INVESTIGATING THE ROLE OF FORMATIVE ASSESSMENTS

IN AN ONLINE LEARNING ENVIRONMENT

by

REGINA PALLIOS

University of Oregon, 2004

A thesis submitted to the

Faculty of the Graduate School of the

University of Colorado in partial fulfillment

of the requirement for the degree of

Master of Arts

School of Education

2011

This thesis entitled:
Investigating the Role of Formative Assessments in an Online Learning Environment
Written by Regina Pallios
has been approved for the School of Education

_____
Dr. Susan Jurow

_____
Dr. Ben Kirshner

_____
Dr. Michele Moses

Date_____

The final copy of this thesis has been examined by the signatories, and we Find that both the content and the form meet acceptable presentation standards of scholarly work in the above mentioned discipline.

IRB protocol # 11-0062

Pallios, Regina (M.A., Educational Psychology)

Investigating the Role of Formative Assessments in an Online Learning Environment

Thesis directed by Professor Susan Jurow

Formative assessments are often used in face-to-face classroom settings to help foster learning. These dynamic assessments embody Vygotsky's view of learning in the *zone of proximal development* (ZPD). While research has shown the ways in which formative assessments can be used in traditional classrooms, less is known about the use of formative assessments in increasingly popular online learning settings for universities. Using what is known about formative assessments in face-to-face classrooms and a case study of an online college course, I investigated how formative assessments can be embedded into online learning settings. The findings indicate that formative assessments such as feedback and self-assessments can be implemented in online courses. However, the structure of online courses can present barriers to facilitating discussions among students, which is another form of formative assessment.

CONTENTS

The Need to Study Online Learning Environments

Online education has gained in popularity in recent years. In 2007, a Sloan Consortium reported that out of 2,500 universities surveyed more than 20 percent of college students in the United States—or, approximately 3.94 million students—took at least one online course, which is double the number who took online courses in 2003 (Allen & Seaman, 2008). This pattern mirrors that of the University of Colorado (CU), where this study was conducted. The Continuing Education & Professional Studies department at CU accommodates this growing demand for online education by offering 151 courses in 25 different fields of study. According to Bill Gates, this growth will continue; he predicted that soon there will not be a need to attend universities in person. He stated: "Five years from now on the web for free you'll be able to find the best lectures in the world" (Siegler, 2010). As the number of students enrolling in online courses grows, it is important to understand how learning is best facilitated in these environments.

Online courses are those that students access via the Internet. The online courses offered at CU are available through a system called "CU Learn," which allows students to access their course(s) with a username and password and then follow links to items including the syllabus, lectures, assignments, university policies, a discussion board and a tool for uploading completed assignments. The length of time that a student has for completing an online course varies at CU. The Continuing Education & Professional Studies department at CU offers courses that are "self-paced" and "term-based". Self-paced courses allow students to complete coursework at their own pace within six months of enrolling in the course; enrollment dates are flexible and assignments are not due on specific dates. Term-based courses start on a given date with all students required to complete assignments and the entire course on the same specified dates.

The variation in course length demonstrates an interesting characteristic of the online learning environment. Likewise, in the fall of 2010, I did preliminary fieldwork for this study, which introduced me to other aspects of the learning environment; these particular characteristics present challenges to the online learning environment. During my preliminary fieldwork, the Director of the Continuing Education & Professional studies department revealed that the online courses have higher attrition rates than other courses offered at CU. This also seems to be a common issue for programs offering online courses. For example, Mitchell (2010), who served as the director of the distance education department at Mid Michigan Community College, notes that in her experience online courses have higher attrition rates than face-to-face courses. Another characteristic of online courses that the director shared with me is that courses offered through the Continuing Education & Professional Studies department are popular among "nontraditional students" (Rubinstein, personal communication, December 2010) meaning those who are older than 22 and may have a job or family. With online courses not requiring students to be present at a specific time and location, nontraditional students may be drawn to these courses because they fit schedules that may be busier than those of traditional students. My preliminary fieldwork demonstrated the number of challenges online education faces that makes how learning is facilitated an important issue.

During fall 2010, I also studied formative assessments in an assessment course. Through this course, I learned how formative assessments can be a tool for facilitating learning in face-to-face classrooms. Formative assessments have been used in these traditional classrooms as part of an effective learning environment. Despite the popularity of online courses, little research has been completed on the presence of formative assessments in online courses, and how they might facilitate learning in those learning environments. This led me to ask: How is learning supported

through formative assessments in an online learning environment and where is there room for improvement?

Conceptual Framework

Sociocultural Perspective

In the preliminary fieldwork that I completed during fall 2010, I became aware of some of the unique challenges online courses face. In order to make sense of how these factors contribute to students' learning, I draw on a sociocultural approach to examining learning environments. This perspective was introduced by Vygotsky but has been adopted by many others. This sociocultural approach draws on social, cultural and historical practices in order to understand learning environments and how challenges such as the pace of the course play a role in facilitating learning.

The sociocultural perspective is useful for understanding online learning environments, because of its attention to how language and technological tools can mediate understanding (Cole & Wertsch, 1997). As Wertsch (2007) explains mediation "build(s) a link between social and historical processes, on the one hand, and individuals' mental processes on the other. It is because humans internalize forms of mediation provided by particular cultural, historical, and institutional forces that their mental functioning sociohistorically situated" (p. 178). Furthermore, Wertsch (2007) lists examples given by Vygotsky of what could be constituted as mediational tools; this list includes language, works of art, writing, diagrams and maps. He then explains that Vygotsky did not view mediational tools as simply leading to quantitative improvements such as speed or efficiency, but he also views these tools as contributing to qualitative transformation—the alteration of "the entire flow and structure of mental functions" (p. 179).

The use of mediation is essential, in a Vygotskian framework, to facilitating learning. Interaction within the *zone of the proximal development* (ZPD) helps learners achieve their full potential for learning a concept. The ZPD is defined as: "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1980, p. 86). In my preliminary fieldwork, I observed a course called "Nutrition, Health and Performance." During my observations, I saw an example of students being guided through the ZPD. This occurred when students were given an assignment in which they were able to put in perspective the unit's discussion about nutrition and dietary intake. For this assignment, students tracked their daily caloric intake and specific foods consumed and then compared that to guidelines for dietary intake. The required reading assignment also around this topic may have helped students reach a certain point of understanding, but the authentic assignment may have guided students to their fullest potential of learning the concept. Thus, the supplemental assignment related to the students' own lives, may have led them through the ZPD.

In this example, guidance through the ZPD utilized what could be considered mediational assistance. In other words, such tools help learners achieve qualitative transformation by leading them through the ZPD. In this study, I will discuss the ways mediational assistance is structured.

An example of mediational assistance that is pertinent to this study is that of "just enough assistance"—a concept discussed by Stone and Gutierrez (2007, p. 51). In their analysis, assistance strategies were used to help children in an after-school club gain a greater understanding of a concept. In this case, children shared strategies for playing a game, and thus moved through the ZPD. This was done by asking questions for the children at the club

questions to respond to. As a result, the children were given the opportunity to create explanations, allowing them to shift from "novice participant" and instead promote "the use of different cognitive skills" (p. 51). The questions students were asked are considered "just enough," because they did not limit the opportunity for students to struggle. On the other hand, scaffolding, which is also sometimes used to teach children, can sometimes give learners too much direction and imply that struggling to learn a concept is not desirable. By struggling with a concept, students have the opportunity to reorganize or modify their understandings, realize it is okay to make mistakes while testing assumptions and rethink their role as a learner as being more active than passive. As Stone & Gutierrez (2007) demonstrate, students are guided most effectively through their ZPD when instructors use "just enough assistance." This study also exhibits how not all mediational tools are equal; "just enough assistance" (p. 51) may be more beneficial at leading students through the ZPD by not giving students too much structure.

In addition to the importance of mediational assistance in online learning environments, this study will also discuss the role of communities in these classrooms. For this, I will draw on Rogoff's (1994) concept of community of learners. She states: "learning occurs as people participate in shared endeavors with others, with all playing active but often asymmetrical roles in sociocultural activity" (p. 209). In other words, learning occurs when people participate in the "sociocultural activities or their community" (p. 209). In this model, the community works together with "all serving as resources to the others, with varying roles according to their understanding of the activity at hand and differing responsibilities in the system" (p. 214). The implementation of situations that allow for communities of learners to exist, and thus support one another in the learning process, serves to give learners a better understanding of concepts. Thus, the community of learners model may also guide learners through the ZPD.

Formative Assessments

In order to create ZPDs, it is necessary to understand a student's current understandings or misunderstandings and what steps may be taken in order to help those students further. Formative assessments are helpful in assessing students' learning and then determining next steps for facilitating learning. Because formative assessments can lead students through the ZPD, I am interested in understanding how these assessments are present in online learning environments.

Formative assessments are sometimes referred to as "assessments for learning" (Stiggins et al., p. 29, 2006), meaning that they are the assessments that occur while learning is still in progress in order to assist in the learning process. Stiggins et al. (2006) further explains:

"These are the assessments that we conduct throughout teaching and learning to diagnose student needs, plan our next steps in instruction, provide students with feedback they can use to improve the quality of their work, and help students see and feel in control of their journey to success. Each one reveals to students increments of achievement and how to do better the next time" (p. 31)

Additionally, Stiggins et al. (2006) notes that students can play an active role in formative assessments. While teachers are vital in ensuring students are involved in self-assessment, students have the opportunity to self-assess their learning when teachers make learning targets clear, students keep track of progress and students act on assessment results to improve future work.

Formative assessments can be viewed as a mediational tool, which can be used to foster learning in the ZPD. While Vygotsky (1980) does not use this term, his view of the ZPD is aligned with formative assessments in that they are an example of tools used for mediation.

Shepard (2000) argues that assessment can help students learn when it is used during the process of instruction. In doing so, she explains that these assessments are congruent with Vygotsky's (1980) theory of ZPD. As she writes: "This type of interactive assessment, which allows teachers to provide assistance as part of assessment, does more than help teachers gain valuable insights about how understanding might be extended. It also creates perfectly targeted occasions to teach and provides the means to scaffold next steps" (page 10).

There are several types of formative assessment tools that can be implemented into classrooms. These include discussions (Bakula 2010), the use of rubrics, student self-assessment and descriptive feedback (Stiggins et al., 2006). These formative assessment tools have been implemented in face-to-face classroom settings, and research, such as that of Bakula (2010), shows how using these assessments can lead to an improvement in summative assessments, which strive to demonstrate how much learning has occurred. For example, she implemented formative assessment techniques into her seventh grade science class, which she claims helped improve student learning and her teaching. Within the span of one unit in which the class was studying the properties of matter, the teacher gave her students six pen and paper assessments in which they were asked questions that allowed them to explain their understanding of the topic. These assessments are considered formative, because Bakula (2010) then used the results to re-teach certain concepts based on misconceptions the students demonstrated. It also encouraged her to come up with new ways to teach students. By learning what concepts to further emphasize for her students, Bakula (2010) saw an increase in summative assessment scores for her students at the end of the unit. While Wertsch (2007) explained that Vygotsky (1980) was not only interested in quantitative improvements, it is possible that the improved summative assessment scores were a result of the students having a greater understanding of the concepts at hand. After

all, the "just enough assistance" (p. 51) questions asked of the children the after-school club in Stone and Gutierrez's (2007) article allowed those children to better understand the topic at hand by thinking through the concept. In this case, the students are also benefiting from the chance to articulate their understandings, which is a mediational tool that is also a formative assessment in that the instructor reteaches concepts that the students have a difficult time thinking through on their own. In other words, this formative assessment is also a mediational tool.

Carillo-de-la-Pena et al. (2009) also discuss how formative assessment can lead to higher summative assessment results. The study was conducted in three college-level health science courses, each of which offered an optional midterm exam and a required final exam. The optional midterm exam was multiple choice and short answer, and students were informed of the correct answers to the test immediately after completion. Additionally, a feedback session demonstrated common misunderstandings in the course. The research found that the students who took the midterm performed better as a whole on the final exam than those who didn't take the midterm. The author argued that the superior performance on the final exam was due to students receiving feedback on the midterm exam. Feedback is considered a form of formative assessment, and it assists in the learning by informing students about their learning process. In other words, it is possible that students who took the midterm used the feedback to focus their learning on concepts they misunderstood, thus improving their performance on the final exam. Feedback has characteristics of mediational tool in that the teacher's use of it serves to guide students through the ZPD. Without feedback, students may not realize there are concepts they need to focus on in order to improve their understanding, thus leading them through the ZPD by reviewing concepts.

Given the successful use of formative assessments to extend student learning in face-to-face courses, I have chosen to investigate how formative assessments can be implemented in online courses.

Navigating the ZPD with Formative Assessments in Online Learning Settings

On initial consideration, it seems that online classrooms could be at a disadvantage in terms of its capacity to facilitate interactions between teachers and students, and students and other students. However, Hatziapostolou & Paraskakis (2010) discuss how formative assessment, particularly feedback, can be implemented in online classrooms to promote learning. In the article, they describe how feedback can be given to students through email and electronic annotations.

In my case study, I will further investigate evidence of formative assessments in online courses. Given the ways in which formative assessment can be a tool for navigating through the ZPD, it is important to understand how this tool is already present in online settings.

A Review of Literature to Understand Online Courses and Contexts

In this study, I sought to answer the question: How is learning supported through formative assessments in an online learning environment and where is there room for improvement? Given that formative assessments create a ZPD, this is an important question to address. The review of literature that follows discusses studies that have demonstrated the importance of incorporating the sociocultural perspective into online courses. In this literature review, I will also explore formative assessments from the sociocultural perspective that have been utilized in face-to-face classrooms, as well as formative assessments from the sociocultural perspective that have been utilized in online classrooms. These studies may give insight into

ways in which an online course at CU can implement formative assessments from the sociocultural perspective.

Sociocultural Perspective in Online Courses

Mitchell (2010) explains that in her experience as the director of the distance education department at Mid Michigan Community College online courses have higher attrition rates than face-to-face courses. However, she warns that this is not the only way to measure the quality of online courses. Likewise, she cautions that the instruction in online courses doesn't necessarily need to mimic what is accepted in face-to-face courses because instruction techniques in such classes may be outdated. For example, she argues that a teacher standing at the front of the class and lecturing a group of students is a popular and accepted format of face-to-face courses. However, she points out that best practices of teaching and learning in face-to-face courses differ from the historically predominant format. One such approach that can sometimes be found in online courses occurs when students interact with each other so that knowledge is co-created by the students and the instructor.

Mitchell (2010) never explicitly defines quality except to suggest that there are other teaching techniques to consider besides traditional lecturing. Gunawardena et al. (2006, p. 218) suggest that designers of online courses must "create educational contexts that support interaction and collaboration through networked communication." The authors point out that this proposal differs from what has been implemented in online courses. Drawing on a sociocultural perspective, Gunawardena et al. (2006) argue that online courses should adopt the Wisdom Communities (WisCom) model, an instructional design model based on principles of the sociocultural learning perspective and distant education. In this model, three dimensions are fostered in order to facilitate transformational learning: "the development of a wisdom

community, knowledge innovation, and mentoring and learner support in an online learning environment." The authors add that WisCom provides a learning environment that "distributes expertise and knowledge construction across individuals and exteriorizes the process of scholarly inquiry resulting in new methods of learning for participants" (Gunawardena et al., 2006, p. 218). The authors then gave examples of design techniques that meet the standards of WisCom.

The first component of WisCom, wisdom communities, is to create community-centered learning environments, which has elements similar to the community of learners model I discussed earlier. This environment allows learners to "navigate the process of learning, collaborate, and become collectively wise." The authors suggest that ways to achieve this include implementing assessment and feedback into the course, so that assessment awards collaboration. The second component of WisCom, mentoring and learner support, argues for people to support others as knowledge is created and inviting new and diverse members to the group. The authors suggest that opportunities for members of the group to answer questions asked by other members of the group will give both an opportunity to learn. The third component of WisCom, knowledge innovation, "is the purposeful creation, sharing and preservation of meaningful, socially constructed ideas" (Gunawardena et al., 2006, p. 221). One example given for meeting this element is by implementing the use of concept maps, which demonstrate connections between concepts and stores knowledge that is easily retrievable.

The claims Gunawardena et al. (2006) make about WisCom also demonstrate characteristics of mediational tools. It seems that implementing components of WisCom may guide the learner through the ZPD. For example, a major element of WisCom encourages sharing knowledge in groups much like the community of learner model, which can be used as a mediational tool to guide learners through the ZPD. Additionally, feedback is an important

element of WisCom as well, and the Carillo-de-la-Pena (2009) article demonstrated how this could be used as a mediational tool. Therefore, this research demonstrates how mediational tools can be implemented in online courses.

Formative Assessments in Face-to-Face Courses

Many of the examples Gunawardena et al. (2006) share for achieving WisCom, a method they believe will improve learning through sociocultural practices, also meet the standards for what constitutes formative assessments. For example, according to Stiggins et al. (2006), feedback allows students to learn from others' assessments of their work by gaining an understanding of their current level of comprehension and then using the feedback to improve their future work.

Discussions in which students learn from one another also fall under the umbrella of formative assessments. This occurs when members of the group assess their group members' understanding to determine how to adjust their own understanding of a concept or explain the concept to their peer to help him or her better understand. The instructor of the course can also participate in this form of formative assessment; if the discussion demonstrates to the teacher that the students are struggling with a certain concept, he or she can choose to place further emphasis on that concept rather than moving on to a different topic (Bakula, 2010).

In addition to these examples of formative assessments in face-to-face classrooms that meet WisCom standards, there are other forms of formative assessments that meet the sociocultural perspective that should be explored. One example is self-assessment, which occurs when students have the opportunity to assess their own work in a way that allows them to understand what is considered high quality work and why it is considered high quality work. This can be done with tools such as rubrics and scoring guides that explain the difference

between good and poor quality work. When these tools are used to allow students to self-assess

their work, students understand where to make adjustments in their work and why they should do

so (Stiggins et al., 2006). In other words, these tools allow for mediational assistance to occur in

that they help further guide students' learning through the ZPD.

Formative Assessments in Online Classrooms

Less research has been done regarding formative assessments in online classrooms

compared to that of face-to-face courses. However, I did find some studies that demonstrated

ways in which previously discussed formative assessments can be handled in online learning

environments.

Bassani (2011) discusses how discussions may be present online. While she does not

describe them using the term formative assessments, she does give additional examples of how

they can be implemented in online courses to foster learning. She points out that these

interactions occur on discussion forums on online course websites. She also adds that Virtual

Learning Communities (VLC) are where online learning occurs. The author then lists several

components that demonstrate that a VLC is present:

a) active interaction, related to the syllabus of a course and to the interpersonal

communication, i.e. for a student to be considered present to a lesson it is not enough to

simply access this lesson online, but also to participate by sending his ideas and reflections;

b) collaborative learning, manifested in exchanges of messages and/or comments between

students and between students and teachers;

c) socially constructed meaning, evidenced in discussions involving consensus or in

disagreement, as the lesson/course progresses;

d) sharing of resources (books, articles found on the Internet, research sources) between

students, widening the bibliography beyond the reading lists chosen by the teacher;

e) students exchanging expressions of encouragement and being willing to critically

appraise their peers' work (Scherer, 2010, p. 935).

The VLC model has many similarities to the communities of learners model suggesting

that implementing VLC components into an online course will reap the benefits of mediational

tools.

Xiaojing (2004) also studied the use of discussion forums in distance education. Xiaojing

(2004) found that there are some factors in determining the success of a discussion forum. That

is, the question was posed as to whether online discussions have a greater impact when they are

mandatory as opposed to optional. Xiaojing (2004) found that when online discussions were

mandatory, students tended to post for visibility. However, when discussion was optional very

few students posted at all. One student added that when discussion was mandatory, students

responded to the original question rather than responding to each other's posts, which might have

supported learning in the way Gunawardena (2006) suggested groups can learn from each other.

It seems that the mandatory nature of some discussion sections deters from the community of

learners model being able to have a positive effect. The analysis suggests that the mere presence

of a discussion section doesn't necessarily mean that learning is automatically improved.

Summary of Literature Review

The studies I explored demonstrate ways in which sociocultural practices have previously

been implemented in online learning environments. It emphasized how some of these practices

fit the mold of formative assessments, which can be implemented in face-to-face classrooms as

well as online. Therefore, it seems plausible that self-paced online courses at the University of

Colorado could also implement sociocultural practices in their online learning environments to

foster learning. In fact, these findings show that there are many possible types of formative assessments that can be present in a course, some of which have been shown to be in online courses too. With that being said, when I began my investigation of the online course at CU, there were many formative assessment of which I was aware, but I knew it was possible to find only some examples rather than all that were mentioned here. Likewise, I was aware that I could find evidence of formative assessments that have not been discussed in literature about online learning.

Methods

I conducted a case study on an online course that included an analysis of the design of the course website, and an interview with the course instructor in order to try and answer the question: How is learning supported through formative assessments in an online learning environment and where is there room for improvement?

Site Description

The course I investigated is an anthropology course entitled "Bones, Bodies and Disease". The course is offered through the CU Continuing Education & Professional Studies department, and it is self-paced. Bones, Bodies and Disease is taught by Andrea Stephenson; she also designed the course in 1996. In addition to the instructor, other key players include the 177 students who were enrolled in the course during Spring 2011. It should be noted that the instructor thinks that only approximately 10 to 15 students are active in the course at a given time. Students who complete the course will earn three credit hours.

In order to enroll in the course, students follow steps on the Continuing Education & Professional Studies department website. On this site, students and potential students can see which courses are available and read short descriptions about each course. Then, if interested,

they select a link that says "enroll" (Pallios, FN 4), which leads students to a page where they can either immediately enroll in the course or fill out an application to take courses through the department. Students who are required to fill out an application first, have either never been a student at CU or haven't been a student at CU in 12 months. Once enrolled, students access the course through the university's CU Learn system hosted by the university. Once students are on the CU Learn site and have selected the Bones, Bodies and Disease course from a list of links of any course the student is enrolled in at CU—whether it be online or face-to-face—he or she can then navigate through the course by selecting links that take him or her to the syllabus, lectures, pictures of bones, assignments, discussion boards, an assignment upload page and course and university policies.

It is possible that on a typical day, a student may not enter the course at all. The instructor thinks that out of 177 students only 10 to 15 are active in the course at a given time. The reason for a relatively small number of active students at a given time is due to the self-paced nature of the course. With self-paced courses, students enroll in the course at various times meaning that each students' required completion date will be six months after enrollment but different than their peers' completion dates. With six months to complete the course, some students may not attempt to complete the courses 10 units until 10 weeks are left in the course; whereas, another student may choose to complete the course in the first 10 weeks of their designated six month completion period. As a result, many students may either be working on different units than their peers or may not be active in the course at a given time. Likewise, the self-paced nature of the course means that the instructor cannot assign specific due dates for assignments.

Once a student is active in the course, that student will enter the site with the intention of completing a unit. Then, he or she will be able to navigate to that specific unit to read a lecture from the instructor, be directed to the unit reading in the textbook and be presented with the unit assignment. Each unit also gives students the opportunity to look at bones in the tutorial section of each unit.

Bones, Bodies and Disease is an introductory course. Professor Stephenson noted that in anthropology courses she teaches in person, she is able to give students hands-on experience with the bones they are studying. However, because the course is online there is no opportunity for students to gain this experience. Instead, Professor Stephenson noted that students learn about the bones by looking at pictures she posted for each of the 10 units in the tutorial section. She also noted that these bones are from a collection students wouldn't normally view in an introductory course.

About the Instructor

Professor Stephenson earned her doctorate the University of Colorado in 1996 and started teaching in 1997. She created Bones, Bodies and Diseases for online use in 1996 when she was a student. Following graduation she continued to teach this course. Since then she has also taught an online course at CU Denver and face-to-face at Fort Lewis College. Additionally, she took a couple of years off from teaching face-to-face to do work at the Smithsonian, but she was able to continue to teach the online courses from Washington D.C. Likewise, she is currently located in southern Colorado near Ft. Lewis College, meaning she is not located on the CU Boulder campus.

Role of the Researcher

My role as a researcher can be described most accurately as an observer analyzing the design of the course. I investigated this course by visiting the course website on three different occasions and taking fieldnotes of my observations. I took fieldnotes on three occasions, because I noticed in my first visit that updates rarely occur on this site. This was apparent when viewing the discussion section; it had been a couple of weeks since anyone had posted anything. On each visit, I paid close attention to see if any changes had occurred on the site, but the only update I ever noticed was an occasional post on the discussion session in response to an assignment task. When I observed the course website, I had been granted access as a teacher assistant, meaning I could see a couple of features that were not available to students such as the grades of everyone in the course. I also conducted one 30-minute phone interview with Professor Stephenson. I collected data from these sources in order to gain an understanding of the way in which the instructor thinks about formative assessments and the ways she implements them in her course.

Selection of the Course

I selected this course, because through a different class project I had access to a few online courses. I reviewed all of these courses, and found that Bones, Bodies and Disease had content that may be considered to be formative assessments. From there I emailed the instructor, and then at her request followed up with a phone call, to see if she would be interested in participating. During that phone conversation I learned that she also had experience teaching another online course at a different school, which gave her an interesting perspective about the different structures of online courses. This insight made me even more interested in pursuing this course.

Rationale for Research Design

Little is known about online learning environments as compared to face-to-face learning, especially as they relate to formative assessments. Because case studies are a good research design to use when a "population, process, problem, context, or phenomenon whose parameters and outcomes are unclear, unknown or unexplored" (LeCompte & Schensul, 1999, p. 83), I used this design for my study. Likewise, in determining how formative assessments are present online, I was interested in learning about "group processes, organizational dynamics" (p. 84) and group interactions, which are all characteristics of case studies (LeCompte & Schensul, 1999).

Collecting Data

Again, I wanted to learn about how formative assessments are present in an online course and where there is room for improvement. I collected data by observing the course site and in doing so, I took notes on all activities but closely considered those that could be considered formative assessments. Likewise, I triangulated this data with an interview with the course instructor. This proved important, because she was able to reveal information about the course that was not noticeable through observations. For example, the instructor told me about feedback, but because I did not have access to her email interactions with students, I was unaware of such activities. Because I wanted to learn about the presence of formative assessments in this course, I focused my interview questions on related content. In determining what questions to ask the instructor, I referred to Weiss (1994) for guidance on constructing interview questions, which took the "fixed-question-open-response" approach. As a result, I developed the following set of questions to ask Professor Stephenson:

1. Tell me about your experiences teaching online. What are your main concerns as you plan a course? When you're teaching?

2. What has been your best online course experience and worst or not-so-good

3. What methods do you implement in the course that you think may assist in the learning process? Can you give me an example?

4. How do you gain an understanding of a students' understanding of a concept? How is this information used to further the students' learning?

5. Can you describe a time in the course when you assessed students' understanding of a concept and adjusted instruction and/or curriculum to improve learning? Or, when you wish you had?

6. What kinds of barriers exit in the course structure that may inhibit methods you believe facilitate learning? How does this compare to the other online or face-to-face courses you teach?

7. Describe the process of assessing a students' assignment and then communicating that assessment to the student?

8. In what ways do you interact with students? Can you give examples of some of those interactions?

9. What techniques do you apply for facilitating interactions among students? Can you give examples of some of these interactions you witnessed?

10. Describe the process of outlining expectations for an assignment? (Pallios, FN4)

Approach to Data Analysis

To ensure that the data collected was accurate, I audiotaped a phone interview of the course instructor. That recordings was then transcribed and used in conjunction with the CU Learn fieldnotes to determine in what ways formative assessments are implemented into the online course. I analyzed the data following LeCompte's (2000) suggestions for analyzing qualitative data sources. The steps included reviewing notes in order to identify items related to

the research question, clumping together items that have similarities, finding relevant sequences (e.g. the instructor mentioned making the final assignment expectations more clear; she also mentioned that the final assignments that have been submitted since then had improved since then), searching for evidence of triangulation (e.g. a fairly inactive discussion board was confirmed by the instructor), structuring patterns together (e.g. accounts of the effect self-paced courses has on the course) and assembling the patterns to form an overall description of the anthropology course

Addressing Issues of Validity

This case study is intended to show ways in which formative assessments may be implemented in online courses, and because this was previously a topic with little exploration it was only necessary to look closely at one course. Despite the fact that this study was conducted on a small-scale, the validity of the study was improved by implementing triangulation. Triangulation occurs when "multiple methods, data sources, and researchers" are used to enhance the validity of the study (Mathison, 1988). In the case of this study, triangulation exists in the use of multiple data sources, which included the course website and the interview with Professor Stephenson. Each helped me understand some of the ways formative assessments were present in the course, as well as ways in which the course structure limited the use of one forms of formative assessment.

Formative Assessments in an Online Course

When analyzing the course design in order to understand how learning is supported through formative assessments in an online learning environment and where there is room for improvement, I found evidence of formative assessments as well as barriers to using formative

assessments in some online course structures. I will explore these findings and discuss how they relate to mediational tools and leading students through their ZPD.

Evidence of Formative Assessments

Through my analysis of the design of the course website and an interview with Professor Stephenson, I was able to detect the presence of three different types of formative assessments. Each of these assessments serves as a mediational assistance guiding students in the course through the ZPD of topics important in grasping anthropological concepts.

Feedback

Fedback is a formative assessment that can act as a mediational tool for guiding learners through the ZPD. As Carillo-de-la-Pena (2009) found, learning was improved for the students who received feedback on a test compared to those who didn't take the test and thus didn't receive feedback. By students becoming aware of concepts they still didn't grasp and the ways in which they could better understand those concepts, they were then able to focus their attention on learning the misunderstood concept. Had students not received feedback on their misunderstandings, they would never improve their understanding on the topic. Thus, without feedback, a student's ZPD remains untouched, but with feedback they are aware they need to gain a better understanding of a concept and the ways in which they can go about gaining that understanding. Therefore, feedback serves as mediational assistance that can guide students through the ZPD. With that being said, there was feedback present in the online course I observed and this feedback also served as mediational assistance.

I learned through my interview with Professor Stephenson that she gives feedback to students on each of their assignments. She explained that she gains an understanding of the students' knowledge of a subject by reviewing their completed assignments. She then gives

them feedback on the assignments based on their level of understanding. When students display minor misunderstandings, she will show them the correct answer using notes on the assignment that she emails back to them. However, she explained that if a student shows they are completely not understanding a concept, she uses more detail in the feedback: "I will try and explain to them and have them do it over again. Usually, they get it after that but sometimes there will be more back and forth" (Pallios, FN4). Additionally, through my observations of the course, I learned that the instructor requires students to receive feedback from all assignments in the first five units prior to submitting the midterm assignment during unit six. This demonstrates the instructor's belief that students can learn from her feedback and utilize it in upcoming assignments.

The feedback students in this course receive also has characteristics of a mediational tool in that the feedback allows students to understand their misconceptions and the guidance that is needed from the teacher to get them back on track to understand the concept. In fact, because Professor Stephenson requires students to resubmit assignments that show glaring misconceptions, she ensures that her feedback is utilized and the newly corrected assignment demonstrates that feedback has guided the student through the ZPD.

Self-Assessment

Self-assessment is a type of formative assessment with multiple tools that fall in the category. Self-assessment is a tool that allows students to assess their own learning or work and then act on their self-assessment to improve understanding or work (Stiggins et al., 2006). The tools that allow for self-assessment to occur are mediational. In this case study, I found an example of self-assessment present in the form of a rubric. Rubrics are a formative assessment, because the student uses the teacher's guide regarding which topics are most important in order

to assess whether that important concept is one in which they currently grasp. With rubrics and other self-assessment tools, students are able to ask: "Do I know what it means to succeed" (Stiggins et al., 2006, p. 35)? Students who use these rubrics or guides and then realize they do not yet understand a concept necessary for succeeding may then focus their attention on trying to gain a better understanding of what the teacher deems to be important. Not only are rubrics a form of formative assessment, but they are also allow for mediational assistance that guides students through the ZPD by demonstrating where they should focus their attention in order to learn the most relevant concepts in a subject. By guiding students toward important concepts, learners seem more likely to grasp the whole topic at hand, thus leading them through the ZPD.

For each of the 10 units in this course, there is a link for obtaining material for that particular unit. Within the page the students are then directed to is the required reading for the unit, which is from the course textbook, a list of questions for students to respond to for the unit assignment, a lecture from the instructor and a tutorial that puts the unit into perspective by giving real-life examples.

The assignment questions at the beginning of each unit tell students what information to seek when reading the textbook and lecture. For example, the assignment for unit one states:

ASSIGNMENT: Provide brief responses to questions 1-4 and post your answer for question 5 on the bulletin board. 1. What kinds of information can a physical anthropologist learn from the skeleton? 2. If you were the physical anthropologist on an archaeological dig, what are three important questions you would want to answer based on your analysis of the human skeletal remains? 3. If you were the forensic anthropologist for a criminal investigation such as a homicide, what are three important questions you would want to answer based on your analysis of the human skeletal

remains? 4. Briefly discuss how your answers to questions 2 and three differ and why. 5. Locate a web site (other than those listed at the end of Chapter 1) that you find interesting and would be useful to students in this class. Provide the URL and a brief statement (about 1 paragraph) about how it is related to this course. To complete question 5, click on the "bulletins" icon on the tool bar. This assignment is labeled, **Unit 1: Web Assignment.** Click on "forum" on the side menu to find this (Pallios, FN 2).

Although, these questions do not include a scoring guide, which is common with rubrics, the questions may work in the same way that a rubric does in that they demonstrate to the student what information the teacher deems important and what is considered quality work. As was previously mentioned, Stiggins et al. (2006) classifies this as a formative assessment, because it assists in the learning process by promoting self-assessment. It is also relevant to the sociocultural perspective, because such guidelines can guide students through the ZPD rather than leaving them confused about what information is most important resulting in them focusing their attention elsewhere.

In addition to assignment questions serving as a formative assessment, the instructor also incorporated five tutorial sections following five of the units. Within these sections, the instructor gives further instruction on the unit by showing students actual pictures of bones and then asking them questions to try and answer before completing the unit assignment. The syllabus describes the tutorial section in more detail:

Complete the tutorial: the tutorial is your chance to try new techniques before going on to the exercises, which will be graded. In general, you will be presented with a question or problem, based on a photographic image of a bone or a group of bones. You should develop an answer on

your own (it might be useful to write it down) and then look at the answer provided. There is no penalty for wrong answers here, so use this as an opportunity to identify areas where you need further explanation before moving on to the exercises. Whenever your answer does not match the one provided, go back through the question again. Just as in a laboratory setting, sometimes answers are much more obvious once somebody points them out (Pallios, FN4)!

The questions not only allow students to self-assess their learning by determining if they have a grasp on the concept the instructor deems important, which is demonstrated by her selection of questions, but it also gives them a second opportunity to self-assess their learning when they compare their response to the one provided by the instructor. Should students find their responses were incompatible with the teacher's, they may review the textbook and lecture in order to gain a stronger grasp on the concept they misunderstood. Additionally, when students attempt to relearn concepts they have further guidance from the instructor through her disclosing of the correct answer, so there may be less confusion when relearning occurs resulting in better understanding on the second attempt to learn a concept. These opportunities to self-assess learning and then use the findings of the self-assessment to relearn important concepts that students may have misunderstood, serve as mediational assistance in that the action of relearning a concept and with more guidance from the instructor gives the student a better grasp on the concept then if they were to embark on learning alone. Thus, the self-assessment opportunity within the tutorials leads students through the ZPD.

The research previously discussed demonstrates how "just enough questions" (p. 51) serves as mediational assistance that guide learners through the ZPD. Again, this occurs when learners are asked questions that allow them to create explanations to gain an understanding of a concept. The guiding question that doesn't divulge too much by leading them to respond with a

specific answer in mind, serves as mediational assistance because it allows students gain a deeper understanding than if they were guided to answer in a certain way. This struggle leads learners through the ZPD, because they eventually achieve a deeper understanding.

At first glance, this doesn't seem like a form of formative assessment but if used as a form of self-assessment these questions can fall in this category. Professor Stephenson utilizes these "just enough questions" (p.51) when she presents the final assignment to students. In this final assignment she asks questions within the description of the assignment. It is evident that she wants students to address these questions, some of which encourage students to think about the topic on a deep level. For example, one question asked states: "Also, think about the discrepancies you might encounter between the cultural history and the biological status of the populations you are studying; do the bones tell a different story than the material remains" (Pallios, FN1)? The instructor does not give the answer or suggest that there is only one response that is correct. Instead, it seems that she is encouraging students to think about important questions as they are related to anthropology in order for students to understand which concepts are important in grasping important topics within the field. This question acts as a mediational tool in that students who explore this question will explore a concept they may have otherwise not considered, thus leading them through the ZPD.

Improving Formative Assessment

The course I investigated also demonstrated room for improvement in the area of formative assessments. The community of learners model was not present even though there was a discussion board in which this model could have been present. Bakula (2010) explained that discussion among students and the teacher can help learners understand their understanding of a concept or help a peer better understand. This mediational assistance helps the members of

the community through the ZPD. Likewise, discussions can also have characteristics of formative assessments.

Within some of the assignments, one of the tasks is to post on the site's bulletin board— also known as the "discussion" section on CU Learn—where students can view other students' posts and respond to those posts or add their own thoughts. For one of these discussion assignments, the instructor asked the students to respond to the following question, which followed the disclosure of a data set:

These results are actually the opposite of what researchers had expected to find, based on the cultural setting of these two populations because it was assumed that the later population living during the feudal "dark" age would be under more stress. Based on what you know about the cultural setting of these two populations, can you think of any possible explanations for this discrepancy? BE CREATIVE (Pallios, FN 2)!

Again, the discussion-section based questions give students the opportunity to learn from their peers as well as learn while giving their own input to peers.

However, while the discussion section could serve to foster students' learning; the instructor questions whether the structure of this particular online course enables students to benefit from this particular type of mediational assistance. The instructor notes that this particular online course is self-paced meaning that only a handful of the over 100 enrolled students may be active at once and even then they may be posting in response to different units. On the other hand, the instructor also teaches an online course at CU Denver, which is semester based meaning that the students complete the course at the same pace as one another. The instructor pointed out that the students in that course more readily interact in the discussion section and likely learn from input given by their peers. Professor Stephenson gave an example

of students in that course posting links to websites that they thought would be useful to helping their peers learn. The different levels of success for the discussion sections for the two different types of online courses somewhat relates to Xiaojing's (2004) research, which showed that there are certain factors that can lead to better use of online discussion forums. In this case, it seems that semester based courses may have more successful discussion sections due to the presence of several students studying the same topic.

While formative assessments are present in this course through feedback, "ask enough questions" (p. 51) and rubrics, the instructor recognizes that there can be barriers to promoting discussions online—another form of formative assessment that can lead learners through the ZPD.

Summary and Discussion

In this analysis of online learning environments, I was able to answer my research question: How is learning supported through formative assessments in an online learning environment and where is there room for improvement? This was an important question to ask and investigate, because enrollment in online courses is growing. I found that formative assessments can be present through feedback and self-assessment. On the other hand, my analysis found that there is room for improvement in the way discussion sections can facilitate learning with formative assessments.

This research study is limited, because it only gave us an understanding of how one instructor implements formative assessments online. Additionally, I tried to capture students' work, but did not find any students interested in participating in the study. Despite these limitations, there are important implications for the Continuing Education & Professional Studies department at CU in that the self-paced nature of the course inhibited the way in which the

discussion section was utilized. By becoming aware of this challenge, the facilitation of learning may be able to be improved in these online courses.

Given the challenge presented by the self-paced nature of the course I investigated and its role on the course discussions, I would recommend to an instructor of such a course to encourage student interaction through cohorts. Because students enroll in self-paced courses at various times, I would suggest to an instructor that he/she contacts students who enrolled in the same time period and encourage them to work together throughout the course by discussing course content on the discussion boards. This may be one way that the negative impact of self-paced courses could be overcome.

Finally, this study has caused more questions to emerge. A follow-up study could be conducted on the same instructor's other online course in order to determine if the semester-based course does in fact facilitate discussions. Likewise, another study could investigate student work and their thoughts on various forms of formative assessments in online courses.

References

Bakula, Nora, (2010). The benefits of formative assessment for teaching and learning. *Science Scope*, 34, 37-43

Bassani, P. (2011). Interpersonal exchanges in discussion forums: A study of learning communities in distance learning settings. *Computers & Education*, 56, 931-938.

Carrillo-de-la-Pena, M. et al, (2009). Formative assessment and academic achievement in pre-graduate students of health sciences. *Advances in Health Sciences Education*, 14, 61-67.

Cole, M. & Wertsch, J. (1997). *Beyond the individual-social antiomony in discussions Piaget and Vygotsky.* Human Development, 39, 250-256.

Gunawardena, C., Ortegano-Layne, L., Carabajal, K., Frechette, K., Lindemann, K. & Jennings, B. (2006). New model, new strategies: Instructional design for building online wisdom communities. *Distance Education*, 27, 217-232.

Hatziapostolou, T. & Paraskakis, I. (2010). Enhancing the impact of formative feedback on student learning through an online feedback system. *Electronic Journal of E-learning*, 8, 111-122.

LeCompte, M. (2000). Analyzing qualitative data. *Theory Into Practice*, 39, 146-155.

LeCompte, M. & Schensul J. (1999). *Designing & Conducting Ethnographic Research*. Lanham, MD: Alta Mira Press.

Mathison, S. (1988) Why triangulate? *American Education Research Association*, 17, 13-17.

Mitchell, R. (2010). Approaching common ground: Defining quality in online Education. *New Directions for Community Colleges*, 150, 89-94.

Rogoff, B. (1994). Developing understanding of the idea of communities of learners. *Mind, Culture and Activity*, 1, 209-229.

Shepard, L. (2000). The role of assessment in a learning culture. *Educational Researcher,* 29, 4-14.

Siegler, M.G. (2010). *Bill Gates: In five years the best education will come from the web* [Electronic version]. Tech Crunch.

Stiggins, R., Arter, J., Chappuis, J. & Chappuis, S. (2006). *Classroom Assessment For Student Learning*. Boston, MA: Pearson.

The Sloan Consortium (2008 November). Staying the course: *Online education in the United States, 2008.* Retrieved March 3, 2011, from http://sloanconsortium.org/sites/default/files/staying_the_course-2.pdf

Stone, L. & Gutierrez, K. (2007). Problem articulation and the processes of assistance: An activity theoretic view of mediation in game play. *International Journal for Educational Research*, 46, 43-56.

Vygotsky, L. (1980). Interaction between learning and development. In Cole, M., John-Steiner, V., Scribner, S. & Souberman, E. (Eds.), *Mind in Society*, (pp. 78-91). Cambridge, MA: Harvard University Press.

Weiss, R. (1994). *Learning From Strangers: The Art and Method of Qualitative Interview Studies.* New York, NY: The Free Press.

Wertsch, J. (2007). *Mediation*. In Daniels, H., Cole, M. & Wertsch, J. (Eds), The Cambridge Companion to Vygotsky. New York, NY: Cambridge University Press.

Xiaojing, L. (2004). Socio-cultural context for online learning: A case study viewed from activity theory perspective. *In Chicago Association for Education Communications and Technology*. Association for Educational Communications and Technology.