, anger, or sarcasm.
12. The Delphi technique: The teacher asks the students to submit individually positives and negatives about a class. The teacher then summarizes them and gives a copy of the summary to each student. The students then revise and

return it. The teacher then can summarize and repeat the process until there was no more comment.

13. Letter to next year's students: Have the students write a letter of advice to the next class of students. Tell them to include what mattered about the course, how to prepare for it, and what they wished someone had told them about the class before they started.
14. The Nominal Group technique: A question is asked such as what has been most useful in this class? The students give their responses, which the teacher lists in full view of the class. The teacher then clarifies the responses. Each student is then given five votes to use as either single or as a group. For example, they could give a 2 to one thing, and a 3 to another, or a 4 to one thing and a 1 to another. Finally, the class would review the results. The six stages are questions setting, reflection, pooling, clarification, evaluation, and review.
15. Evaluate your assessments: Use these eight questions as a guide: 1) is the assessed syllabus the same as the one handed out at the start of class? 2) Does the assessment cover the objectives? 3) Which questions did the students always get right or wrong? 4) Do the students know what is expected of them? 5) Do the students understand the questions? 6) Are the students challenged to think during their assessments? 7) Are there real differences in quality across the range of student scores? 8) Does the assessment confirm that enduring learning has taken place?
16. Checklists: This is a quick way to get a lot of information. There are a wide variety of things you can check; for example, you can create a checklist that asks the students to check which of the following they found useful – discussion, links, a hyperlink, email, lesson 1, activity 2, etc. There are survey tools on WebCT and on Centra that can be used for this function.
17. Confidence Logs: These are self assessment measures used to gauge a student's confidence level in a particular part of a course. It provides a snapshot of the class at a given point. In a confidence log, the topics are listed

in a column, followed by 5 columns headed with very confident, confident, some confidence, little confidence, and no confidence. Bar charts can be used to display the information graphically.

18. Resource Questionnaires: Use to find out what resources students are actually using, not just the ones you recommend, but ones they find on their own. Determine how much time they spend on each resource, establish how much value they place on them and any difficulties they had in accessing the resource. The questionnaire would list the resource in one column, followed by columns that allow the student to indicate if the resource was used, not used, not useful, useful, very useful, and extremely useful, followed by a section for an open-ended answer.
19. Evaluate the Formative Evaluation Process: Ask the students for suggestions on what questions they though mattered in the process. Also ask them for suggestions on methods to gather future data.

For additional explanations about some of these techniques and even more possible techniques, see:

Cross, K. P., & Angelo, T. A. (1988). *Classroom assessment techniques: A handbook for faculty.* Ann Arbor, MI: National Center for Research to Improve Postsecondary Teaching and Learning.

Dick, W. & Carey, L. (1996). *The systematic design of instruction*, (4th ed.) New York: Harper Collins.

George, J. & Cowan, J. (1999). *A handbook of techniques for formative evaluation: Mapping the student's learning experience.* London: Kogan Page.

WCU (2005). West Chester University Learning Assistance and Resource Center. Available from: http://www.wcupa.edu/_ACADEMICS/cae.tut/TCornell.htm.

APPENDIX III – ADMINISTRATION INTERVIEW QUESTIONS

1. How are course design expectations communicated to the teachers?
2. How are course delivery expectations communicated to the teachers?
3. Could a teacher find applicable course design standards in school documentation?
4. Is the instructional systems design model used in the online high school course design process?
5. What training do online teachers receive regarding course design?
6. What training do online teachers receive regarding course delivery?
7. How are courses approved prior to being offered online?
8. How are courses improved over time?
9. What assistance is provided to online teachers regarding delivery or design?
10. What are the barriers to formative evaluation at an online school?
11. How often are courses evaluated?
12. Is there a checklist or other framework in place that encourages the use of formative evaluation by the teachers?

APPENDIX IV – INFORMED CONSENT LETTER

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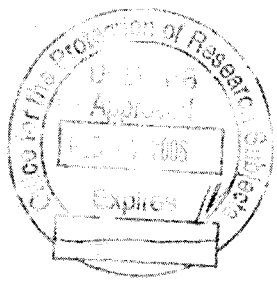

INFORMED CONSENT

Department of Curriculum and Instruction

TITLE OF STUDY: A Case Study of the Formative Evaluation of Online Courses Developed and Delivered by Distance Education Teachers at the Secondary Level

INVESTIGATOR(S): David Garner and Dr. Randall Boone (Faculty Advisor)

CONTACT PHONE NUMBER: (702) 204-1770

Purpose of the Study

You are invited to participate in a research study. The purpose of this study is to conduct a case study on the formative evaluation of online courses developed and delivered by distance education teachers at the secondary level.

Participants

You are being asked to participate in the study because you represent the targeted level of experience desired in this study and meet the requirements of the inclusion criteria. The inclusion criteria used for this study was that the participant must be a teacher licensed by the state of Nevada and currently teaching an online course at the secondary level that was developed by the same teacher. An experience level ranging from 1 year of online experience to over 5 years was desired to study differences associated with a range of experience. Individuals not meeting these requirements were excluded from consideration. This study is not attempting to identify differences in teacher practice based on factors of race, color, creed, religion, gender, age, marital status national or ethnic origin or disability, and participants will not knowingly be excluded based on these factors.

Procedures

If you volunteer to participate in this study, you will be asked to do the following: You will first be interviewed on your current assumptions, values and beliefs regarding the instructional systems design process and formative evaluation. You will then attend a session with the researcher where instructional systems design theory will be taught, and specific formative evaluation techniques will be presented for you to use in your course design and delivery. You will then be observed via the Centra playback for synchronous sessions, and via WebCT for asynchronous sessions for evidence of formative evaluation. After each 5 weeks of observation, you will be again interviewed regarding your adjusted assumptions, values and beliefs regarding the ISD theory and the use of formative evaluation techniques. You will be provided data collected during the observations as feedback. After 20 weeks of interviews and observations during this constant comparative collection mode, you will be given an exit interview to establish any final changes in the assumptions, values and beliefs regarding formative evaluation of online curriculum.

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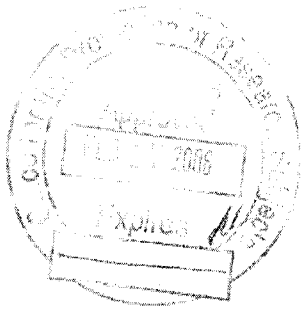

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INVESTIGATOR(S): David Garner and Dr. Randall Boone (Faculty Advisor)

CONTACT PHONE NUMBER: (702) 204-1770

Benefits of Participation

There *may* be direct benefits to you as a participant in this study. However, we hope to learn about the efficacy of including formative evaluation techniques as part of the instructional design and delivery of online courses.

Risks of Participation

There are risks involved in all research studies. This study may include only minimal risks. *These risks have to do with the level of discomfort you may feel when having your classes observed via the Centra playback or via the WebCT sessions. There also may be some discomfort when answering questions about your assumptions, values and beliefs regarding instructional design and the use of formative evaluation as the study progresses. The data collected will not be provided to your supervisor and will only be used for the purpose of contributing to the study.*

Cost /Compensation

There *will not* be financial cost to you to participate in this study. The study will take 15 hours of your time beyond normal instructional duties. You *will not* be compensated for your time. *The University of Nevada, Las Vegas may not provide compensation or free medical care for an unanticipated injury sustained as a result of participating in this research study.*

Contact Information

If you have any questions or concerns about the study, you may contact David Garner at **204-1770,** or the principal investigator, Dr. Randall Boone at 895-3233 For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office for the Protection of Research Subjects at 702-895-2794.**

Voluntary Participation

Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

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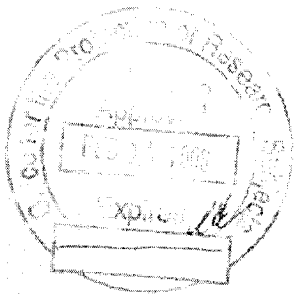

INFORMED CONSENT

Department of Curriculum and Instruction

TITLE OF STUDY: A Case Study of the Formative Evaluation of Online Courses Developed and Delivered by Distance Education Teachers at the Secondary Level

INVESTIGATOR(S): David Garner and Dr. Randall Boone (Faculty Advisor)

CONTACT PHONE NUMBER: (702) 204-1770

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be destroyed.

Participant Consent:

I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

_____ _____

Signature of Participant Date

_____

Participant Name (Please Print)

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.

APPENDIX V – AN ALPHABETIZED LIST OF OPEN CODING ELEMENTS

access

adapting to learning needs

asynchronous use

attitude

barriers

behavior

beliefs of students

beliefs of teachers

Exemplary practice

breakout rooms

changes in practice

chat

class awareness of FE

class discipline

community

complimentary

confusion

constructivist

content feedback

course delivery

course design

discipline

efficacy/technological

emoticon

encouragement

Evaluate

exemplary examples

expectations

extra credit

FE evidence

FE technique

framework

frustration

guests

humor

inappropriate behavior

inhibiting

interaction

metacognition

motivation

non-verbal communication

observation

playback

polite

procedures

process of formative evaluation

responsibility

role playing

student motivation

student performance

student preparation

Student questions

student reluctance

students helping

Teacher motivation

teacher perception

Teacher questions

teacher self-efficacy

teacher time

teaching practice

technique feedback

tone

tools

trust

why FE?

APPENDIX VI: SAMPLES OF COMMUNICATIONS BETWEEN TEACHERS AND STUDENTS

Samples of Teacher Communications

1. This is the third Centra class you have missed. Please call me ASAP. You are failing the class due to your lack of participation.

2. I am excited about the effort you are making in this class. I noticed that you were last in WebCT on May 3, 2006 2:28pm, keep up the good work! If you need any help let me know ASAP. Remember get into WebCT every day and keep posting your ideas/research in a timely manner.

3. I am very worried about your effort in the class. Please email me a time I can call you on Friday to discuss this issue with you.

4. I noticed that you have not been working or posting in WebCT. Please call me today as soon as possible.

5. You told me all semester that you needed a topic that you were interested in to be successful. Now that you have that chance, you have disappeared from the class. I am concerned about you and disappointed that a person with your talent has chosen not to get the work done.
6. I am very disappointed to see that you have chosen not to do your final exam. Please understand that this will result in an F in the class. Please call me asap.

7. It is easy to forget that when posting your ideas please use proper grammatical style and formats, the online discussion area is an academic experience.

8. Have you decided to take an F? I have CC'ed our assistant principal to RPC [required parent conference] you as soon as possible.

9. According to my records you have not done your required WebCT work this week.

10. Due to your lack of effort and interactivity I am submitting a denial of credit to the school. If you have any questions please contact me as soon as possible.

11. I noticed that you have not been working or posting in WebCT. Please call me today as soon as possible.

12. I noticed that the last time you were in WebCT was April 26, 2006 10:52pm. Please understand that part of your responsibility in this class is to get into class everyday! I really need you to be in class and active everyday! Please take the time to finish your projects and do the final exam in a timely manner.

13. Pleas me or email me ASAP and let me know what is going on and why you are having so many issues getting the job done. I am hoping that you want to be a success and are willing to put in the time/effort that it takes to be a successful student. Let me know what I can do to help you in this endeavor.

14. You failed to post in assignment 2.

15. I have not seen any work on this assignment; please call me at your earliest convenience.

16. How are you doing? I was a bit worried at times but you had some good questions and answers.

17. I am very concerned that you have fallen behind on your final exam project. Do you need some help?
18. I was wondering why you are not able to complete the work.

19. I have not seen any postings in the discussion area of WebCT and you have not sent me your PowerPoint at this time.

20. You are struggling with getting your work done in steps 2-5.

21. We have spent a great deal of time discussing how to be a successful online student and you seem to understand what it takes and have chosen to not be successful.

22. I am not sure what prompted you to be so insubordinate during today's session but I have forwarded the issue on to the Assistant Principal.

23. I was just wondering how (student name) was doing in your classes...Charley
24. 83%, one of my best!!!
25. Thanks...Charley

Samples of Student Communications (provided by the participating teachers with student misspelling intact)

26. Mrs. Charley, Im terribly sorry that I missed class today....I set my alarm and it didnt wake me up...Im really sorry about this mess....I will go back and watch the playback ASAP Ok.

27. hey. i got my centra fixed. my dad is a computer programer so he fixed it when he got home. so i was wondering, what do i need to do so as not to get counted absent for that centra session? most teachers say watch the playback and email me a summary of the class. i guess ill do that.

28. here is a screenshot of my centra thing. I deleted my cookies and internet files, and that download thing went away. but i still can't get into centra. i don't know why.

29. hey im just emailing you to let you know i cant get into class. first, it wouldnt let me in, so i clicked the thing that said click here if centra hasnt started after 1 minute. so i downloaded that file, and now whenever i click attend, a download window pops up with a file called attend. but then windows cannot find the file or something like that and i cant get in.

30. hey. um, i was wondering if i could get a list of all the assignments i am missing and their locations so i can catch up. please!

31. What exactly am I supposed to do for assignment 3? Review it all then post a review on it?

32. my computer froze, and I cannot get back into Centra.

33. I will be no longer attending VHS. That's why i havnt been posting. You are a great teacher. Have a great summer. and good luck with everything :)

34. School has been a pain, I feel like its holding me back.

35. I know i got really over wellmed my third quarter. I was wondirng if i do good this fourth quarter and i do good on the final, can I still pass the class?

36. AHhhh! I posted what i said in clas...well check out what you posted and wrote in class. Go back into Centra and do a replay...once it starts go to your "whiteboard slide" and then copy it off and repost it in WebCT. If you need help let me know.. omg this is bull. Patience...be cool Im so freaking out relax you can do it...just take your time and get things a bit more organized. and behind as it is and now i do do something and it doesnt even post? Things like that happen...so just adjust to it. I'll go do what i can tonight. Well in about an hour as soon as im done sorting though my History. Thanks...you are the best.

37. I havnt been able to get to my Email account. It hasnt let me loggin. I needed to tell you my internet has been dropping like ever 30 min. I dont know if its COX or our router. it seems to be fixxed now. I hope. If i still can im going though the

play back right now and im working on the assinments. i woke up early, hoping i could get to you in time.

38. I am just getting this. OMG im so lost.

APPENDIX VII: TEACHER EXPECTATIONS SHEET

1. Maintain attendance and grades on SASI ClassXP. Update STU43 and ATP17 reports each Friday, print copies and maintain in Attendance Binder. Call absent students each Friday documenting reasons for absences on Credit Denial forms. Enter attendance into ClassXP prior to 4 p.m. Fridays.
2. Retain all homework for a period of one year after the conclusion of the course.
3. Teachers are responsible for answering all questions regarding grades or homework.
4. Teachers are required by law to make contact with each student once a week. Contact can be made by weekly group emails. Students are required to contact teachers weekly. Document student absences and reasons on Credit Denial forms weekly.
5. Check voice mail and email daily. Respond to students' questions within 24 hours, excluding weekends.
6. Attend and participate in monthly online staff meetings. The staff meetings are scheduled on the second Tuesday of each month at 3:00 p.m. on *Centra*. (See web designer for instructions on logging onto software.)
7. Attend and participate in Distance Education staff development as appropriate, including summer training.
8. Review all course materials, including: course expectations, assignment sheets, textbooks, and final exam annually. Maintain answer keys for your semester exams. Provide a copy of your answer key to the Administration.
    1. Revised course expectations and assignment sheets are due to the Administration two weeks prior to the start of the course (enter date): _____
    2. Final exam revisions and answer keys are due to the Administration one month prior to implementation (date): _____
    3. Textbook requests and course reviews are due to the Administration six weeks prior to the end of the school year (date):_____

Retain a copy of grade book information (homework, exam, final grade) for a period of one year after the conclusion of the course. Final exam and final grades are due on the dates listed on the annual calendar. There will be no exceptions to these dates and times.

Teachers are responsible for reading the information and following the instructions included in the Staff Handbook.

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