COMPOSITE LEARNING OBJECTS IN GEOGRAPHICAL SCIENCES: A COMPARISON STUDY OF THE LEARNING PROCESS BETWEEN A COSTA RICA AND UNITED STATES UNIVERSITY CLASSROOM

by

Angela D. Wranic, B.S., M.S.

A dissertation submitted to the Graduate Council of
Texas State University in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
with a Major in Geographic Education
May 2016

Committee Members:

Osvaldo Muniz – Solari, Chair

Richard Boehm

David Butler

Christine Rodrigue

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

Duplication Permission

DEDICATION

This dissertation is dedicated to my dear friend Cassandra Williams. She was an inspiration to me to finish this PhD and to live life to the fullest.

ACKNOWLEDGEMENTS

There are many people that I want to thank. I am grateful to Dr. Muñiz who kept me motivated through this whole process and for the time he was willing to invest in me. I want to thank Dr. Rodrigue who provided invaluable statistical consultations on the home front and who was the first to inspire me to get a PhD. Thank you to Dr. Boehm who promoted the summer cohort program and who made a doctoral program available to non-traditional students, and thank you to Dr. Butler who kept me connected to Texas State via social media. Thank you Allison Glass-Smith for making me feel at home in Texas and numerous assists in the administrative needs department. Thanks to everyone who assisted me in this project including Dr. Unna Lassiter, Dr. Laura Rodriguez Amaya, and Carin Tabag. Special thanks to Lilliam Quirós Arias and Gustavo Barrantes for making the research possible in Costa Rica. Thank you to my family and friends, including my dear hubby Greg, for their support and love.

TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS v

LIST OF TABLES viii

LIST OF FIGURES x

ABSTRACT xi

CHAPTER

1. INTRODUCTION 1

    Significance of the Problem 1
    Conceptual Framework 2
    Problem Statement 4
    Development of the cLO 5
    Scope and Limitations of the Study 8

2. LITERATURE REVIEW 11

    Constructivism Learning Theory 11
    Assessing Learning 15
    Geography and Technology Use 17
    Comparison of Costa Rica and U.S. Educational Systems 19

3. RESEARCH DESIGN AND DATA COLLECTION METHODS 25

    Research Methods 25
    Data Collection 28
        Process of Selecting the Sample 28

Studying the Population 29
Cognitive Assessment and Survey Instrument 32

4. DATA ANALYSIS 34

Quantitative Data Analysis of Cognitive Data 34
Quantitative Data Analysis of Survey Data 44
Content Analysis of Open Comments 53
Assumptions and Limitations 57

5. DISCUSSION OF RESULTS 60

Question 1 60
Question 2 66
Question 3 68

6. CONCLUSIONS 74

Projections for Future Research 77

APPENDIX SECTION 78

REFERENCE LIST 191

LIST OF TABLES

Table **Page**

3.1 Survey question adapted from (Mottet and Richmond 1998): Construct 2: The likelihood of developing an "appreciation" for the content/subject matter 33

4.1 Descriptive statistics for multiple choice results for all student participants and for the outlier trimmed subset.....36

4.2 Multiple choice test results for Costa Rica students compared to U.S. students 37

4.3 Descriptive statistics for essay results for all student participants and for the outlier trimmed subset 39

4.4 Essay test statistics for Costa Rica students compared to U.S. students.....40

4.5 Descriptive statistics for activity results 41

4.6 Statistical data comparing Costa Rica and U.S. participation rate in activities $\alpha = 0.10$; Chi –Square Test of Independence[a] 42

4.7 Activities test statistics for Costa Rica students compared to U.S. students 43

4.8 Pre-survey statistical data comparing Costa Rica and U.S. student attitude toward technology at $\alpha = 0.10$; Chi –Square Test of Independence[a] 48

4.9 Pre-survey statistical data comparing Costa Rica and U.S. student attitudes toward facilitator at $\alpha = 0.10$; Chi –Square Test of Independence[a] 49

4.10 Post-survey statistical data comparing Costa Rica and U.S. student attitude toward technology at $\alpha = 0.10$; Chi –Square Test of Independence[a] 50

4.11 Post-survey statistical data comparing Costa Rica and U.S. student affective learning at $\alpha = 0.10$; Chi –Square Test of Independence[a] 51

4.12 Statistical data (Post-Survey) Comparing Costa Rica and U.S. Student Demographic Data at $\alpha = 0.10$; Chi –Square Test of Independence[a] 52

4.13 Post-survey statistical data comparing Costa Rica and U.S. student attitudes toward facilitator at α= 0.10; Chi –Square Test of Independence[a] 53

4.14 Categories generated for open comments in student survey.....54

4.15 Number (N) of ideas associated by category and tone for Costa Rica 55

4.16 Number (N) of ideas associated by category and tone for U.S.....56

4.17 Contingency table number of ideas per location and tone.....57

4.18 Open comments statistical data at α= 0.10; Chi –Square Test of Independence[a] 57

5.1 Multiple choice test statistics comparing Costa Rica and U.S. students for cognitive level of remembering.....61

5.2 Essay test statistics comparing Costa Rica and U.S. students for cognitive level of understanding.....63

5.3 Comparison of average percentage scores for multiple choice and essay results.....64

5.4 Average percentage scores for activities.....65

5.5 Pre-survey and Post-Survey statistical data for student attitude toward technology variables that showed significance at α= 0.10; Chi –Square Test of Independence[a] 70

5.6 Pre-survey and Post-Survey statistical data for student attitude toward facilitator variables that showed significance at α= 0.10; Chi –Square Test of Independence[a] 72

E1 Results of multiple choice exams as percentages.....161

E2 Results of essay exams as percentages.....164

E3 Results of journal, wiki, and discussion board as percentages.....167

E4 Contingency tables for participation rate in activities of Costa Rica and U.S. Students.....171

LIST OF FIGURES

Figure **Page**

1.1 cLO Design 7

3.1 Relationship of variables within the setting of the research design 26

3.2 Sequence of events in Costa Rica 30

A1 Overall design of Plate Tectonics cLO 88

ABSTRACT

This study systematically evaluated the learning process of post-secondary students in the U.S. and Costa Rica using a technology enhanced lesson. A composite Learning Object (cLO) was created for this research study which was organized around a website, and taught using social constructivist pedagogical setting. Evaluating the learning experience consisted of comparing cognitive and affective learning of students from both locations. Student attitudes toward the facilitator, the person responsible for guiding students through the lesson, were also assessed as they can be strong influences on the learning experience. Student attitudes toward technology were assessed because of the online delivery mechanism. This study was a mixed methods approach with more emphasis on the quantitative analysis. The evaluation instruments used to measure quantitatively the learning experience was a cognitive test, a survey instrument, and student's grades on activities performed. Qualitative analysis consisted of content analysis of open comments from the survey and personal on-site interviews. The nonparametric statistics used in the comparison were the Mann-Whitney-Wilcoxon and the Chi square Test for independence. The exam data indicated significant difference between pre- and post-test scores between the two groups, with U.S. students scoring higher, but no significant difference in improvement scores between the groups was indicated. Furthermore, improvement in cognitive learning did occur, but the gap could not be closed between the two groups despite having participated in the same lesson. This has detrimental implications for international students taking classes online and prompts further questions of why the gap in post-test scores between the two groups could not be eliminated. Affective learning did not differ between the two groups except for the future use category. Furthermore, the difference in the future use category is linked with the majority of Costa Rica students being geography majors. The prominent use of the English language on the Internet also had a negative effect on the Costa Rican group. Survey results support this conclusion where 70% of students believed they could

have done better if Internet material were in their native language. It is recommended that more Spanish educational material be available on the Internet for this population.

Survey results and personal interviews indicate that the Costa Rican students and U.S. students had a positive learning experience with the online constructivist lesson. Regarding motivation, 78% of the Costa Ricans and 75% of U.S. students agreed that the cLO stimulated their interest. In each group, at least half indicated that the lesson motivated them to spend more time with the subject than they normally would. The open comments analysis also supported the positive response to the approach of the lesson by the Costa Rica group. Despite lower cognitive scores and a secondary educational system focused on didactic methods, the Costa Rican students are amicable to the use of geographic technology presented in social constructivist pedagogy.

Field data are lacking on the topic of culture and online learning. This study provided some insight into the subject but much more research is needed. The mass marketing of global online education by developed countries is already in progress and in order for students to have an enriching experience care should be taken in development of these courses. Future topics that currently need exploration include how student-teacher and student-student interactions affect the learning experience in different cultural settings, how language affects the learning experience for second-language learners, and development of best training methods for instructors with a global audience.

Key words: composite learning object; geographic education; assessment; online learning; culture

1. INTRODUCTION

Significance of the Problem

Use of computers in the classroom began in the 1970s when they primarily delivered information as drill-and-practice programs. A typical lesson consisted of problems for students to solve, answers entered by the learners, and feedback given by the computer (Jonassen 2000). Computer technology has advanced exponentially since the 1970s. Technology is now used in a variety of ways such as tablet PCs, mobile phones, GIS (geographic information systems), GPS (global positioning systems), games, building virtual reality worlds, animation, and a host of others. Online delivery of educational material has become more popular and is seen as a convenient and viable alternative to a traditional classroom experience. According to the National Center for Education Statistics, 20% of undergraduates took at least one distance education course in 2007-08 and 4% of undergraduates took all of their classes online. Online education delivery is dominated by developed English speaking countries but the market for online education is global. Haigh (2002) indicates a moral obligation to make online education culturally sensitive. Another consideration is the desired internationalization of U.S. curriculum in order to better prepare students for a work force needed to solve global problems (National Science Board 2008). This internationalization will be largely technology driven as free online tools such as Google Docs, Skype, and Prezi have become available (Connell 2014). Online international interactions are desired and the global online market continues to increase but empirical research concerning online learning and cultural diversity is lacking (Conway-Gómez and Pelacios 2011; Brunn 2003; Haigh 2002; Reeve et al. 2000; Rich, Robinson and Bednarz 2000). If an

inappropriate design for online international experience is used, the instructional effectiveness for students will suffer.

Geographers, in general, have a history of adopting innovative approaches to learning and teaching perhaps due to geography's eclectic nature (Lynch et al. 2008). Many geographers have adopted constructivism, students produce or construct their own knowledge from personal experiences, learning theories for problem-based and collaborative learning environments. It is believed that teaching with the Internet can improve geographic education and is the leading edge to a new teaching and learning paradigm (Hill and Solem 1999), but only if lessons are designed in a pedagogically sound manner. In general, there is a lack of well-structured research in geographic education (Downs 1994). In particular, research in the area of geographical educational technologies is needed (Lynch et al. 2008; Hurley, Proctor, and Ford 1999; Nellis 1994), given the rapidity of their adoption.

Conceptual Framework

One of the most common complaints about online education is the social alienation experienced by students. Students in a typical class only interact with the educational material provided by the computer and occasionally with the instructor. This alienation leads to a lack of motivation and interest and can lead to a low student retention rate (Rovai and Whiting 2005; Hurley, Proctor, and Ford 1999; Morgan and Tam 1999). Use of social constructivism pedagogy offers a solution to this social alienation by encouraging increased amount of interaction between instructor-student and student-student relationships. Constructivism is a learning theory that emphasizes student learning occurs not from absorption of material, but by actively constructing

hypotheses and gaining understanding from that construction. Social constructivism emphasizes learning occurs in a socio-cultural setting. Social constructivists emphasize that positive and negative reinforcements experienced through the learning community, combined with a learner's own motivation provide the best learning environment (Rowe and Berv 2000).

Constructivism is compatible with lessons utilizing computer technology in educational settings (Nurmi and Jaakkola 2006; Littlejohn 2003; Jonassen 2000). The social constructivist pedagogy was selected because it as seen as a potential solution to student alienation experienced online.

This research study provides field data on the use of social constructivism in university geography classrooms in two different cultures where the amount of technological accessibility varies. One parameter used to compare countries is the digital access index (DAI) which" measures the ability of the individuals in a country to access and use new information and communication technology" (Muñiz-Solari 2009, 25). Countries are rated on a scale from 0 to 1, where 1 is the highest. Countries are ranked into 5 categories which consist of high access, upper access, medium access, low access, and not on the list. In order to ensure that the study would not be dominated by severe differences in technology, two countries with high DAI access were chosen. The United States was selected as one location because it is an English speaking country and is one of the countries currently marketing Internet classes globally. The DAI ranking of the United States is 0.78 and this rank falls in the high access countries category. The second location selection was based on choosing a country that was a potential consumer of U.S. Internet classes, a country where English was the second language, and had a relatively

high digital access index. Costa Rica fit all necessary criteria with one category lower ranking than the U.S. on the digital access index at 0.52 according to Internet world stats.

Problem Statement

This study will systematically evaluate the learning process of post-secondary students in the U.S. and Costa Rica using a technology enhanced lesson and taught using social constructivist pedagogy. Evaluating the learning experience will consist of comparing cognitive and affective learning of students from both locations. Student attitudes toward the facilitator, the person responsible for guiding students through the lesson, were also assessed as they can be strong influences on the learning experience (Goodboy, Martin and Bolkan 2009; Mottett and Richmond 1998). Student attitudes toward technology were assessed because of the online delivery mechanism.

Cognitive learning is the type of learning associated with acquisition of knowledge or information. It is commonly associated with Bloom's taxonomy that includes the following concrete to more abstract concepts: knowledge, comprehension, application, analysis, synthesis, and evaluation (McCroskey 2007). Cognitive learning is the type of learning we generally associate with the content of the course and typically uses assessment tools such as multiple choice and essay questions. Affective learning is a type of learning that consists of attitudes, emotions, values and beliefs formed by the knowledge and psychomotor skills acquired. Affective learning occurs when students internalize positive attitudes toward subject matter. This type of learning serves as a motivational catalyst and is linked with higher levels of cognitive learning (Mottett and Richmond 1998). A survey will be the instrument used to assess affective learning. Student attitudes toward the facilitator and toward technology will also be assessed using

a survey.

The technologically-enhanced lesson consists of a composite Learning Object (cLO), in the form of a website, on plate tectonics, which was developed for use in the research study. The topic of plate tectonics was chosen for this study because both locations of the study, California and Costa Rica, are located in tectonically active areas. It was believed that this would increase interest for the students since the topic has particular relevance to their everyday lives. The study will address the following research questions and hypotheses:

Question 1. Is there any difference in student learning outcomes for cognitive learning using cLOs between student populations in Costa Rica and the U.S.?

Hypothesis 1. No difference exists between the Costa Rican and U.S. student populations with regard to their mean improvement test scores based on the updated Bloom's taxonomy categories of remembering and understanding.

Question 2. Is there a relationship between cultures; specifically a Costa Rican and U.S. student population, each using a cLO and affective learning?

Hypothesis 2. Culture and affective learning are independent.

Question 3. Is there a relationship between culture; specifically a Costa Rican and U.S. student population, each using a cLO and student attitudes toward technology, and student attitudes toward the facilitator?

Hypothesis 3. Culture and student attitudes toward the facilitator and student attitudes toward technology are independent.

Development of the cLO

What is a learning object (LO)? The most general definition is, "Any entity,

digital or non-digital that may be used for learning, education or training" (Littlejohn 2003, 12). The "materials" in a learning object can be documents, pictures, simulations, movies, sounds, etc. Objects should be organized in an effective way so that learning objectives can be achieved (Nash 2005). A cLO is an organized combination of learning objects that has a certain degree of relationship guided by a central theme (Muñiz-Solari and Wranic 2008).

A cLO was created for this research study; it is organized around a website and addresses the topic of plate tectonics (www.geography.wranic.com) (Figure 1.1). The cLO was designed particularly for an undergraduate physical geography class. Modifications to the original cLO were made to conform to specific pedagogical requirements and to conform to a previously designed cLO that had been pilot tested in the classroom.

What follows is an explanation for the organization of the website and rationale for the design and generation of the website. This includes an explanation of the different types of learning objects. The website is an instructional and collaborative object. It provides a means of delivery for knowledge and a place for students to work collaboratively. The website has a traditional behaviorist bottom-up design, meaning that students begin with easier tasks and proceed to more difficult projects. The overall cLO demonstrates a moderate social constructivist approach. This means that the cLO was designed so that students construct their own knowledge in a group setting; it is moderate, in the sense that students still have guidance from an instructor.

The home page contains a general introduction to the creator of the website, contact information, and a video introducing the instructor. The video is a way to

familiarize students with the instructor and encourages high tech collaboration between students. The home page has a navigation bar to the two lessons for this cLO. Lesson 1 consists of three parts: (1) student examination of Internet multimedia, (2) student construction of a journal and, (3) student participation in a discussion board. The review of Internet multimedia is based on the idea of guided practice.

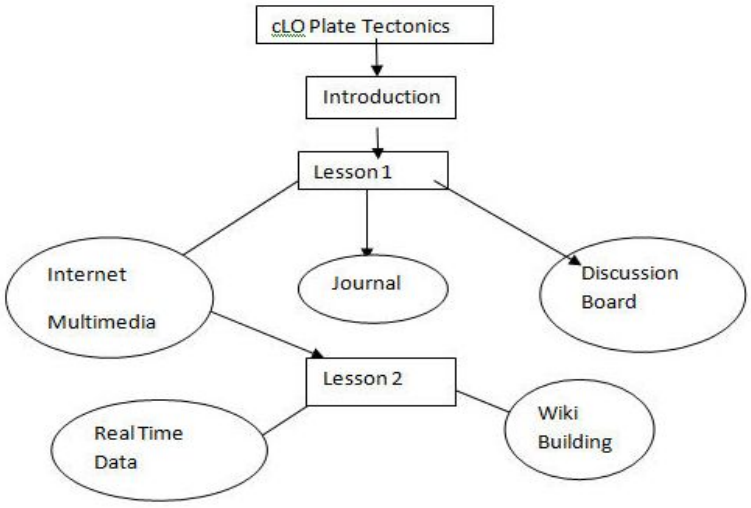


Figure 1.1. cLO Design.

During their review of the multimedia, students should be acquiring a base level of knowledge. With this goal in mind, students are required to submit a journal answering specific questions on the subject. The journal assignment is based on behavioral theories of learning with some elements of constructive discovery learning, because it has a variety of websites and readings that students can explore. The second part of the first lesson is the interaction of students on a discussion board. The interaction in the message board is intended to prepare students to work together in lesson 2 and to make the topic of plate tectonics more relevant on a personal level. Students will share and read about personal experiences with earthquakes, and reflect on the consequences of earthquakes from a human and hazard point of view. Rubrics for grading of each part in

the lesson are included on the cLO.

Lesson 2 begins with plotting of real time earthquake data obtained through the Internet. The process of obtaining and plotting the earthquake data is a way for students to see reliable data available on the Internet and present them with the problem of organizing scientific data. Lastly, students work in groups to construct a wiki (a group website) about a location with a history of earthquakes. They are required to describe physical processes and hazards associated with their location and use this information to synthesize a disaster management plan. This is the most important LO in this experience from a constructivist point of view because students are required to synthesize their knowledge on the topic and construct their own learning object cooperatively.

Scope and Limitations of the Study

This study will systematically and quantitatively compare cognitive learning, affective learning, student attitudes toward technology, and student attitudes toward the facilitator between two technology-enhanced classrooms in two separate locations, with one classroom in Costa Rica and the other in the U.S. For both study locations, the students had F2F (face to face) interaction with the instructor rather than a completely online experience; therefore, the technology enhanced setting is a blended learning environment. The study took place over the course of two standard school semesters in Costa Rica and the U.S. The study is longitudinal because student progress was tracked through the 4 week period the students interacted with the cLO lesson. Because of differences in semester time periods between the U.S. and Costa Rica the studies occurred during different times of the year. Consequently, the studies were not run at the same time in each location. It is important to notice that the cLO remained constant

throughout the study and, therefore, the time discrepancy should have limited impact on the study.

The specific topic of the cLO in this study was plate tectonics, which is a topic covered in the National Geography Standards for earth science and geography in the U.S. It is unclear if this topic is covered in the K-12 system in Costa Rica as it could fall under the science or social studies categories. Students in Costa Rica indicated they had not received instruction on the topic of plate tectonics in their K-12 experience, which is a distinct possibility.

This experimental design is quasi-experimental because of the inability of the researcher to select or assign subjects randomly. This inability poses threats to the internal validity of the results because selection factors go uncontrolled due to lack of randomization (Creswell 2008). Quasi-experimental designs are frequently used in educational studies because instructors are required to keep classroom groups intact in order to avoid disruption to classroom learning (Creswell 2008). Although the selection of population is not random, both populations are independent from each other.

Language was also a limitation for the students in Costa Rica because their primary language is Spanish and most of the websites in the cLO had to be translated via an online engine translator. This experiment simulates what an international student would encounter if taking an online class. Most online classes are offered only in English. To simulate a better environment than is normally offered in online classes, lesson guides were provided to the facilitator and students in Spanish. In addition, the students had an onsite native facilitator and activities were conducted in Spanish.

Non-parametric tests have repeatedly been shown robust against violations of the

critical assumptions of parametric tests (e.g., scalar data, conformity with an established probability distribution, and small sample sizes). Their use is increasingly common, especially in the case where a random sample is not always available (Daniel 1990; Pett 1997). Because of the irregular sampling distribution and the violation of normal distribution of sample results, use of non-parametric tests was warranted.

The scope of the research is limited to geography education at the tertiary level. Because of the wide array of variables (e.g., language spoken, DAI ranking of countries, and level of geographic education), findings might not be generalizable to other student populations.

2. LITERATURE REVIEW

Constructivism Learning Theory

What is a learning object? The most general definition is, “Any entity, digital or non-digital that may be used for learning, education or training” (Littlejohn 2003, 12). The “materials” in a learning object can be documents, pictures, simulations, movies, sounds, etc. Objects should be organized in an effective way so that learning objectives can be achieved (Nash 2005). Presently, learning object design is focused on content delivery rather than on construction of student knowledge. Learning objects are designed so that they are reusable, granular, and interoperable (Littlejohn 2003). These characteristics focus on technical aspects of the learning object rather than the learning theory behind the design of the objects. Current learning theories indicate that learning should be active and motivational, although LO’s designed with this approach are not well represented; this includes their uses in the geographical sciences (Muñiz and Wranic 2008). Building cLOs based on social constructivism is an opportunity to develop educational technology from a different perspective, basing construction on pedagogy rather than delivery.

Computer technology use in the classroom has changed a great deal since its inception in the 1970s. Along with changes in computer technology, learning theories have also evolved during this time. A significant shift in learning theories occurred in the 1980s with the introduction of constructivist learning theory; where students construct their own knowledge. This shift in learning theories is in part a result of implementing active learning strategies due to poor student response to didactic instruction (Doering and Veletsianos 2008; Edsall and Wentz 2007; Littlejohn 2003; Jonassen 2000).

Constructivism is a broad learning theory that emphasizes that student learning occurs not from absorption of material, but by actively constructing hypotheses and gaining understanding from that construction. In other words, knowledge is not acquired automatically, but rather learners create their own understanding (Schunk 2000). Constructivism evolved from a broad spectrum of educational psychologists and philosophers. Three of the more prominent contributors include Piaget, Brunner, and Vygotsky. Piaget's psychological learning theory is based on the idea that children will pass through fixed stages of cognitive development. The four stages of cognitive development are sensorimotor, preoperational, concrete operational, and formal operational. His stage theories assume that the stages are each distinct and do not continuously merge one to another, the development of the structures are dependent on preceding development, and the age at which a person passes through each stage is not equated with any particular age. Piaget theory is constructivist in the sense that it assumes children impose their own concepts in order to make sense of their world (Schunk 2000). Bruner's theory of cognitive growth emphasized how children represent knowledge. Knowledge emerges in a developmentally sequence which includes enactive (motor responses), iconic (mental images that can alter), and symbolic (where knowledge is encoded such as in math). Brunner is a constructivist in the sense that learners assign meaning to events based on their own cognitive capabilities and their own experiences. Social constructivism, the Vygotsky form of constructivism, emphasizes learning occurs in a socio-cultural setting (Schwartz, Lindgren and Lewis 2009). Vygotsky believed that individual's learn from social interactions within which cultural meanings are shared and then internalized by the individual (Chadha, Faraday, and Nicholls 2001). Social

constructivism is seen as one of the best approaches to online education because of its ability to allow students to interact with one another and therefore avoiding lack of success due to alienation of the student (Rovai and Whiting 2005; Hurley, Proctor, and Ford 1999; Morgan and Tam 1999). However, the majority of higher education institutions have not applied this learning theory to their educational technology. Most instructors take the "file cabinet" approach to using the Internet: Lectures are simply posted on learning management systems to be downloaded by students. There is a need and hope to use educational technology to enhance student learning particularly in Bloom's taxonomy of higher order learning. Technology must be used when appropriate and with a particular pedagogical approach in mind; otherwise it will not support meaningful learning (Littlejohn 2003; Jonassen 2000). With the advent of Web 2.0 tools and processes, the Internet has become an ideal learning environment for social constructivism, in which students construct knowledge based on a team-building environment (Collis and Moonen 2008; Hurley, Proctor, and Ford 1999).

What follows is a description of social constructivist strategies in the classroom. The role of the instructor changes completely. Ideally, the instructor is more of a facilitator or collaborator in the learning process, a role seen earlier only in graduate seminars. Active participation of the student is central to this theory. The student is given freedom and autonomy and is responsible for controlling the direction of learning. There is no "right" knowledge assigned by the facilitator. Students construct their own knowledge through interpersonal interaction with the teacher and classmates. Constructivism develops higher-order problem-solving skills, including thinking skills, such as discovery, inquiry, and exploration (Schwartz, Lindgren and Lewis 2009).

Constructivism replaces factual recall and rote memorization with a form of problem-based learning (PBL) where the focus is on “how” and “why” types of questions. Social constructivism also facilitates development of social skills, such as cooperation between students, which will benefit students in their working lives.

Constructivism has its share of criticisms particularly in the area of practicality in the classroom setting. Adopting constructivism in an online classroom requires a considerable amount of time, effort, resources, and technical knowledge by instructors (Hurley, Proctor, and Ford 1999). Assessment is also more difficult as instructors need to measure not just old knowledge but the new construction of knowledge by students (Schwartz, Lindgren and Lewis 2009). Frequently this type of assessment is difficult to transfer to objective measures used by school districts. Constructivism in some classrooms can be detrimental to some learners if they lack enough prior knowledge in the subject area; a feature of this learning philosophy is to withhold information from students that could more easily be told or demonstrated (Hurley, Proctor, and Ford 1999). Critics also believe that you are sacrificing breath for depth and in certain learning situations material can more easily be taught by instructors. Therefore, constructivism may not be the most efficient teaching methods in certain situations and the skills and performance students need to acquire should be evaluated before its use. For example, if students need to learn how to type; constructivism would not be an efficient means of teaching as keystrokes do not vary and it is much easier for students to learn with standard drill and practice methods rather than an exploratory approach of how to type (Schwartz, Lindgren and Lewis 2009). A paradigm shift has occurred with the increased use of technology in the classroom, but field research is lacking on how to implement a

pedagogically sound design for use with educational technology. Constructivism is compatible with lessons utilizing computer technology in educational settings (Nurmi and Jaakkola 2006; Littlejohn 2003; Jonassen 2000). However, more research is needed to explore this option and the concerns associated with constructivism. Research is also lacking on the globalization of educational technology where online education delivery is dominated by English speaking countries. Is social constructivism an appropriate option for other cultures? Research indicates that the changing role of the instructor and learner may cause students to react negatively to this particular pedagogy (Zhang 2009; Muñiz and Coates 2009).

Assessing Learning

Is online education equal to or better than regular F2F education in regards to student learning outcomes? Answering this question is proving to be a difficult task (Jahng, Krug and Zhang 2007). Some of the problems have to do with the diversity of learners (Rodrigue 2002) and methodological flaws in research designs (Jahng, Krug and Zhang 2007). In general, educational technology studies are having difficulties with assessing student learning.

Cognitive learning is traditionally evaluated using Bloom's taxonomy (Bloom et al. 1956; Anderson and Krathwohl. 2001). Cognitive levels represented by Bloom's Taxonomy are: knowledge, comprehension, application, analysis, synthesis, and evaluation (Slavin 2006) or, more recently, remembering, understanding, applying, analyzing, evaluating, and creating (Anderson and Krathwohl 2001). Rutherford (2000) found that computer aided instruction (CAI) improved student achievement at the cognitive level of comprehension, and achievement of women especially improved under

CAI at the cognitive level of knowledge. In addition, Rutherford (2000) found a statistically significant gap in achievement between White ethnicity and Mexican/Hispanic ethnicities in lecture instruction, but no statistically significant gap in performance between the two ethnicities during CAI. This indicates that CAI aided in closing the learning gap between the White ethnicity and Mexican Hispanic ethnicities. This study suggests two interesting points. One, a focus on various cognitive levels gives a more sensitive and discriminating analysis. Two, the change in pedagogy to small group discussion during CAI could have an effect on student achievement, particularly for Mexican and Hispanic students. Bos (2007) found statistically significant results for use of interactive educational technology for 11th grade low achieving students when studying quadratic functions; this supports the idea that improvement in student achievement at higher cognitive levels and understanding of abstract ideas can be aided with educational technology.

Mateo and Sangra (2007) indicate a restructuring of our assessment techniques is needed in order to evaluate the learning process for educational technology comprehensively. Bloom et al. (1956) indicate that learning occurs in three different domains: cognitive, affective, and psychomotor. Although cognitive learning is an important component of the learning process, other components exist. Cognitive learning focuses on comprehension, retention, recall, and application of knowledge (Zhang 2009), while affective learning involves students' feelings, emotions, and degrees of acceptance toward the subject matter (Goodboy, Martin and Bolkan 2009). To assess the learning process, therefore, more than the standard cognitive assessment is needed.

Zhang (2009) provides a focused analysis of how cognitive learning, affective

learning, and teacher credibility influence the learning process. A confirmatory factor analysis showed a link between teacher competence and caring to affective learning, which affected motivation and which in turn was related to cognitive learning. This model was used across four different cultures: U.S., German, Chinese, and Japanese. Zhang (2009) showed some cultural differences in the study, using the Mottet and Richmond (1998) affective learning scale to measure affective learning. The U.S., Germany, and Chinese all showed significant association between cognitive learning and affective learning, but the Japanese did not. Zhang (2009) indicates a need for a more discriminatory look of relationships involved in the learning process across different cultures.

Geography and Technology Use

It is believed that e-learning matured in geography in the early 2000 decade; this idea is based on the increase of journal articles written about technology and geography (Lynch et al. 2008). The driving force of e-learning evaluation, however, seems to be the technology with a lack of consideration for pedagogy (Lynch et al. 2008; Solem 2001; Reeve et al. 2000). Careful pedagogical consideration of how to use technology in the classroom is then needed (Brunn 2003; Jonassen 2000; Reeve et al. 2000). Constructivism offers an option for e-learning as it is the most contemporary of learning theories and compatible with lessons utilizing computer technology (Nurmi and Jaakkola 2006; Littlejohn 2003; Jonassen 2000). With the advent of Web 2.0 tools, social constructivism would be an ideal learning environment to construct knowledge in a team-building environment (Collis and Moonen 2008). Geography courses are no longer confined to the realms of a localized university. Many schools are offering courses to

international students via the Internet. Delivering geography courses internationally poses difficult challenges and brings another dimension to the classroom (Reeve et al. 2000 and Rich, Robinson and Bednarz 2000). Most e-learning course development is dominated by developed English speaking countries (Haigh 2002). Education is embedded in national cultures and some cultures are radically different from the developed countries delivering e-learning (Reeve et al. 2000). Collaboration and e-learning across national borders is very appealing as it holds hope to reduce the digital divide and provide a global learning experience for students involved (Muñiz-Solari 2009; Klein and Solem 2008). Open educational and technological resources are a positive movement that could help with getting native language resources to Latin America. The Latin American Open Textbook Initiative is a specific example that could reduce the cost of higher education and bring customized textbooks for the region (Ochoa, Sprock, and Silveira 2011). The Latin American Conference on Learning Objects (LACLO) and Technologies is another resource that brings together educational administrators, technology leaders, and educators to discuss emerging educational technologies and how to apply these new technologies in a culturally, social, and pedagogically sound manner for Latin America (http://www.laclo.org/laclo 2015). The LACLO has been hosted 9 times in different locations of Latin America. It is yet to be determined however, if educators can provide an enriching learning experience for international students, especially considering cultural differences (Reeve et al. 2000). There is a need for more studies that examine pedagogies, technology, and the international factor (Conway-Gómez and Pelacios 2011; Brunn 2003; Haigh 2002; Reeve et al. 2000; Rich, Robinson and Bednarz 2000). International users' performance

may be affected by such factors as (1) use of English as a second language, (2) cultural norms, (3) written symbol use, (4) role of the instructor, and (5) any preconception for standard definitions used, such as “cheating” or “essay.” How these international factors relate to the pedagogies and technology use is critical in order to provide enriching student learning experiences.

Comparison of Costa Rica and U.S. Educational Systems

Approaches to education vary a great deal from instructor to instructor; therefore, differences in approaches to education on a country to country comparison can also be expected. Costa Rica and the U.S. are both considered part of the Pan American world and, as such, one would expect some similarities (Muñiz-Solari 2009). Education is valued in both of these societies. This can be demonstrated by the high literacy rate of 97% in the U.S. and 95% in Costa Rica. Costa Rica’s average is 23% higher than regional averages (Marlow-Ferguson 2002). Both countries spend a prominent amount of money on education. In the U.S. 5.4% of public expenditure is on education. The U.S. does spend less as a percentage of the total budget than Costa Rica. Costa Rica’s history is different from most Latin American countries. After the revolution of 1948, the country eliminated its national army and with those funds established a national health care and an educational system. Educational funds make up 33% of the total national budget (Marlow-Ferguson 2002). Structurally the two systems are very similar. Both countries have a primary school system, secondary school system, and post-secondary systems. A high school diploma in Costa Rica would be equivalent to one in the United States (Marlow-Ferguson 2002). Primary and secondary systems are free to the public in both countries. Tuition is charged in post-secondary systems in both countries; although both

systems have systems of scholarships available to students. Compulsory school age is similar in both countries where Costa Rica students are required to attend from age 6-15 and in the U.S. from ages 6-16 in most states, but 6-18 in other states. Only 47% of students enroll in secondary education in Costa Rica whereas 97% enroll in the U.S. Teachers in both countries are required to have bachelor's degrees although, frequently, K-12 teachers who teach geography do not specifically have geography degrees in either country. A bachelor's degree takes 4 years of study in Costa Rica as well as the U.S.

Although the two systems are similar at the primary and secondary levels, there are still a number of differences which could affect overall student performance at the university level. The school day is much shorter in Costa Rica with either a morning or afternoon attendance; students on average attend 3 hours a day (Marlow-Ferguson 2002). Most teachers in Costa Rica rely on rote learning methods. Teachers write on the blackboard and students copy from the board. Textbooks are limited and children work in groups with one student reading and others copying (Marlow-Ferguson 2002). In contrast, the U.S. Department of Education in 1995 mandated schools to strengthen the secondary school curriculum by focusing on making the classroom more active and relying less on passive students receiving lectures (Marlow-Ferguson 2002). The primary school structure between the two countries is similar, although Costa Rica incorporates what would be considered junior high age students into the primary system. The secondary school structures vary a great deal. Costa Rica secondary system consists of 2 cycles of 3 years. The first 3 years students study Spanish, social studies, math, science, music, and religion and the second cycle students make a choice between 2-3 years of humanities or science or they have the option of taking a 3 year professional program

(agriculture, industrial arts, or office skills).

In the U.S., standards and testing primarily have been governed at the state and district level and funding is the responsibility of state and local governments. This study was conducted in 2011 and hence students would have been educated and tested in accordance with Bush's reauthorization of the Elementary and Secondary Education Act (also known as No Child Left Behind). This legislation expanded the role of the federal government in education and increased standardized testing. According to the National Center for Education Statistics, the most accurate measure of on-time graduation rates in the U.S. are calculated using the ACGR (adjusted graduation cohort rate) where the graduation rate is determined by following first-time entering 9th graders for 4 years to graduation. The United States Department of Labor reported a national ACGR of 79% for 2010 and 66% of high school graduates enrolled in college in 2013. In contrast to the U.S., Costa Rica curriculum is developed and standardized by the Ministry of Education, thus funding and testing are administered by a federal entity. Standardized tests are administered after grade 3 and 6 where a passing score of 65% is needed to graduate. To graduate with a high school diploma, students in Costa Rica must pass tests in a number of subject areas; if they fail in one area they do not graduate. The results for 1988 were as follows: 33.7% failed in math, 4.4% failed in science, 5.9% failed in Spanish, and 4.5% failed in social studies; consequently, 48.3% of students did not graduate from high school (Marlow-Ferguson 2002). Only 2.5% of students (double the rate of Mexico) attend universities. It is difficult to determine from these statistics if Costa Rican students are more prepared for university than the U.S. counterparts. It is clear that they are tested in a broader number of subjects, and only a small minority of secondary students is able

to attend university.

Specific stand-alone classes for geography do not exist at the K-12 level in Costa Rica. Geography is incorporated into social studies which include geography, history, and civics. Geography is characterized by traditional classroom teaching methods which include rote memorization of basic facts in K-12 classrooms and consequently new alternative teaching methods with new technologies are needed in order for children and adolescents to become more informed and critical-thinking citizens (Quirós-Arias 2009). The U.S. educational system varies by state. The majority of states take the approach of incorporating geography into social studies where history curriculum dominates (Mohan and Boehm 2009).

Four general cultural dimensions contribute to differences in the educational systems of the U.S. and Canada versus Central, Caribbean, and South American countries (Muñiz-Solari 2009). The first cultural dimension is power. In Central, Caribbean, and South American countries, the power-distance relationship is large. This means that the power in these countries is concentrated at the top and distant from the wide base of citizens. In the classroom this translates to a traditional role for an instructor who is expected to transmit knowledge to the student with little interruption by the students. For the U.S. and Canada, the opposite is the case, with a small power-distance relationship, in which there is a closer relationship between political groups and the citizens. A typical U.S. or Canadian class emphasizes freedom of speech and participation is the norm.

The second cultural dimension is societal organization. Central, Caribbean, and South American early societal development formed as a collectivist society. The colonial period of these countries departed from this view but later economic struggles, after the

colonial period, have reemphasized collectivism. The U.S. and Canada have developed as societies based on individual interest rather than group interests. Classrooms in the collectivist organization emphasize group activities and frequent sharing of expensive books and instruments is a common practice from elementary to college age students.

The third cultural dimension is time. Time can be organized based on a specific schedule, which is a monochromic approach, or a more fluid flexible view of time organization where multiple tasks are done simultaneously, which is a polychromic approach. The U.S. and Canada organized based on a monochromic approach where time is measured by the output time or time on a particular task. This type of time organization puts interpersonal relationships subordinate to output schedules. Central, Caribbean, and South America output schedules are subordinate to interpersonal relations and work and personal time are not separate. Tasks are measured by organization goals rather than output time.

The last cultural dimension is perception of geographic space. Central, Caribbean, and South American countries see geographic space as a relationship rather than categories. This perception results in professional geographers being applied geographers; where geography is used as a tool for societal solutions (Muñiz-Solari 2009). It is important to note these different cultural dimensions in order to understand differences in the educational systems and to understand the academic behavior of these societies.

Literature provides guidance on the research design and data collection of this study. Geography, technology and e-learning are interlinked and have matured in the 2000 decade (Lynch et al. 2008). Geographic technology can address a broader range of

spatial questions (Nellis 1994). An exciting challenge for geography is to broaden horizons and extend and consider e-learning outside of the national borders of the U.S. Student alienation in the e-learning environment has been linked to lack of motivation and interest that lead to low student retention rate (Rovai and Whiting 2005; Hurley, Proctor, and Ford 1999; Morgan and Tam 1999). E-learning lessons designed with social constructivism offers a solution to this problem. How different cultures react to a constructivist lesson provides insight into how design of e-learning should take place in order to maximize the positive learning experience for all students. This research study varies the cultural parameters in order to assess the learning experience with an online constructivist lesson. Literature indicates that assessment of a constructivist lesson poses a challenge to instructors. Assessment is more difficult as instructors need to measure not just old knowledge but the new construction of knowledge by students (Schwartz, Lindgren and Lewis 2009). This research study included evaluation of a pre-test and post-test in order to assess the construction of knowledge. To capture more of the learning experience the lesson assessed cognitive domains at distinct levels of Bloom's Taxonomy and affective learning that took place in the two different cultures were compared.

3. RESEARCH DESIGN AND DATA COLLECTION METHODS

Research Methods

This study systematically evaluates the differences in the learning process of post-secondary students in the U.S. and Costa Rica using a technology-enhanced lesson and taught using social constructivist pedagogy. A paradigm shift has occurred with the increased use of technology in the classroom, but field research is lacking on how to implement a pedagogically sound design for use with educational technology. Constructivism is compatible with lessons utilizing computer technology in educational settings (Nurmi and Jaakkola 2006; Littlejohn 2003; Jonassen 2000). Social constructivism was used as the major theory guiding the pedagogy and study here because it offers a solution to the problem of alienation students experience when working online (Rovai and Whiting 2005; Hurley, Proctor, and Ford 1999; Morgan and Tam 1999). Since the 1980s constructivism is the more common learning theory in U.S. schools. This shift to constructivist learning is in part a result of implementing active learning strategies due to poor student response to didactic instruction (Doering and Veletsianos 2008; Edsall and Wentz 2007; Littlejohn 2003; Jonassen2000). Constructivism develops problem-solving skills, which are higher-order thinking skills, such as discover, inquiry, and exploration (Schwartz, Lindgren and Lewis 2009). Research is also lacking on the globalization of educational technology where online education delivery is dominated by English speaking countries. Educational studies pose specific problems for the researcher because of the inherent problem of holding variables constant (Jahng, Krug and Zhang 2007). One problem is the diversity of learners in the classroom and in this case across cultures. The context or setting of this study takes place

in an online social constructivist lesson environment where the two groups compared were students in Costa Rica and students in the U.S. The independent variables are cultural parameters, student attitudes toward the facilitator, and student attitudes toward technology. The dependent variables are the differences observed between the two groups in regards to test results in multiple choice and essay questions, scores on activities, and affective learning (Figure 3.1).

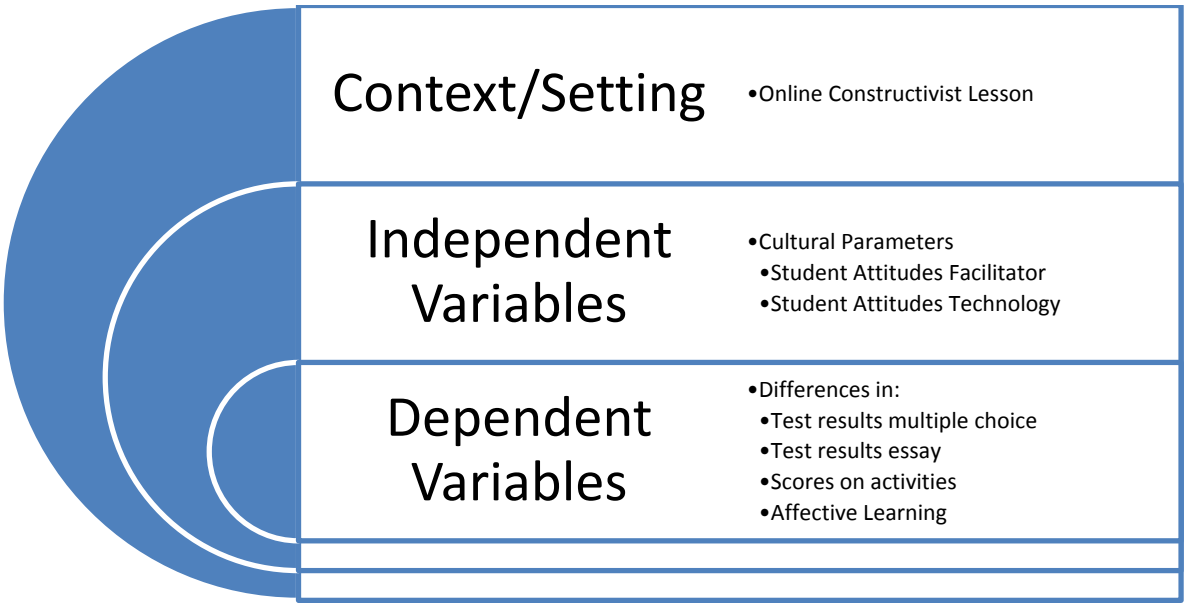


Figure 3.1. Relationship of variables within the setting of the research design.

The evaluation instruments used to measure quantitatively the learning experience was a cognitive test, a survey instrument, and student grades on activities performed. The cognitive test consisted of evaluation of the improvement scores at the two different cognitive levels of remembering and understanding (revised Bloom's taxonomy), which correspond to the multiple choice and essay parts of the cognitive test, respectively. Student activity scores consisted of student grades received on the journal, discussion board, and wiki-building activities. Although cognitive learning is an important component of the learning process, other components exist. Cognitive learning focuses

on comprehension, retention, recall, and application of knowledge (Zhang 2009), while affective learning involves students' feelings, emotions, and degrees of acceptance toward the subject matter (Goodboy, Martin and Bolkan 2009). A survey instrument was used to evaluate affective learning quantitatively. The affective learning section of the survey consisted of 11 questions. Affective learning was not assessed in the pre-survey as it is directly linked to the engagement of the student with this particular lesson.

This study is a mixed methods approach with more emphasis on the quantitative analysis. The qualitative aspect of this study consists of content analysis of the open comments in the survey. Also on-site interviews with the Costa Rica facilitators and research associate and students provide qualitative data. The qualitative data are used to explain independent variables.

Three main research questions guided this study. They are:

Question 1. Is there any difference in student learning outcomes for cognitive learning using cLOs between student populations in Costa Rica and the U.S.?

Hypothesis 1. No difference exists between the Costa Rican and U.S. student populations with regard to their mean improvement test scores based on the updated Bloom's taxonomy categories of remember and understand.

Question 2. Is there a relationship between culture, specifically a Costa Rican and U.S. student population each using a cLO, and affective learning?

Hypothesis 2. Culture and affective learning are independent.

Question 3. Is there a relationship between culture, specifically a Costa Rican and U.S. student population each using a cLO, and student attitudes toward technology and student attitudes toward the facilitator?

Hypothesis 3. Culture and student attitudes toward the facilitator and student attitudes toward technology are independent.

Data Collection

Process of Selecting the Sample

The goal of the study was to compare cognitive and affective learning between two countries whose technological accessibility varied, using a common cLO. Technological accessibility is represented by the digital access index (DAI), which "measures the ability of the individuals in a country to access and use new information and communication technology" (Muñiz-Solari 2009, 25). Countries are rated on a scale from 0 to 1, where 1 is the highest. Countries are ranked into 5 categories, which consist of high access, upper access, medium access, low access, and not the list. To ensure the study could be completed, two countries with high DAI access were chosen. The United States was selected as one location because it is an English speaking country and is one of the countries currently marketing Internet classes globally. Availability of a geography class taught by the researcher was also a factor. The DAI ranking of the United States is 0.78 and this rank falls in the high access countries category. The second location selection was based on choosing a country that was a potential consumer of U.S. Internet classes, a country where English was the second language, and had a relatively high digital access index. Availability of an instructor willing to participate was also a factor. Costa Rica fit all necessary criteria with an upper digital access index ranking at 0.52 according to Internet World Stats. This is one category lower in ranking than the U.S. and the upper access category is the highest category available containing Spanish-language dominated countries.

Studying the Population

The first population was a geosciences classroom in the Department of Geographical Sciences at the *Universidad Nacional*, Heredia, Costa Rica. It is the physical geography class that undergraduates take in the second level (year) of their studies where typical classroom size is thirty students. The study had two trial runs. The first run of the study occurred in October 2011 and the second run in October 2012. The runs could not be scheduled in consecutive semesters due to unavailability of the course in the spring semester. The facilitator was the same for each run. The facilitator and student guides, pre-test, pre-survey, and post-survey were all translated into Spanish by a professional translation service (www.daytranslations.com) and reviewed by the facilitator in Costa Rica and Dr. Osvaldo Muñiz -Solari, Professor, Texas State University, who is fluent in Spanish. One guide was not translated into Spanish, the Research Associate Guide.

Spanish versions of the facilitator and student guidelines (Appendix A) were sent to Costa Rica in September 2011 to prepare students for the first run. The facilitator and Director of the School of Geographical Sciences were given both sets of guidelines prior to the study for review. Revisions were requested and changes to the student guide prior to the beginning of the study. Students were given a Spanish version of the pre-test (Appendix B) before the cLO lesson. The pre-test was administered by the facilitator for the first run and by the Director of the School of Geographical Sciences for the second run. Hard copies of the pre-tests results were mailed to the researcher by the Director of the School of Geographical Sciences. The pre-survey (Appendix C) was administered online. A link to the survey was e-mailed to all students. Results were collected over the

Internet via SurveyMonkey. Students were given time in class to complete the survey but some opted to complete the survey from home.

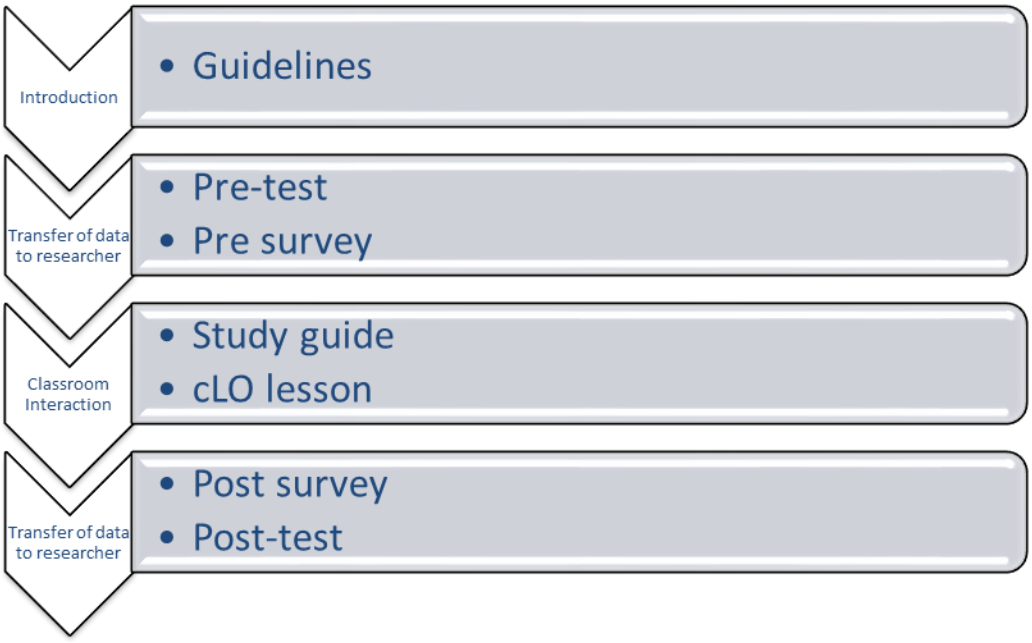


Figure 3.2. Sequence of events in Costa Rica.

The cLO lesson took 4 weeks to complete (Figure 3.2). Upon completion of the cLO a post-test (Appendix B) was to be administered as part of a larger unit test in the first run. Unfortunately, due to a miscommunication between the facilitator and researcher during the first trial run in Costa Rica, the post-test of the facilitator was substantially different from the pre-test. Therefore, the first set of results for the pre-and post-tests could not be used. The post-survey (Appendix C), which measured affective learning, student attitudes toward technology, and student attitudes toward the facilitator was administered prior to the post-test via the Internet service SurveyMonkey. Preferable, the post-survey should have followed the post-test, but because of end of semester schedules it was administered prior to the post-test.

The second trial run of the Costa Rica study occurred in October of 2012. The

sequence of events was identical to the first run except the Director of School of Geographical Sciences administered the pre-test and the post-test. The pre-test, post-test, pre-survey, and post-survey data were successfully collected.

The second study population was a lower-division introductory physical geography classroom at California State University, Long Beach (CSULB). Three runs occurred for this location. The study was run in two sections of physical geography in the fall of 2011 and the second run in one section of physical geography in the spring of 2011. For each run, the facilitator and researcher were identical. A research associate not related to this study agreed to administer the pre-test. This decision protected students' identification as well as the objectivity of the procedure. The post-test was administered by the facilitator but results were coded by the research associate for the same reasons indicated above. The survey results were collected anonymously via the Internet service SurveyMonkey.

The IRB Institutional Review Board process was cleared from both Texas State and CSULB (Appendix D). Texas State classified the study as non-exempt due to its educational nature. CSULB had some precautions that were necessary because the researcher and facilitator were identical in the U.S. location. To conform to the IRB requirements, a research associate not related to the study was used.

The first and second runs occurred in November of 2011. The sequence of events was identical to the Costa Rica run except the post-survey was administered after the post-test rather than before. The third run occurred in April of 2012 with the same sequence of events as the first two runs.

The data analysis for the cognitive assessment, which included the pre-test, post-

test, and activities, consisted of trial run 2 for Costa Rica and trial runs 1, 2, and 3 for the U.S. Because the survey did not have collection problems, the data analysis for the survey consisted of trials 1 and 2 for Costa Rica and trials 1, 2, and 3 for the U.S.

Cognitive Assessment and Survey Instrument

Cognitive assessment consisted of comparing pre-test scores, post-test scores, and improvement scores between the pre-test and post-test (Appendix E). The post-test was identical to the pre-test. Rutherford (2000) proposes the strategy of evaluating student achievement at different cognitive levels. Multiple choice and essay questions are categorized according to a revised model of Bloom's Taxonomy of Educational Objectives (Anderson and Krathwohl 2001). The two levels measured were remembering and understanding, which in the original Bloom's Taxonomy were known as knowledge and comprehension. Questions that fall under the remembering category are questions that require the student to retrieve or recall information. The understanding level questions are questions that require the student to interpret, paraphrase, translate, illustrate, classify, summarize, or contrast (Anderson and Krathwohl 2001). The multiple choice part of the exam represents the cognitive level of remembering and the essay questions represent the level of understanding.

The pre-survey and post-survey were both administered through the Internet service SurveyMonkey. The survey was used to measure and compare, between the two study locations, the following categories: academic and personal information, affective learning, student attitudes toward technology, and student attitudes toward the facilitator. The survey instrument used in the study was constructed based on a survey instrument that has proven to be a satisfactory instrument for measuring higher-order affective

learning in the instructional communication field (Mottet and Richmond 1998) (Table 3.1). The Mottet and Richmond (1998) survey was based on eight constructs and used a seven-step bipolar scale.

Table 3.1. Survey question adapted from (Mottet and Richmond 1998): Construct 2: The likelihood of developing an "appreciation" for the content/subject matter.

Condition	Rating							Condition
	1	2	3	4	5	6	7	
Likely								Unlikely
Impossible								Possible
Probable								Improbable
Would Not								Would

Conway-Gómez and Palacios (2011) noted problems using a survey instrument where negative wording caused confusion, particularly where English is not a first language of participants. Since the Costa Rican participants in this study use English as a second language, the survey has been modified to make wording less confusing. Therefore, the survey follows constructs used by (Mottet and Richmond 1998), but the survey questions have been modified to reduce confusion for second language users. Those modifications include use of a five point Likert scale, all constructs reflect a positive attitude, and a bipolar scale is not used. The English edition of the survey was translated into Spanish by a professional translation service (www.daytranslations.com). These modifications help make the research more culturally sensitive.

4. DATA ANALYSIS

Quantitative Data Analysis of Cognitive Data

This study systematically and quantitatively compares cognitive learning, affective learning, student attitudes toward technology, and student attitudes toward the facilitator between two technology-enhanced classrooms in two separate locations with one classroom in Costa Rica and the other in the U.S. The nonparametric statistics used to quantitatively compare these variables were the Mann-Whitney-Wilcoxon and the Chi square test for independence. To understand these comparisons better, the variables were defined for each characteristic compared. A list of variables for the cognitive learning follows.

1. "Cognitive learning" is the type of learning associated with acquisition of knowledge or information. It is commonly associated with the revised Bloom's taxonomy that includes the following concrete to more abstract concepts: remembering, understanding, applying, analyzing, evaluating, and creating (Anderson and Krathwohl 2001).
2. "Essay results" refers to the essay scores evaluated by the instructor per the rubric included in Appendix B. Scores were calculated based on percentages.
3. "Multiple choice results" are the percentage scores determined by a key for the exam.
4. "Journal" refers to the scores students received on the journal activity.
5. "Wiki" refers to the scores students received on the group website activity.
6. "Discussion" refers to the scores students received on the discussion forum activity.

Cognitive assessment consisted of comparing pre-test, post-test, and improvement scores (also known as gain scores between the two locations). Multiple choice scores and essay scores will be evaluated separately as they represent different cognitive levels. Based on Bloom's revised version of cognition, the multiple choice questions represent the cognitive level of remembering and the essay represents the higher level of cognition, understanding.

A trial was defined as a class of students. Two trials were run for Costa Rica, but only the second trial results were usable. The first trial results in Costa Rica could not be used because the pre-and post-test were different and, therefore, gain scores could not be calculated. Three trials were run in the United States. All three runs were included in cognitive results for the U.S.

Multiple choice results, the cognitive level of remembering, were graded by comparing student scores with the answer key. A question is either right or wrong. The tests had fifteen multiple choice questions. Results were inputted into Microsoft Excel (2010) with a right answer given a point value of one and incorrect answers a value of zero. A score was generated on a percentage basis for each student for pre-test and post-test results. The improvement score for each student was calculated by subtracting the pre-test from the post-test score for each student. Results from these calculations are contained in Appendix E. Outliers were identified for all sets of data using the inner fence method (Lane 2013). The interquartile range (IQR) was multiplied by 1.5, the answer added to the 3rd quartile or 75th percentile case and also subtracted from the 1st quartile or 25th percentile case. Any score beyond the fence was deemed an outlier and excluded. A scatter plot of the data was obtained and outliers identified. Results were

then imported into IBM SPSS (2007).

Descriptive statistics were calculated (table 4.1) where all data were included and another analysis where outliers were excluded (outlier trim). The outlier trim for the pre- and post-tests scores, as expected, excluded some of the more extreme points. The improvement score in each analysis was identical, meaning no outliers were present. The most common and powerful formal test for determining normality of data was used, the Shapiro-Wilk test (Razali and Wah 2011).

Table 4.1. Descriptive statistics for multiple choice results for all student participants and for the outlier trimmed subset.

Variables	Mean	Std. Deviation	Minimum	Maximum	N
Pre-test	48.51	15.0	20	87	96
Pre-test (OT)	50.8	11.4	33	73	81
Post-test	69.5	11.4	40.0	93.0	96
Post-test(OT)	71.4	9.58	53.0	93.0	89
Improvement	20.9	14.3	-13.0	60.0	96
Improvement (OT)	20.9	14.3	-13.0	60.0	96

Where OT= outlier trim and N= Number of samples

Previous educational studies indicate a problem establishing a normal distribution in regards to student populations because of the inherent problem of holding variables constant (Jahng, Krug, and Zhang 2007; Rodrique 2002). This study was no different. The cognitive data consisted of pre-test, post-test, and improvement scores for the essay and multiple-choice of which only the pre-test essay scores were distributed normally. The vast majority of the data was not normally distributed. Nonparametric analysis was

used in order to avoid the assumptions needed in parametric analysis, mainly that the distribution is normal (Shapiro-Wilk p values were 0.056, 0.002, and 0.089 for the pre-test, post-test, and improvement scores, respectively, all < 0.100). The Mann-Whitney-Wilcoxon test was used to compare the pre-test, post-test and improvement percentages across the two samples. The Mann-Whitney-Wilcoxon test is particularly useful when the sample size is unequal, as is the case here (Daniel 1990). Z values and p (probability) values were calculated for the pre-test, post-test, and improvement scores with all data included and with an outlier trim scenario.

Table 4.2. Multiple choice test results for Costa Rica students compared to U.S. students.

Variables	Z value	Asymp. Sig. (2 Tailed)	N Costa Rica	N U.S.	N	Significance at 0.1 level	Effect Size	Power[a]
Pre-Test	-2.729	0.006	32	64	96	Yes	0.576	0.824
Pre-Test (OT)	-2.248	0.025	25	55	81	Yes	0.545	0.717
Post-Test	-2.687	0.007	32	64	96	Yes	0.648	0.896
Post-Test (OT)	-2.332	0.020	28	61	89	Yes	0.634	0.860
Improvement Score	-0.558	0.577	32	64	96	No	0.132	0.159

Where OT= outlier trim; N= Number of students; N/A= Not Applicable

[a]=Power analysis via G*Power 3 (2007)

Determination of significance was set at an alpha level of 0.10 because of the experimental nature of the study. The pre-test and post-test analyses resulted in the same conclusions: The Costa Rica and U.S. locations were statistically different (table 4.2) with the Costa Rica results showing lower percentage scores for both the pre-test and post-test results. This conclusion was true for all data points included and for the outlier trim scenario. The only difference between the two scenarios was that the probability

level was lower in the all data points included scenario. Here the two locations were equivalent meaning the Costa Rica and U.S. populations had the same improvement scores ($p=0.58$).

Five essay questions (Appendix B) were used to evaluate the cognitive level of understanding. The essay questions were the same for both the pre and post-tests. Point levels were assigned to each essay question depending on difficulty. Rubrics were used in order to standardize grading. The rubrics (Appendix B) were translated into Spanish for the Costa Rica location. Each location had two graders. The U.S. graders were the researcher/instructor and a former graduate assistant in geography at CSULB. The Costa Rica graders were the instructor of the class and a doctoral student in geography at Texas State who was fluent in Spanish. All essay questions had two graders except the Costa Rica pre-test, which only had one, the doctoral student at Texas State. While unfortunate, this should not impact sample results as pre-test results for the essay questions were very short or blank answers.

Point values were recorded for each grader and each question in a Microsoft Excel (2010) spreadsheet. Average points were calculated for each question based on the two graders' decisions. The sum of the averages for each question was totaled and then divided by the total point amount of all questions to determine the percentage for the essay part of the exam. Data were collected in ratio scale. The improvement score for each student was calculated by subtracting the pre-test from the post-test score for each student (table 4.3). Results from these calculations are contained in Appendix E. Outliers were identified for the Costa Rica (CR) run 2 and United States (US) runs 1, 2, and 3 data sets. Outliers were identified using the same procedure as used for the

multiple choice part of the exam. Results were then imported into SPSS. Two scenarios were run for the essay results: one, with all data points included and a second scenario with outlier trim.

Table 4.3. Descriptive statistics for essay results for all student participants and for the outlier trimmed subset.

Variables	Mean	Std. Deviation	Minimum	Maximum	N
Pre-test	30.5	16.1	0	71.2	93
Pre-test (OT)	30.5	16.1	0	71.2	93
Post-test	70.3	15.2	22.2	98.1	93
Post-test(OT)	71.6	13.6	39.3	98.1	90
Improvement	39.9	16.1	-8.7	84.6	93
Improvement (OT)	40.0	14.7	13.4	74.3	91

Where OT= outlier trim and N= Number of samples

Since there was not a normal distribution for the post-test and the improvement scores (with Shapiro-Wilk prob-values of 0.050 and 0.059 respectively), the nonparametric Mann-Whitney-Wilcoxon test was used to compare the pre-test, post-test, and improvement percentages across the two populations.

Table 4.4. Essay test statistics for Costa Rica students compared to U.S. students.

Variables	Z value	Probability (2 Tailed)	N Costa Rica	N U.S.	N	Significance at 0.1 level	Effect Size	Power[a]
Pre-Test	-5.561	0.000	32	61	93	Yes	1.549	0.999
Post-Test	-5.077	0.000	32	61	93	Yes	1.348	0.999
Post-Test (OT)	-4.631	0.000	29	61	90	Yes	1.242	0.999
Improvement Score	-0.445	0.656	32	61	93	No	0.0567	0.1518
Improvement Score (OT)	-0.846	0.398	31	60	91	No	0.211	0.241

Where OT= outlier trim; N= Number of students; N/A= Not Applicable

[a]=Power analysis via G*Power

The pre-test results had no outliers. The pre-test and post-test analysis resulted in the same conclusions: The Costa Rica and U.S. locations were statistically different with the Costa Rica results showing lower percentage scores for both the pre-test and post-test results, echoing the results for the multiple-choice tests (table 4.4). This applied to the pre-test results that included all points and the post-test results that included the all points and outlier trim scenario. The improvement score results showed no statistical difference between the Costa Rica and U.S. location, again reinforcing the impression from the multiple-choice tests; this held true for both the all data and the outlier trim scenario.

Data were also collected for student activities. Score distributions significantly departed from normalcy in Shapiro-Wilk tests, with prob-values <0.001 for journal, wiki, and discussion scores. The nonparametric Mann-Whitney-Wilcoxon test was, therefore, again used to evaluate differences between the Costa Rica and U.S. scores for the following activities: journal, wiki, and discussion forum. The journal was an individual's

collection of answers to a series of questions pertaining to the subject of plate tectonics. The topic centered on hazard preparation for various seismically active locations throughout the world. For the purpose of organization, the wiki activity consisted of group of students working together. Consequently, students received group grades for this activity. The discussion forum was an asynchronous discussion between class members. Students were graded on an individual basis. Grades for each activity were determined by individual instructors. Rubrics were provided to grade the activities. The second trial run for Costa Rica was analyzed and the first, second, and third trial runs for the U.S. were analyzed. These runs were chosen in order to match the results of the pre- and post-tests. The descriptive statistics for activity results (table 4.5) are expressed in percentage.

Table 4.5. Descriptive statistics for activity results.

Variables	Mean	Median	Std. Deviation	Minimum	Maximum	IQR	N
Journal	78.4	90.0	28.2	0.0	100	20.0	107
Wiki	86.4	98.0	22.4	0.0	100	20.0	107
Discussion Forum	75.4	100	35.2	0.0	100	20.0	107

The data for the activities is strongly non-normal data. Frequency tables of participation and non-participation were constructed for each activity where a score of zero on an activity was considered non-participation and any score above zero was considered participatory. These frequency tables are included in Appendix E. A Chi square test for independence was calculated in order to determine if any differences

existed between the two groups, based solely on participation. If the contingency table violated the small cell count rules (80 % of rows must have an expected frequency of 5 or greater and no cell smaller than or equal to 1), the Yates correction for continuity was reported and supplemented with the probability results for the Fisher's Exact Test. The Fisher's Exact Test (two-tailed) for probability was generated using the website http://vassarstats.net/ because it is able to handle sample sizes of 1000 whereas; the spreadsheet program was limited to a sample size of 100. Determination of significance was set at an alpha level of 0.10 because of the experimental nature of the study (Table 4.6).

Table 4.6. Statistical data comparing Costa Rica and U.S. participation rate in activities $\alpha = 0.10$; Chi –Square Test of Independence[a].

Activity	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sig.
Journal	9.507 (Yates)	2.706	1	107	0.333	0.964	0.001 0.001[b]	Yes
Wiki	.804 (Yates)	2.706	1	107	0.134	0.399	0.165 0.324[b]	No
Discussion Board	1.439 (Yates)	2.706	1	107	0.146	0.466	0.132 0.217[b]	No

[a]=Rodrigue, C.M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at: http://vassarstats.net/

Two of the activities, wiki building and the discussion board, had no significant difference between the two groups. This indicates the two groups equally participated. The third activity, journal writing, there was a significance difference between the two groups. On a percentage basis, 97% of U.S. students participated in this activity where

77% of Costa Rica students participated. A low participation rate is a concern for reliability of results. What is considered low participation? Sociometric assessments, which are studies of interpersonal relationships in a social group especially in peer nomination studies, are highly dependent on participation rates (Marks et al. 2013). Hamilton et al (2000) indicate a participation of 75% and below indicate insufficient participation rate from which to generalize assumption to the whole classroom while (Marks et al. 2013) indicate 60-70% is considered a high participation rate. In either case the participation rate of 77% would be deemed sufficient. Participation rates for each group in the wiki and discussion board were all above 80%.

Analyses of differences in scores between the two groups with regard to the particular activities are indicated in Table 4.7. Results for the Mann-Whitney-Wilcoxon test are summarized below.

Table 4.7. Activities test statistics for Costa Rica students compared to U.S. students.

Variables	Z value	Probability (2 Tailed)	N Costa Rica	N U.S.	N	Significance at 0.1 level	Effect size	Power[a]
Journal	-0.334	0.738	34	73	107	No	0.383	0.558
Wiki	-4.153	0.000	34	73	107	Yes	0.798	0.981
Discussion Forum	-1.910	0.056	34	73	107	Yes	0.000	0.100

Where N= Number of students, N/A= Not Applicable

[a]=Power analysis via G*Power (2007)

No significant difference, at the p=0.1 experimental level, between the two groups existed for the individually performed journal activity, but we do see a significant difference for the assessments that entailed student interaction, the wiki and discussion forum activity, where scores for Costa Rican students are lower.

Quantitative Data Analysis of Survey Data

The following definitions of variables are provided to clarify characteristics that were measured. The survey was divided into five sections: standard demographic information, affective learning, student attitudes toward technology, student attitudes toward facilitator, and open comments. The variables are listed alphabetically for each section.

"Affective learning" is a specific type of learning that consists of attitudes, emotions, values, and beliefs formed by the knowledge and psychomotor skills acquired. (Mottett and Richmond 1998).

1. "Appreciation" refers to a general feeling of enjoying the content of the lesson.
2. "Behavior hazards" refers to change in behavior prompted by exposure to the educational material. The change could be in terms of a practical matter in everyday life or a larger change in personal values.
3. "Future interest" connotes the desire to learn more about the topic both within the educational setting and outside the educational setting.
4. "Motivation" refers to how the educational material prompts students to spend more time with the material and stimulates interest in the subject.
5. "Self-confidence" refers to the belief that following exposure to educational material the student feels they can take on tasks with a similar set of skills.

6. “Real life” connotes that the skills learned in the lesson would be used in a work setting.

“Student attitudes toward technology” is the evaluation of how the students regard the particular technology in each lesson.

1. “Enjoyment” is the level of satisfaction the student experienced using a particular technology.
2. “Access” refers to any restrictions to technology the student may have experienced at home or at school that interfered with the learning process.
3. “Facilitate learning” connotes the ability of the particular technology to aid the student in cognitive learning.
4. “Stress” is the amount of anxiety experienced by the student with the use of a particular technology.
5. “Technological difficulties” are the problems encountered with a particular technology and how it impeded the learning process.
6. “Future use” is attitudes that reflect to what degree students would like to see technology integrated into the standard lecture format.

“Attitudes toward Facilitator” is the evaluation of teacher performance.

1. “Assessment” refers to fair grading procedures by the instructor.
2. “Negative bias” indicates the instructor did not show a negative attitude toward technology.
3. “Positive bias” indicates the instructor did not show a biased positive attitude toward technology.
4. “Facilitation” connotes that the instructor provided an adequate amount of

guidance to complete the lesson.

5. “Overall performance” is the overall evaluation of the teacher.
6. “Take another class” connotes the willingness of the student to repeat their experience with that particular instructor.

A pre-survey (Appendix C) was administered in order to get a baseline reading of two categories within the survey: student attitude toward technology (table 4.8) and student attitude toward the facilitator (table 4.9). Student attitudes toward the instructor are a critical factor in learning (Mottett and Richmond 1998). Since this study specifically has to do with computer technology, it was also important to get a general idea of beginning attitudes and differences between the two groups regarding this subject. The post-survey (Appendix C) was administered after the post-test and contained the same two sections as the pre-survey with modification to some of the questions to specifically address use of the cLO (table 4.10). The post-survey contained the additional section of affective learning (table 4.11) and analysis of the demographic data (table 4.12) along with student attitudes toward the facilitator (table 4.13).

Chi square contingency tables were generated from these survey results and are included in Appendix G. Four additional questions were presented on the post-survey in the Costa Rica class. These questions concerned the use of the online English translator. The results for these questions are also contained in Appendix G with the contingency tables. The contingency tables are organized by survey section and identification is by variable and then by question for both the pre- and post-surveys. Questions were renumbered from the original survey to standardize numbers between the English and Spanish versions and pre- and post-surveys. Frequency tables were generated by

collapsing the 5-point Likert scale (strongly agree, agree, neither disagree or agree, disagree, and strongly disagree) into three categories. Categories indicated as 'strongly agree and 'agree' were collapsed into 'agree.' 'Strongly disagree' and 'disagree' were collapsed into 'disagree.' Finally, 'neither disagree' and 'agree' were collapsed as 'neutral.' If 20% of rows had an expected frequency of <5 or one cell was one or smaller, a 2x2 contingency table was generated with the following two categories: 'strongly agree' and 'agree' collapsed into 'agree'; 'strongly disagree', 'disagree', and neither 'disagree' or 'agree' collapsed into a 'disagree/neutral' category.

Chi-square test for independence, power, and Cramer's phi (effect size measure or w) were calculated using a spreadsheet (Rodrigue 2011). If the contingency table violated the small cell count rules (80 % of rows must have an expected frequency of 5 or greater and no cell smaller than or equal to 1), the Yates correction for continuity was reported and supplemented with the probability results for the Fisher's Exact Test. The Fisher's Exact Test (two-tailed) for probability was generated using the website http://vassarstats.net/ because it is able to handle sample sizes of 1000 whereas; the spreadsheet program was limited to a sample size of 100. Determination of significance was set at an alpha level of 0.10 because of the experimental nature of the study.

Table 4.8. Pre-survey statistical data comparing Costa Rica and U.S. student attitude toward technology at α= 0.10; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sig.
11	Enjoyment	0.365 (Yates)	2.706	1	128	0.098	0.297	0.266 0.340[b]	No
12	Access	8.115	4.605	2	128	0.252	0.821	0.020	Yes
13	Access	13.789	4.605	2	128	0.328	0.962	0.001	Yes
14	Facilitate Learning	0.261 (Yates)	2.706	1	128	0.063	0.177	0.609 0.542[b]	No
15	Facilitate Learning	0.15 (Yates)	2.706	1	129	0.052	0.148	0.698 0.677[b]	No
16	Facilitate Learning	1.902	4.605	2	128	0.122	0.316	0.386	No
17	Stress	17.22	4.605	2	128	0.367	0.986	0.000	Yes
20	Future use	2.05 (Yates)	2.706	1	128	0.143	0.489	0.152 0.142[b]	No
21	Future use	2.256	4.605	2	128	0.133	0.357	0.324	No

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at:
http://vassarstats.net/

Table 4.9. Pre-survey statistical data comparing Costa Rica and U.S. student attitudes toward facilitator at α= 0.10; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sign.
33	Facilitator	0.044 (Yates)	2.706	1	127	0.045	0.130	0.834 0.771[b]	No
34	Take another class	4.520	4.605	2	127	0.189	0.589	0.104	No
35	Assessment	1.045 (Yates)	2.706	1	129	0.112	0.356	0.307 0.219[b]	No
36	Assessment	0.678 (Yates)	2.706	1	127	0.101	0.307	0.410 0.347[b]	No
37	Negative Bias	0.576 Yates	2.706	1	127	0.089	0.262	0.448 0.332[b]	No
38	Positive bias	54.90	4.605	2	127	0.657	1.00	0.000	Yes
39	Overall Performance	0.261 (Yates)	2.706	1	129	0.063	0.177	0.596 0.580[b]	No

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at:
http://vassarstats.net/

Table 4.10. Post-survey statistical data comparing Costa Rica and U.S. student attitude toward technology at α= 0.10; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sig.
11	Enjoyment	0.564 (Yates)	2.706	1	124	0.084	0.240	0.349 0.400[b]	No
12	Access	4.571	4.605	2	127	0.190	0.593	0.102	No
13	Access	8.951	4.605	2	127	0.265	0.855	0.011	Yes
14	Facilitate Learning	0.691	4.605	2	128	0.073	0.165	0.708	No
15	Facilitate Learning	3.450	4.605	2	127	0.165	0.488	0.178	No
16	Facilitate Learning	0.217	4.605	2	127	0.041	0.102	0.897	No
17	Stress	4.097	4.605	2	127	0.180	0.551	0.129	No
18	Technical difficulties	5.936	4.605	2	127	0.216	0.698	0.051	Yes
19	Technical difficulties	9.446	4.605	2	127	0.273	0.872	0.009	Yes
20	Future use	3.315	4.605	2	127	0.162	0.474	0.191	No
21	Future use	4.889	4.605	2	127	0.196	0.620	0.087	Yes

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at:
http://vassarstats.net/

Table 4.11. Post-survey statistical data comparing Costa Rica and U.S. student affective learning at α= 0.10; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sig.
22	Motivation	0.747	4.605	2	125	0.077	0.172	0.688	No
23	Motivation	0.288	4.605	2	125	0.048	0.112	0.866	No
24	Future interest	2.653	4.605	2	125	0.146	0.403	0.265	No
25	Future interest	7.901	4.605	2	125	0.251	0.811	0.019	Yes
26	Future interest	4.720	4.605	2	125	0.194	0.606	0.094	Yes
27	Self-confidence	2.916	4.605	2	125	0.153	0.432	0.233	No
28	Self-confidence	0.763 (Yates)	2.706	1	123	0.095	0.278	0.291 0.364[b]	No
29	Hazards	0.178 (Yates)	2.706	1	125	0.055	0.155	0.536 0.600[b]	No
30	Real Life	3.990	4.605	2	125	0.179	0.541	0.136	No
31	Real Life	1.649	4.605	2	126	0.114	0.285	0.438	No
32	Real Life	0.424 (Yates)	2.706	1	125	0.076	0.215	0.393 0.423[b]	No

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at:
http://vassarstats.net/

Table 4.12. Statistical data (Post-Survey) Comparing Costa Rica and U.S. Student Demographic Data at α= 0.10; Chi –Square Test of Independence[a].

Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sig
University Level	26.73	6.251	3	129	.455	0.998	0.000	Yes
Languages Spoken	1.402 (Yates)	2.706	1	131	0.120	0.392	0.171 0.195[b]	No
Gender	3.785 (Yates)	2.706	1	128	0.188	0.683	0.034 0.051[b]	Yes
First Language	89.387 (Yates)	2.706	1	128	0.862	1.00	0.000 0.000[b]	Yes
Country Born	113.2 (Yates)	2.706	1	121	0.984	1.00	0.000 0.000[b]	Yes
Major	85.3	4.605	2	124	0.829	1.00	0.000	Yes

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at:
http://vassarstats.net/

Table 4.13. Post-survey statistical data comparing Costa Rica and U.S. student attitudes toward facilitator at α= 0.10; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sign.
33	Facilitator	0.359 (Yates)	2.706	1	125	0.075	0.210	0.549 0.476[b]	No
34	Take another class	3.868	4.605	2	127	0.175	0.529	0.145	No
35	Assessment	0.026 (Yates)	2.706	1	127	0.010	0.072	0.871 1.00[b]	No
36	Assessment	0.021 (Yates)	2.706	1	125	0.036	0.111	0.885 0.801[b]	No
37	Negative bias	0.049 (Yates)	2.706	1	128	0.006	0.067	0.825 1.00[b]	No
38	Positive bias	55.90	4.605	2	126	0.666	1.00	0.000	Yes
39	Overall Performance	0.149 (Yates)	2.706	1	127	0.034	0.109	0.839 0.718[b]	No

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)
[b]=Lowry 1998. Fisher's Exact test (two-tailed). Department of Psychology, Vassar College. Available at: http://vassarstats.net/

Content Analysis of Open Comments

Literature content analysis is a form of qualitative analysis which can be used to yield quantitative characteristics (Rodrigue 2003). One coder, the researcher, was used in the interest of costs and due to the advantage of consistency and familiarity with the subject.

The open comments section of the post-survey consisted of two statements:

- What did you like and dislike about using the plate tectonics computer

unit?

- If you have any other comments please write them here. Thank you for your participation!

Comments for both questions in trial 1 and 2 in Costa Rica and trials 1, 2, and 3 in the U.S. were analyzed. A literature content analytical method was applied, which is a form of qualitative analysis. Each comment was broken into one or more ideas. Ideas were listed and coded based on categories that emerged from the data (table 4.14). This process was iterative as categories were combined and their use checked for consistency. A total of 18 categories were found.

Table 4.14. Categories generated for open comments in student survey.

Categories	Students expressed opinions regarding
Difficulty answers	difficulty answering questions
No lecture notes	lecture notes were not available.
Clarity	clarity of the learning experience.
Amount of information/lack /abundance	amount of information either a lack of it or abundance.
Particular activity	a particular activity in the learning experience.
Organization	the organization of the cLO.
Independence	independent work.
Prior knowledge	prior knowledge concerning the subject area.
Technology	use of technology.
Approach	the approach of the learning experience was active, creative, different, and interesting.
Enjoy, interest general	enjoyment of the learning experience in general.
Implement future	implementing this approach in future lessons.
Professor	any comments concerning the professor
Content	content of the lesson.
Translator	use of the translator in the learning experience.

Table 4.14. continued

Categories	Students expressed opinions regarding
Resent questionnaire	use of questionnaire.
English	working in English.
Unclear comments	Could not translate comment, silly, or not relevant.

Comments were then coded based on tone (tables 4.15 and 4.16). The tone of the comments was either classified as positive, negative, neutral, or unclear.

Table 4.15. Number (N) of ideas associated by category and tone for Costa Rica.

N	Category	Tone
5	Technology	Negative
7	Translator	Negative
4	No lecture notes	Negative
3	Difficulty answers	Negative
3	Enjoy, interest general	Negative
1	Approach	Negative
1	Resent questionnaire	Negative
1	Professor	Neutral
2	Content	Positive
13	Technology	Positive
15	Approach	Positive
1	Organization	Positive
1	English	Positive
1	Implement future	Positive
2	Enjoy, interest general	Positive
8	Unclear comments	Unclear

Table 4.16. Number (N) of ideas associated by category and tone for U.S.

N	Category	Tone
7	Difficulty answers	Negative
5	No lecture notes	Negative
5	Amount of information/lack /abundance	Negative
4	Particular activity	Negative
2	Organization	Negative
2	Independence	Negative
2	Prior knowledge	Negative
1	Technology	Negative
1	Difficulty Answers	Neutral
2	Independence	Neutral
1	Prior knowledge	Neutral
2	Approach	Neutral
2	Clarity	Positive
1	Amount of information/lack /abundance	Positive
2	Particular activity	Positive
5	Organization	Positive
7	Independence	Positive
7	Approach	Positive
17	Technology	Positive
7	Enjoy, interest general	Positive
5	Professor	Positive
2	Content	Positive
5	Unclear comment	Unclear

Table 4.17. Contingency table number of ideas per location and tone.

Tone	Costa Rica	U.S.	Total
Negative	24	33	57
Positive	35	59	94
Neutral/Unclear	9	11	20

The neutral and unclear categories were collapsed into one category due to low frequency numbers in the neutral category (table 4.17). No statistical significance was found in the open comments between the two groups based on tone (table 4.18).

Table 4.18. Open comments statistical data at $\alpha = 0.10$; Chi –Square Test of Independence[a].

Variable	X2 (Calc.)	X2 (Crit.)	df	n	W effect size	Corrected Power	Probability	Sign.
Tone	0.611	4.605	2	171	0.060	0.155	0.737	No

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)

Assumptions and Limitations

Educational studies pose specific problems for the researcher because of the inherent problem of holding variables constant (Jahng, Krug and Zhang 2007). The three independent variables identified in this study were cultural parameters, student attitudes toward the facilitator, and student attitudes toward technology. The survey instrument is used to quantify and identify the influences of the last two variables. International users' performance may be affected by such factors as (1) use of English as a second language, (2) cultural dimensions that include interpretations of power, time, space, and societal

organization (3) written symbol use (4) role of the instructor and, (5) any preconception for standard definitions used such as “cheating” or “essay.” Empirical research concerning online learning and cultural diversity (Conway-Gómez and Pelacios 2011; Muñiz-Solari 2009; Brunn 2003; Haigh 2002; Reeve et al. 2000; Rich, Robinson and Bednarz 2000; Wild 1999) is lacking. To address the cultural variable, the researcher took the following precautions. First, the researcher provided lesson guides and rubrics for the facilitator and students for both the English and Spanish speakers. Second, facilitators in each location were native to that culture, which helped with language aspects and cultural norms. Third, students produced work in their native language in regards to test taking, activities, and surveys. Fourth, the researcher was in close contact via Skype and e-mail with the Costa Rican facilitator in order to provide assistance and clarification. Different instructors could have different grading techniques. Consequently, the researcher provided rubrics for grading essay questions and two graders were employed, for essay questions, both of whom were native language speakers. Rubrics were provided for grading the activities at each location, but dual graders were not used. This makes the results for activities more prone to the influence of the individual facilitators' grading.

Nonparametric analysis was used in order to avoid the assumptions needed in parametric analysis, mainly that the distribution is normal. The Shapiro-Wilk test for normality revealed that all quantitative scores departed significantly from normality except the pre-test for the essay questions. The Mann-Whitney-Wilcoxon test was used to compare the pre-test, post-test and improvement percentages across the two populations. The Mann-Whitney Wilcoxon test is particularly useful when the sample

size is unequal as is the case here (Daniel 1990, 90). Chi square is used to decide whether two variables in a population are independent. In this study, a comparison between the two study groups was made based on survey questions associated with variables that represented student attitudes and affective learning. The Chi square analysis gives insight concerning the independent variables of student attitudes toward the facilitator and technology and the dependent variable of affective learning. Determination of significance was set at an alpha level of 0.10 due to the exploratory nature of the study. Power analysis was calculated for all variables with no significance, in order to exclude the possibility of a Type II error; a false negative.

5. DISCUSSION OF RESULTS

This dissertation starts with the cLO as the setting of the study and compares the effects of cultural influences, student attitudes toward technology and the facilitator on cognitive and affective learning. This chapter relates the results presented in the previous chapter to the research questions and hypotheses of the study. The study did not compare the composite learning object as a treatment against a traditional didactic approach or control.

Question 1

There were 3 research questions investigated. The first question and hypothesis provides data concerning the following dependent variables: test results for multiple choice, essay questions, and activity results.

Question 1. Is there any difference in student learning outcomes for cognitive learning using cLOs between student population in Costa Rica and the U.S.?

Hypothesis 1. There will be no difference between the Costa Rican and U.S. student populations with regard to their mean improvement test scores based on the updated Bloom's taxonomy categories of remembering and understanding.

Test scores were compared for the pre-test and post-test to evaluate cognitive learning. Pre-test scores, post-test scores, and gain scores were compared using the Mann-Whitney-Wilcoxon test. Multiple choice scores and essay scores were evaluated separately as they represent the different cognitive levels of remembering and understanding. The all data points scenario was used instead of the outlier trim scenario as there was fundamentally no difference between the two outcomes and the all data points scenario gives a larger sample size.

Table 5.1. Multiple choice test statistics comparing Costa Rica and U.S. students for cognitive level of remembering.

Variables	Z value	Asymp. Sig. (2 Tailed)	Number of students Costa Rica	Number of students U.S.	Total number of students
Pre-Test	-2.729	0.006	32	64	96
Post-Test	-2.687	0.007	32	64	96
Improvement Score	-0.558	0.577	32	64	96

The analysis of both the pre-test (p=0.006) and post-test (p=0.007) scores resulted in the same conclusions (table 5.1). The Costa Rican and U.S. locations were statistically different. The Costa Rican students started with a lower average of 43% compared to 51% for the U.S. students. Both cases entailed an introductory physical geography class. The difference in the scores between the two locations did not reflect differences in the academic studies at each university so much as the different preparation students received in the K-12 educational systems. In each location geography is not a separate subject but is taught in the social studies curriculum, where it is included with history and civics (Quirós-Arias 2009). The topic of the cLO was plate tectonics, which in the U.S. would be taught in the physical sciences curriculum. Costa Rica students indicated they had no previous instruction on this topic in their K-12 experience. The low pre-test scores indicate that the subject of physical geography is being neglected in both countries with Costa Rican students starting 8 percentage points below their U.S. counterparts. The post-test results were also different with the average being 65% for Costa Rica and 72% for U.S. students. The improvement scores were not significantly different; the two

groups improved at approximately the same rate. The power for the improvement score statistic was 0.1558, which indicates insufficient power (0.80 is the customary criterion for sufficient power to detect falsely negative results) for the study. With an effect size of only 0.1322 (0.20 is considered a small effect size (Cohen 1988)) the sample size would have had to be over 11,000 in order to be sufficiently powered, if the tiny effect size is real (G*Power 2014). The sample size was n=96. The Costa Rican students improved as much as U.S. students. The Costa Rican students improved on average 22% and U.S. students 20%. Comparing pre-test and post-test scores resulted in significant difference for the aggregate group (n=192, z=-8.692, p=0.000). This indicates a significant improvement in their understanding of plate tectonics in spite of the need for the Costa Rican students to translate web pages via the Microsoft Bing Translator. Despite similar improvement scores, the Costa Rican students were not able to close the initial gap experienced by the groups. Therefore, the group that started with better preparation was able to remain significantly higher than their peers. This would indicate that although the online material can be used effectively in teaching the subject, it cannot compensate for poor academic preparation in K-12 schooling.

The essay results represented the higher cognitive level of understanding.

Table 5.2. Essay test statistics comparing Costa Rica and U.S. students for cognitive level of understanding.

Variables	Z value	Asymp. Sig. (2 Tailed)	Number of students Costa Rica	Number of students U.S.	Total number of students
Pre-Test	-5.561	0.000	32	61	93
Post-Test	-5.077	0.000	32	61	93
Improvement Score	-0.445	0.656	32	61	93

We see similar results for the essay results (table 5.2) as for the multiple choice: the pre- and post-test scores show a significant difference between the two groups, but there is no statistically significant difference between the two groups for the improvement score. The average improvement for the Costa Rica students was 41% while the U.S. average improvement was 40%. Comparing pre-test and post-test scores resulted in significant difference for the aggregate group (n=186, z= -10.763, p=0.000). The power of the improvement statistic was 0.1518. This indicates insufficient power but the effect size was also extremely low with a value of 0.0567. The sample size would have had to be huge, more than 65,000, in order to be sufficiently powered, if the miniscule effect size is real. The sample size was n=93. The Costa Rica average pre-test scores for the essay results were 20 percentage points lower than the U.S. counterparts. The average essay scores for the Costa Rica students were much lower (26 percentage points) than the average of the multiple choice pre-test Costa Rica results. Barantes and Quirós-Arias (2014) indicated that routine exams in the Costa Rica classes consisted primarily of multiple choice and not essay questions.

Table 5.3. Comparison of average percentage scores for multiple choice and essay results.

Variable	Costa Rica	U.S.	Difference
Pre-Test Essay	17	37	20
Pre-Test Multiple Choice	43	51	8
Post-Test Essay	58	76	18
Post-Test Multiple Choice	65	72	7
Improvement Score Essay	41	40	1
Improvement Score Multiple Choice	22	20	2

The Costa Rica students performed lower on the post-test results for both the average essay and multiple choice scores but the gap was larger for the essay results where a 18 percentage points difference existed between the U.S. students and Costa Rica students compared to the 7 percentage point gap for the multiple choice scores between the two groups (table 5.3). Other influences could have also affected the Costa Rican group, such as uncertainty concerning a different and unfamiliar method of testing and learning and the difficulties of using the online translator for a non-native language when higher order learning concepts are involved. In addition, the pedagogy used in Costa Rican secondary school system consists mainly of rote learning where students frequently share a textbook and rely heavily on direct copying of material from a blackboard (Marlow-Ferguson and Lopez 2002).

The three main activities were all learner-centered activities. The journal was designed with constructivist pedagogy, and the wiki and discussion board with social

constructivist pedagogy. No significant difference between the two groups existed for the journal activity but we did see a significant difference for the wiki and discussion forum activity. Average scores for the Costa Rica students are lower (table 5.4). Standardizing grading was more difficult for this part of the cognitive assessment, although rubrics were provided to mitigate this problem. Each facilitator graded their own student work and no dual graders were employed due to the necessity of providing students timely feedback on participation. Differences in the scores could be due to performance of each group but it is more likely due to differences in grading between the two facilitators. The activity grades are, therefore, used only to indicate that adequate participation by both groups occurred.

Table 5.4. Average percentage scores for activities.

Activity	Costa Rica	U.S.	Difference
Journal	70	82	12
Wiki	74	92	18
Discussion Board	75	76	1

In summary, the null hypothesis was rejected for the following variables: pre-test scores for the multiple choice and essay questions, post-test scores for the multiple choice and essay questions, and scores for the discussion board and wiki activities. The null hypothesis was not rejected for improvement scores on multiple choice and essay tests and the journal activity.

Question 2

Affective learning is a type of learning that consists of attitudes, emotions, values, and beliefs formed by the knowledge and psychomotor skills acquired. Affective learning occurs when students internalize positive attitudes toward subject matter. This type of learning serves as a motivational catalyst and is linked with higher levels of cognitive learning (Mottett and Richmond 1998). Because of this link with cognitive learning, it is studied as a dependent variable in question 2.

Question 2. Is there a relationship between culture, specifically a Costa Rica and U.S. student population, each using a cLO and affective learning?

Hypothesis 2. Culture and affective learning are independent.

Affective learning cannot be measured through a standard exam; therefore, it was measured using a survey instrument. This was supplemented by interviews with three of the Costa Rica students. The five variables assigned to affective learning were: motivation, future interest, self-confidence, behavior hazards, and real life. Survey questions associated with each variable are indicated in the Appendix G. Affective learning was measured only through a post-survey as it is associated directly with the cLO. There was no significant difference between the two groups in all variables except for future interest. All variables with no significant difference were underpowered, with 0.80 indicating sufficient power, because of small effect sizes. The sample size would have had to be huge in order to be sufficiently powered, if a tiny effect size is real. Sample size was n=125. The variable with significance, future interest, was assessed using 3 survey questions. The two questions that indicated significance were: “I would be more likely now to spend more time outside of class keeping abreast of the subject”

and “I would want to enroll in another course with similar content.” The significant difference variables are an indication of the difference between the two groups in terms of majors. The geography majors in the U.S. classes were only 12% of the students, because introductory physical geography is commonly a general education physical science course. In the Costa Rica class, 95% of the students were geography majors. The students at Universidad Nacional Costa Rica Heredia do take general education (GE) classes, 38% of classes in the first year of college consist of general education classes (Universidad Nacional Costa Rica 2014?) These GE requirements are not as extensive as at CSULB. Therefore, it is less likely to find a non-geography major in a physical geography class. It makes practical sense that the geography majors are more interested in keeping abreast of their subject and taking geography classes in the future as it is linked to job opportunity. The non-significant variables, meaning the two groups were equivalent and the null hypothesis was accepted, were associated more with a personal response to the lesson. In regards to motivation, 78% of the Costa Ricans agreed that the cLO stimulated their interest compared with 75% of U.S. students. In each group at least half indicated that the lesson motivated them to spend more time with the subject than they normally would. A personal interview with three Costa Rica students indicated that they did enjoy the lesson and would be interested in similar lessons in the future. The open comments analysis also supported the positive response to the approach of the lesson by the Costa Rican group with 15 positive comments tabulated specifically about the approach. Despite lower cognitive scores and a secondary educational system focused on didactic methods, the Costa Rican students are open to the use of geographic technology presented in social constructivist pedagogy. Both groups agreed (73% Costa

Rica and 68% U.S.) that the cLO changed their behavior in regards to hazards. This indicates that this type of pedagogy can influence behaviors in spite of the different culture characteristics. The last variable where the two groups were equivalent was self-confidence, taking an average of the 2 questions, where 58% of Costa Rican and 60% of U.S. students felt more confident after the lesson.

The open comments chi-square test of independence further supported the lack of significant difference between these two groups in terms of student beliefs and attitudes. Statistical data indicated no significance at the 0.10 level (n=171, 2 df, w=0.060, p=0.737, power=0.155) in regards to positive or negative tones of open comments between the two student groups. If the extremely small effect size were real, it would require a sample in excess of 2,100 to detect it.

In summary, the null hypothesis was accepted for four of the five variables associated with affective learning. This indicates that the affective learning did not differ between the two groups. The one variable that was rejected, future interest, is more indicative of differences in types of majors. The majority of Costa Rican students were geography majors while most U.S. students were taking the class to fulfill a general education requirement. Additionally, both groups of students expressed high degrees of affective learning through their engagement with the cLO.

Question 3

The third of the research questions specifically focuses on two sets of student attitudes that could have an overall effect on the learning experience. These two sets of attitudes are considered independent variables.

Question 3. Is there a relationship between culture; specifically a Costa Rican and

U.S. student population, each using a cLO and student attitudes toward technology, and student attitudes toward the facilitator?

Hypothesis 3.Culture and student attitudes toward the facilitator and student attitudes toward technology are independent.

The first set of attitudes discussed will be the student attitudes toward the technology. These attitudes are important because of the direct connection to the learning experience since the research study is assessing a technologically enhanced lesson. Student attitudes were measured with a survey instrument using a pre-survey and post-survey. One variable, technical difficulties, was only measured on the post-survey as it pertained directly to the difficulties students encountered with the cLO. The student attitudes toward technology variables were enjoyment, access, facilitate learning, stress, and future use. Each variable is represented by a question or series of questions in the survey; these questions are indicated in Appendix G. All variables with a no significant difference were underpowered, with 0.80 indicating sufficient power, but with small effect sizes. The sample size would have had to be huge in order to be sufficiently powered, if the small effect size is real. Sample size was n=124. The two variables that showed significant difference between the two groups in the pre-survey were access and stress. For the post-survey, three variables (access, technical difficulties, and future use) showed statistical significance (table 5.5).

Table 5.5. Pre-survey and Post-Survey statistical data for student attitude toward technology variables that showed significance at α= 0.10; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	df	N	w	Corrected Power	Probability
12	Access (Pre)	8.115	2	128	0.252	0.821	0.014
13	Access(Pre)	13.79	2	128	0.328	0.962	0.001
13	Access (Post)	8.951	2	127	0.265	0.855	0.011
17	Stress (Pre)	17.22	2	128	0.367	0.986	0.000
18	Technical difficulties (Post)	5.936	2	127	0.216	0.698	0.051
19	Technical difficulties (Post)	9.446	2	127	0.273	0.872	0.009
21	Future use(Post)	4.889	2	127	0.196	0.620	0.087

a=Rodrigue, C. M. 2011. Chi-square modeling spreadsheet. Department of Geography, California State University. Available at:
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.ods (OpenOffice original)
http://www.csulb.edu/~rodrigue/geog200/ChiSquareModels.xls (Excel version)

In the pre-survey the Costa Rican students showed some concern about access to the Internet both at school, 16%, and at home, 23%, compared to U.S. students at school, 4%, and at home 12%. Nevertheless, by the end of the study, Costa Rican students only showed a concern with access at home and the level of concern dropped to 13%, while U.S. stayed about the same at 4.5%. This is confirmed by the lower DAI reading for Costa Rica. Barantes and Quirós-Arias (2014) indicated that most university students have good access at school but cannot afford Internet access at home. Costa Rican students (26%) also indicated in the pre-survey that technology does cause them to experience anxiety, while only 7% of U.S. students reported experiencing this symptom.

Once the cLO lesson was performed, however, no significant difference was seen between the groups with only 11% of Costa Rican students reported experiencing anxiety using the cLO and 17% of U.S. students reported experiencing stress (Appendix G). The post-survey showed a significant difference for both questions concerning technical difficulties. This was anticipated as a technical difficulty with a hyperlink occurred with the second run in Costa Rica. It is most likely that, because of this problem, 23% of Costa Rican students reported technical difficulties impeding their learning process. The last variable that displayed a significant difference between the two groups was future use in the post-survey. The two statements that represented the variable of future use were:

1. I would like to see more technology integrated into a standard lecture format.
2. I would like to see technology replace the standard lecture format.

Both groups agreed that they would like to see more technology integrated into a standard lecture format, 70% Costa Rica and 56% U.S., but the significant difference between the two groups occurred in the second question with 42% of Costa Ricans agreeing compared to 27% of U.S. students.

Although home access to the Internet is different between the two groups, this was a criterion of the study; mainly a country where digital access was slightly lower than the U.S. The lack of access from home could have reduced the cognitive results for the Costa Rican students. The attitudes for future use could have had an effect on the dependent variable. The attitudes for both groups were positive in regards to wanting to see more technology integrated into lectures. The positive attitudes were more pronounced in the Costa Rica students. This could have positively influenced affective learning, particularly in terms of motivation. Consequently, cognitive results could have

been positively influenced. The technical difficulties could have also influenced the dependent variables of cognitive and affective learning. Since the problems occurred in the Costa Rican group alone, this could have negatively impacted their results.

Zhang (2009) indicates that teacher credibility also has a direct connection with the learning experience. The student attitudes toward the facilitator was measured in the pre-survey and post-survey as the following variables: facilitator, take another class, assessment, negative bias, positive bias, and overall performance. Each variable is represented by a question or series of questions in the survey; these questions are indicated in Appendix G. All variables with a no significant difference were underpowered, with 0.80 indicating sufficient power, but with small effect sizes. Sample size was n=125. Of the six variables measured, the only significant difference detected in the pre-survey and post-survey was the positive bias variable (table 5.6).

Table 5.6. Pre-survey and Post-Survey statistical data for student attitude toward facilitator variables that showed significance at $\alpha = 0.10$; Chi –Square Test of Independence[a].

Question	Variable	X2 (Calc.)	df	N	w	Corrected Power	Probability
38	Positive bias (Pre)	54.90	2	127	0.657	1.00	0.000
38	Positive bias (Post)	55.90	2	126	0.666	1.00	0.000

The statement posed on the survey was: The facilitator did not show a biased positive attitude toward technology. The Costa Rican students indicated 18% (compared to 75% of U.S. students) in the pre-survey agreed with this statement. This would indicate that the students believed the facilitator in Costa Rica did show a positive bias

toward technology. In the post-survey, results were very similar with 13% of Costa Rican students agreeing compared to 72% of U.S. students. Overall this could have had a positive effect on Costa Rican students in terms of affective learning; motivation could have increased because of the facilitator's attitude. Despite the indication of a positive bias, the overall performance variable indicated no significant difference between the two facilitators.

One last variable that was assessed was use of the Microsoft Bing translator by the Costa Rican students. The Costa Rican students did all assignments in Spanish, but the links and associated information were in English, being the dominant educational language on the Internet. Four questions were included on the survey to assess student perception of how it influenced the Costa Ricans' learning experience. When asked if they understood English and did not have to use the translator, only 26% agreed with this statement. The majority of students, 54%, disagreed with this statement and, therefore, did need to use the translator, while 20% of these students remained neutral. The majority of students, 66%, indicated that the translator did help to understand the content of the lesson, and only 16% indicated that the extra work affected their motivation in regards to the learning experience. When asked if they could have done better if the material had been presented in Spanish the majority of students, 70%, agreed with this statement. The open comments also support the strong opinion that students would prefer to have access to geotechnical information not only in English but also in their native language of Spanish. Of the 24 negative open comments, 29% had to do with the translator engine.

6. CONCLUSIONS

The purpose of this research study was to provide needed field data through a comparison of Costa Rica and U.S. geography students' experiences with a cLO centered on the topic of plate tectonics.

The independent variables in this study were cultural parameters, student attitudes toward the facilitator and student attitudes toward technology and the dependent variables were affective learning, assessed through the survey, and cognitive learning, assessed through the multiple choice and essay exams and activity scores. The context/setting of the study was an online constructivist lesson represented as the cLO.

The exam data indicated significantly different pre- and post-test scores between the two groups, with U.S. students scoring higher, but no significant difference in improvement scores between the groups. Further calculations verified both group did improve from the pre- to the post-test. Pre-test and post-test scores for the multiple choice scores resulted in significant difference for the aggregate group ($n=192$, $z=-8.692$, $p=0.000$). A significant difference was also seen in the Costa Rica group ($n=64$, $z=-5.568$, $p=0.000$) and U.S. group ($n=128$, $z=-6.9072$, $p=0.000$) computed separately. Essay results has similar results with significant differences in the aggregate group ($n=186$, $z= -10.763$, $p=0.000$) and significant differences in the Costa Rica group ($n=64$, $z=-6.547$, $p=0.000$) and U.S. group ($n=122$, $z=-9.227$, $p=0.000$). The pre and post-test gaps between the two differences were larger going from the lower cognitive level of remembering to the higher cognitive level of understanding. These data indicate that the group with the better preparation base, indicated by higher pre-test scores, is able to score significantly higher on the post-test. Although 95% of the Costa Rica students were

geography majors, this particular class is a beginning class and the pre-test scores reflect a lack of K-12 geography preparation. Geography in Costa Rica is characterized by traditional classroom teaching methods, which include rote memorization of basic facts in K-12 classrooms and consequently new alternative teaching methods with new technologies are needed in order for children and adolescents to become more informed and critical-thinking citizens (Quirós-Arias 2009). Furthermore, improvement in cognitive learning did occur, but the gap could not be closed between the two groups despite having participated in the same lesson. This has detrimental implications for international students taking classes online and prompts further questions of why the gap in post-test scores between the two groups could not be eliminated.

It is believed that the following circumstances could have influenced the difference in post-test scores between the Costa Rica students and U.S. The amount of increase or decrease is not known in this study and could provide topics for future research. Survey data and cognitive data indicate that lack of Internet access at home, poor K-12 preparation, and technical difficulties could all have contributed to lower post-test scores for the Costa Rican group. The prominent use of the English language on the Internet also had a negative effect on the Costa Rican group. Survey results support this conclusion where 70% of students believed they could have done better if Internet material were in their native language. Klein and Solem (2008) found language to be a weakness of collaboration between international groups participating in the CGGE (Center for Global Geography Education) project. Native language is an important component in education. The Pitchford (2014) research study found tablet-based math intervention more effective when the lesson was in the native language of Malawian

students compared to current pedagogical practices. According to http://www.internetworldstats as of January 13, 2015, Spanish users comprise 7.9% of world-wide Internet users. It is recommended that more Spanish educational material be available on the Internet for this population. Variables that are believed to have influenced cognitive test scores are the positive bias and future use variables assessed in the survey. The positive bias variable indicated the pro-technology attitude of the Costa Rican facilitator. The future use variable indicated the favorable attitude the Costa Rican students had toward technology where 42% of students compared to 27% of U.S. students would like to see technology replace the standard lecture.

Survey results and personal interviews indicate that the Costa Rican students and U.S. students had a positive learning experience with the online constructivist lesson. Affective learning did not differ between the two groups except for the future use category. Furthermore, the difference in the future use category is linked with the majority of Costa Rica students being geography majors. Regarding motivation 78% of the Costa Ricans and 75% of U.S. students agreed that the cLO stimulated their interest. In each group, at least half indicated that the lesson motivated them to spend more time with the subject than they normally would. A personal interview with some students indicated they did enjoy the lesson and would like to have similar lessons available. The open comments analysis also supported the positive response to the approach of the lesson by the Costa Rica group with 15 positive comments tabulated specifically about the approach. Despite lower cognitive scores and a secondary educational system focused on didactic methods, the Costa Rican students are amicable to the use of geographic technology presented in social constructivist pedagogy.

Projections for Future Research

Culture is believed to be inseparable from learning and teaching and has an impact on national groups' learning behavior (Uzuner 2009; Smith and Smith 2000). The different dimensions of a society can strongly influence student/student interactions and student/teacher interactions (Muñiz-Solari 2009; Hofstead1986). Uzuner (2009) conducted a research review on culture in distance learning in an asynchronous environment within the following educational databases: EBSCO, ERIC, Education Fulltext, and PsychINFO. The result of the search was a review of 27 studies. The lack of studies located reflected the dearth of data regarding the subject. Future research is needed in this area as web-based learning becomes increasing global; empirical studies are needed in order to provide successful delivery to global students (Liu et.al. 2010). Future research could enhance this study by providing a control group for each study location that compared the constructivist setting to a traditional lecture university setting. There are several potential research topics that would add to the body of knowledge associated with this research. Such topics include:

- How student-teacher and student-student interactions affect the learning experience in different cultural settings?
- How language affects the learning experience for second -language learners? This could include cases where the alphabet is similar to English and more extreme cases where the alphabet is completely different.
- What are the best training methods for instructors with a global audience?
- How culture affects learning within the U.S. educational system regarding domestic minority populations?

APPENDIX SECTION

APPENDIX A

Student (English and Spanish), Facilitator (English and Spanish), and Research Associates (English) Guides

Introduction to Learning Object (L.O.): Plate Tectonics Module

1. Lesson 1, Activity 1-Journal Writing. Topics: Theory of Plate Tectonics; internal structure of the earth; volcanic activity; movement of the plates.

   Step 1: Go to the website http://platetectonics.wranic.com/ to begin.

   Step 2: You will be constructing a journal for the first activity. To begin you should open a new Word document. This document will be your journal. Copy and paste the questions required to be answered in your journal. You will find these questions in your "Student Guide" or on the website http://platetectonics.wranic.com/.

   Step 3: Review the website links associated with the journal indicated on the website, http://platetectonics.wranic.com/. As you review the links enter your answers to the journal in your Word document. Make sure you use your own words. Do not just copy and paste text from the links.

   Step 4: When you are done answering all the questions save your Word document. Make the file name the same as your own name and also put your name in the Word document. E mail the Word Document to your instructor and yourself. Always keep a copy of your work as backup.

2. Lesson 1 Activity 2- Discussion Board. Topic: Hazards associated with plate movement.

   Step 1: Go to the website http://platetectonics.wranic.com/. Read the links under "Famous Earthquake Accounts."

   Step 2: Go to the discussion forum your instructor has set up. You will respond to the following two items. To receive full credit for this activity you need to respond to both items and respond to one other student's comment.

   - How did the earthquakes affect the personal lives of people you read about?
   - Share a personal earthquake experience or discuss the hazards associated with an earthquake.

3. Lesson 2 Activity 1-Real Time Data Analysis. Topics: mapping using the global grid system; volcanic activity; plate tectonics; types of plate movement.

   Step 1: Form groups of 3-5 students per directions of your instructor. This activity is a group activity so you will turn in one map and answers to the two questions per group not per individual. You will use the same group to do the next activity, wiki building.

   Step 2: Go to the website http://platetectonics.wranic.com/. Click on the upper left hand corner tab, “Lesson 2”.

   Step 3: Look under the section “Real Time Data Analysis” on this webpage. Click on the “National Geographic Map” link. Click on the upper right hand tab for “Print.” This will print out a paper copy of a world map.

   Step 4: Click on the link “USGS” on the website. This will take you to the data you need. It will list all of the earthquakes larger than 2.5 across the world. You need to look at the “Lat deg” and “Long Deg” for your data. The North coordinates for the latitude reading is given by a positive number and “-“negative number indicates a South Coordinate. The longitude reading is east for a positive number and West for a negative number. Plot all of the data points on your paper map. You will have to estimate locations since we have a large scale map.

   Step 5: After completing your map answer the following two questions.

   - What is the relationship between plate location and earthquake generation?
   - What location will you focus on for your wiki construction?

   You can write the answers on the back of your map or use a separate piece of paper. The second question, “What location will you focus on for your wiki construction?” should be a tectonically active location. Check with your instructor to make sure you have chosen a suitable location.

4. Lesson 2 Activity 2- Wiki (group website) Construction. Topics: Hazards associated with plate movement and preventive measures associated with hazards of specific locations.

   Step 1: Get into the groups you formed in the “Real Time Data Analysis Activity.”

   Step 2: Go to the website http://platetectonics.wranic.com/.

   Click on the upper left hand corner tab, “Lesson 2”.

   Step 3: Look under the section “Wiki Building” on this webpage.

Step 4: Each person needs to create an account for the wiki. Go to the website www.wikispaces.com as indicated on the website. In the upper right hand corner click "sign in". Next click on a link near the bottom of the pages, "Create a new Wikispaces Account."

Step 5: Next you will go to the wiki www.geographywranic.wikispaces.com where you will navigate to the page "Using Wikispaces". From the links you can become familiar with how to use the software needed to construct the wiki. There are instructions both in English and Spanish. Make sure you understand how to use the software before starting construction of the wiki. This will ensure a better quality wiki.

Step 6: Have one person log into http://www.wikispaces.com/. Create your wiki (one per group) and make sure all your group members know the link to your wiki. Once you have created your wiki post a link to your wiki on http://geographywranic.wikispaces.com/ along with your group members' names, university name, and your chosen location. Once you have a working idea of how to edit information, make sure your group members have access to the wiki and are able to edit content. You do this Under "Manage Wiki" then "People" and "Invite People." You will need to send each member of your group an e mail invitation and they will need to respond and accept. When this is complete they will be able to edit the wiki although group members cannot edit the group website at the same time as information will be lost. Next go to "Permissions" where you will select the "Protect" option. This allows everyone to view your wiki but only group members to edit the wiki.

Step 7: The following content should be included in your wiki.

1. Include any type of physical processes that might be occurring at that location.

2. What are some natural hazards for your location and what human interests may be at risk?

3. You should describe how community residents and authorities can prepare for an earthquake or volcanic eruption and its aftermath in the area of your location. Review earthquake advice from the USGS, the Red Cross and other agencies indicated on the website.

Step 8: Your wiki must contain at least **two** creative elements to explain information about your location or engage viewers with your topic. Some ideas for this can be found on the SARS link indicated on the website. For example, you can include a timeline of events, create a survey for visitors to take regarding your topic, create a video and upload it to your wiki, post a PowerPoint slideshow, upload a podcast,

create a blog, or any other original ideas you come up with. Any textual information needs to be written by you and cannot be copied from a website. Be aware of copyright laws throughout the designing process.

Step 9: Brainstorm with your group on what elements you want to include and how you want to focus your information. *Remember that only one person can edit the wiki at a time. If simultaneous editing occurs, one person can risk losing their edits.* Any information you gather to put on your wiki needs to be cited. The SARS website has a reference list of their citations. Use their format to cite the sources you are using to gather information for your wiki. At the bottom of the page are two links that will give you ideas and tips for putting creative elements on your wiki.

Step 10: Make sure you save your wiki each time you work on it.

5. <u>Lesson 2 Activity 3- Review of Wikis-Topics: Topics: Hazards associated with plate movement and preventive measures associated with hazards of specific locations.</u>

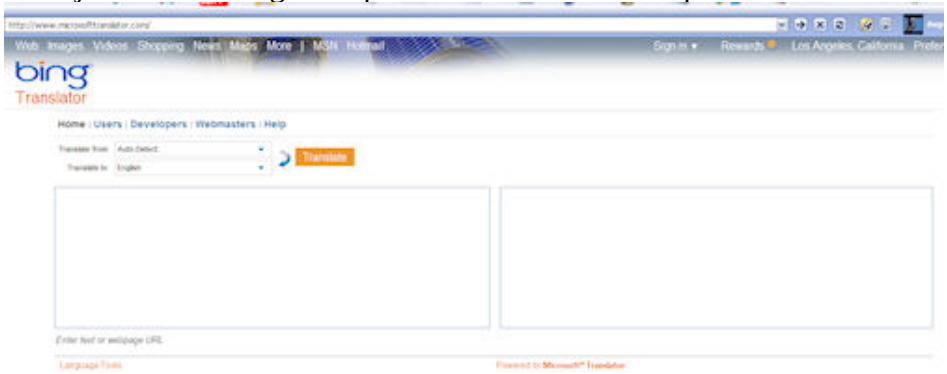
   Step 1: Go to http://geographywranic.wikispaces.com/ where you will find the links your classmates posted of their wikis. Review the wikis created by your classmates.

   Step 2: Write a brief summary of the each location covered which should include why you liked their site and improvements that could be made to the wikis. This can be done by creating a Word document or neatly hand-written.

Introducción al Objeto de Aprendizaje (L.O.)

1. Uso de Traductores Online

El mejor traductor Inglés-Español es Microsoft en http://www.microsofttranslator.com/.



Para traducir una página de Internet: copie y pegue la dirección del sitio (URL) en la recuadro de la izquierda. El traductor lo llevará al sitio y empezará traduciendo la información. Para mayor comodidad usted podría dejar 2 páginas web abiertas al mismo tiempo. La página de Internet que usted está viendo y la página del traductor Microsoft.

2. Lección 1, actividad 1-diario escrito. Temas: Desarrollo de la Teoría de en Tectónica de Placas; estructura interna de la Tierra; actividad volcánica; en tectónica de placas; tipos de movimientos de placas.

Paso 1: Vaya a la página Web http://platetectonics.wranic.com/ para comenzar.
Paso 2: Va estar construyendo un diario para la primera actividad. Para empezar te debe abrir un nuevo documento de Word. Este documento será su diario. Copiar y pegar las preguntas necesarias para responder en su diario. Encontrará estas cuestiones en su "Guía del estudiante" o en el sitio Web http://platetectonics.wranic.com/.
Paso 3: Revise los vínculos de sitio web asociados con el diario indicado en el sitio Web, http://platetectonics.wranic.com/. Como revisar los vínculos escriba sus respuestas al diario en el documento de Word. Asegúrese de que utilizar sus propias palabras. No sólo copiar y pegar el texto de los vínculos.
Paso 4: Cuando haya terminado de contestar todas las preguntas guardar el documento de Word. Hacer el archivo de nombre el mismo como su propio nombre y también poner su nombre en el documento de Word. El documento de Word a su instructor y usted el correo electrónico. Mantener siempre una copia de su trabajo como copia de seguridad.

3. Lección 1 actividad 2-discusión. Tema: Riesgos asociados con el movimiento de placas.

Paso 1: Vaya a la página Web http://platetectonics.wranic.com/. Leer los vínculos de "Famoso terremoto cuentas."
Paso 2: Ir al Foro de discusión que el instructor ha puesto en marcha. Responderá a los dos elementos siguientes. Para recibir crédito completo para esta actividad es

necesario responder a ambos temas y responder a comentario del otro alumno.
• Cómo los terremotos afectan las vidas personales de leer acerca de las personas?
• Compartir una experiencia personal terremoto o discutir los peligros asociados con un terremoto.

4. Lección 2 actividad 1 Real análisis de datos de tiempo. Temas: Asignación mediante el sistema de red Global; Actividad Volcánica; En tectónica de placas; Tipos de movimientos de placas.

Paso 1: Formar grupos de 3-5 estudiantes por instrucciones de su instructor. Esta actividad es una actividad de grupo, por lo que se convertirá en un mapa y respuestas a las preguntas de dos por grupo no por persona. Va a utilizar el mismo grupo para hacer la siguiente actividad, wiki edificio.
Paso 2: Ir a la página Web http://platetectonics.wranic.com/. Haga clic en la esquina superior izquierda, "Lección 2".
Paso 3: Busque en la sección "Datos de análisis en tiempo Real" en esta página Web. Haga clic en el vínculo "Mapa geográfico nacional". Haga clic en la ficha superior derecha para "Imprimir". Esto imprimirá una copia impresa de un mapa del mundo.
Paso 4: Haga clic en el vínculo "USGS" en el sitio Web. Esto le llevará a los datos que necesita. Enumerará todos los terremotos más de 2,5 en todo el mundo. Es necesario mirar el "Lat deg" y "Larga Deg" para sus datos. Las coordenadas del Norte para la lectura de latitud está dada por un número positivo y "-" número negativo indica una coordinación Sur. La lectura de longitud es este para un número positivo y al oeste por un número negativo. Trazar todos los puntos de datos en el mapa del documento. Tendrá que calcular ubicaciones ya que disponemos de un mapa a gran escala.
Paso 5: Después de completar el mapa de responder a las siguientes dos preguntas.
• ¿Cuál es la relación entre la ubicación de la placa y la generación de terremoto?
¿• Qué ubicación centrará en su construcción wiki?

Puede escribir las respuestas en la parte posterior de su mapa o utilizar un trozo de papel separado. La segunda pregunta, "qué ubicación centrará en para su construcción wiki?" debe ser una ubicación tectónicamente activa. Compruebe con su instructor para asegurarse de que ha seleccionado una ubicación adecuada.

5. Lección 2 actividad 2-Wiki (sitio Web de grupo) construcción. Temas: Riegos asociados con el movimiento de placas y las medidas preventivas asociadas con los riesgos de tales movimientos en localizaciones específicas.

Paso 1: Entrar en los grupos formados en la "actividad de análisis de tiempo Real datos".
Paso 2: Ir a la página Web http://platetectonics.wranic.com/.
Haga clic en la esquina superior izquierda, "Lección 2".
Paso 3: Busque en la sección "Creación de Wiki" en esta página Web.
Paso 4: Cada persona necesita crear una cuenta para la wiki. Vaya a la página Web

www.wikispaces.com como se indica en el sitio Web. En la esquina superior derecha haga clic en "sign in". A continuación, haga clic en un vínculo en la parte inferior de las páginas, "Crear una nueva cuenta de Wikispaces".
Paso 5: A continuación irá a la www.geographywranic.wikispaces.com de wiki donde navegará a la página "Con Wikispaces". Desde los enlaces pueda familiarizarse con cómo utilizar el software necesario para construir la wiki. Hay instrucciones en inglés y español. Asegúrese de que entender cómo utilizar el software antes de iniciar la construcción del wiki. Esto asegurará una mejor wiki de calidad.
Paso 6: Tener un registro de persona en http://www...wikispaces.com/. Crear tu wiki (uno por grupo) y asegúrese de que todos los miembros de su grupo saben el enlace a su wiki. Una vez ha creado tu post wiki un vínculo a su wiki en http://geographywranic.wikispaces.com/ junto con los nombres de los miembros del grupo, el nombre de Universidad y su ubicación elegida. Una vez que tenga una idea del trabajo de cómo editar información, asegúrese de que los miembros de su grupo tienen acceso a la wiki y puedan editar contenido. Ello en virtud de "Administrar Wiki" y "Gente" y "Invitar A la gente." Tendrá que enviar una invitación de correo electrónico a cada miembro de su grupo y tendrán que responder y aceptar. Cuando esto se complete podrán editar la wiki aunque los miembros del grupo no pueden editar el sitio Web de grupo al mismo tiempo, la información se perderá. A continuación vaya a "Permisos" donde se selecciona la opción de "Proteger". Esto permite que todo el mundo ver tu wiki pero sólo los miembros del grupo para editar la wiki.
Paso 7: El siguiente contenido debe incluirse en su wiki.
1. Incluir cualquier tipo de procesos físicos que podría estar ocurriendo en esa ubicación.
2. ¿Cuáles son algunos peligros naturales para su ubicación y qué intereses humanos pueden estar en riesgo?
3. Debe describir cómo las autoridades y los residentes de la comunidad pueden prepararse para un terremoto o erupción volcánica y sus secuelas en el ámbito de su ubicación. Asesoramiento de terremoto de revisión de la USGS, la Cruz Roja y otros organismos indicados en el sitio Web.
Paso 8: Su wiki debe contener al menos dos elementos creativos para explicar la información sobre su ubicación o participar de espectadores con su tema. Algunas ideas para ello pueden encontrarse en el enlace de SRAS indicado en el sitio Web. Por ejemplo, puede incluir una cronología de eventos, crear una encuesta para los visitantes a tomar con respecto a su tema, crear un vídeo y subirlo a su wiki, publicar una presentación de PowerPoint, subir un podcast, crear un blog o cualquier otras ideas originales con que topar. Cualquier información textual debe ser escrita por usted y no se pueden copiar desde un sitio Web. Ser consciente de las leyes de copyright en todo el proceso de diseño.
Paso 9: Intercambiar ideas con su grupo en los elementos que desea incluir y cómo desea centrar su información. Recuerda que sólo una persona puede modificar la wiki en un momento. Si se produce la edición simultánea, una persona puede perder sus ediciones. Cualquier información que se reúne para poner en su wiki debe ser citado. El sitio Web de SRAS tiene una lista de

referencia de sus citas. Utilice su formato para citar las fuentes que se utiliza para recopilar información para su wiki. En la parte inferior de la página son dos enlaces que le darán ideas y sugerencias para colocar elementos creativos en su wiki.
Paso 10: Asegúrese de que guardar su wiki cada vez que se trabaja en ella.

6. Lección 2 actividad 3-examen de Wikis - Temas: Riesgos asociados con el movimiento de placas las medidas preventivas asociadas con los riesgos de tales movimientos en localizaciones específicas.

Paso 1: Ir a http://geographywranic.wikispaces.com/ donde encontrará los enlaces de tus compañeros publicados de los wikis. Revise los wikis creados por sus compañeros.
Paso 2: Escribir que un breve resumen de la ubicación de cada cubierta que debe incluir, por eso gustó su sitio y mejoras que podrían introducirse en los wikis. Esto puede hacer mediante la creación de un documento de Word o prolijamente escrito a mano. Cada individuo se convertirá en un documento separado para esta actividad.

Facilitator instructions for Plate Tectonics cLO (composite learning object) at www.geography.wranic.com

"A learning object is any grouping of materials that is structured in a meaningful way and is tied to an educational objective. The 'materials' in a learning object can be documents, pictures, simulations, movies, sounds, etc. Structuring these objects in a meaningful way implies that the materials are related and are arranged in a logical order" (Nash 2005). A cLO is an organized combination of learning objects that has a certain degree of relationship guided by a central theme.

A cLO, in the form of a website, on plate tectonics has been developed for use in this research study. The cLO was generated during an independent study class in geographic education at the Ph.D. level at Texas State during the spring of 2008 by Clovis Perry and modified by Angela Wranic in December of 2010. The modification of the cLO was based on the instructor's use of a similar cLO on global warming in an undergraduate climatology lab class. The general format of the cLO was field tested in this class and used successfully. The field test also provided information on difficult areas where students may need guidance. The "tips" provided below will be of help in the implementation of the cLO. The cLO was designed particularly for an undergraduate geography or geosciences class.

The website is an instructional and collaborative object. It provides a means of delivery for knowledge and a place for students to work collaboratively. The website has a traditional behaviorism bottom-up design. Students begin with easier tasks and proceed to more difficult projects. The overall cLO demonstrates a moderate social constructivist approach in pedagogy which has developed historically as a response to poor learner response to didactic instruction (Doering and Valetsianos 2007; Edsall and Wentz 2007;

Koohang and Harman 2007). In order to successfully use this cLO the instructor must realize the changing role of the instructor in this particular lesson compared to a traditional lesson where the instructor lectures on a given subject. Here the students will explore the content material and construct their own knowledge from that material. It does not mean they can do the lesson completely on their own. This lesson is best presented in a blended learning environment where students still have access to an instructor's guidance and to ensure that students have consistent computer access.

The Plate Tectonics cLO consists of two lessons. The first lesson consists of two assignments: the journal and discussion board which will take approximately 1 week.

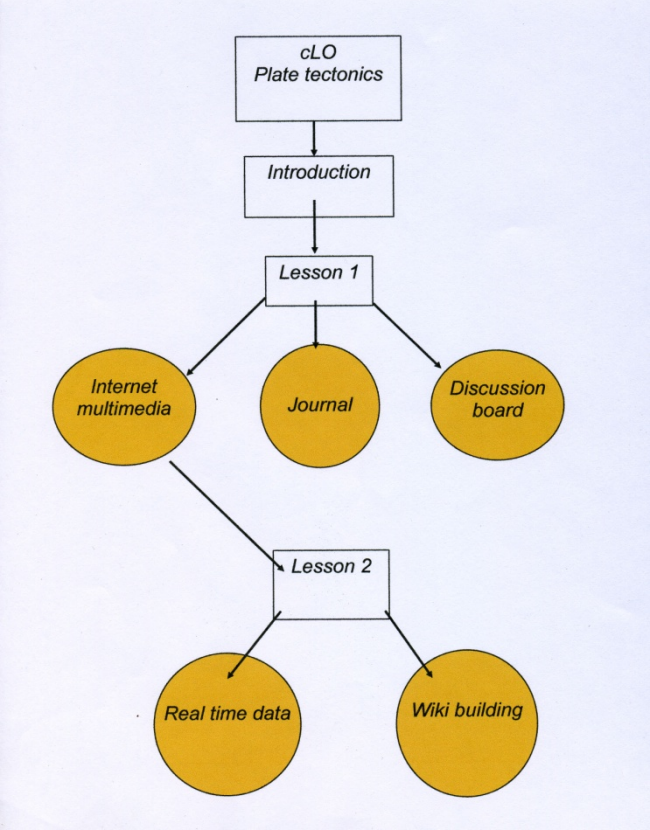


Fig A1. Overall design of Plate Tectonics cLO.

A rubric (system of assessment) has been included on the website. It is important that you follow this grading procedure so that the two groups I will be comparing in my research have experienced the same lesson and grading procedures. The overall grading scheme for the entire cLO in regards to the overall credit in your class is at your personal discretion although I would request that it hold enough credit so that students would be required to take the assignment seriously. In order for the student to be included in my survey results I have set a criteria of a 70% or better on graded activities and participation in all group activities. I will need you to keep track of these criteria for each student and to only allow students who meet these criteria to participate in the survey. The first assignment is a journal where specific questions are required to be answered. The answers to these questions are contained within the website as links to the various Internet multimedia. Here students will read material, view movies, and participate in active animations.

*Tip: Draw attention to the last question of the journal, "As a **summary** for the journal include a personal reflection of your thinking process on how you educated yourself on this topic and what was the most important thing you learned from your journal exploration." Students need to specifically be aware to write a summary and that simply answering the other 5 questions does not automatically mean they have answered this question. This question is to focus student on the overall thinking process of this project. It was included as a part of the constructivist pedagogy that indicates student reflection is important to the overall learning process.*

The second assignment in lesson 1 is the discussion board. Here readings on personal accounts of earthquake experiences are presented for student review and

students then must reflect on effects that earthquakes have on people's lives. They are also asked to share a personal experience with an earthquake. The intention of the discussion board is for students to become aware of the real life importance of plate tectonics in their personal lives and from a hazards point of view. The location of the discussion board is yet to be determined. Let me know if you need help setting up a spot for a discussion board via the Internet or if your University has its own in house system with a discussion board.

Tip: You will want to open the discussion board as soon as possible so that students will have a full week to participate in the discussion board. Direct students to get the discussion board readings done early and to post early since part of the grading criteria requires that they interact with other students in the discussion board; this cannot be accomplished if everyone waits until the last minute to post. You should also monitor the discussion board and guide students if they get too off of the subject.

The second lesson consists of analyzing real time data and wiki (group website) building. This lesson is estimated to take 2 weeks. The first assignment of analyzing real time data consists of extracting recent global earthquake activity and plotting this data on a map. It is at your discretion if students do this as a group or individually. I have not included a rubric of grading for this activity; it will be at your discretion. This assignment is intended to allow students to make the connection between earthquake activity and plate boundaries. It is also intended to help students pick a particular location for study in the second assignment in lesson 2. You would want to start this activity first and have students monitor the data for 2 weeks, but you will also want to start the students on the second assignment as soon as possible. The second assignment

in this lesson is construction of a wiki (group website). Students will pick a particular location and discuss the earthquake history of the site. The website indicates the content the wiki should include. This assignment is intended to be open-ended, meaning students may have a variety of responses to the assignment. A rubric for wiki grading is included. The rubric will give you a good idea of how open-ended the assignment is as you assess on a variety of characteristics from organization, creativity, and collaboration. The wiki building is the most difficult assignment in this cLO as it requires a great deal of original thought, more extensive use of technology, making sense of content about earthquakes and plate tectonics, and evaluating hazards posed by earthquakes. It is also recommended that students evaluate and review other students wiki's as this will exert peer pressure on students to build better wikis and extend the content area of the lesson. A link to where students can setup their wikis is recommended and has been used by my class. During my lesson I familiarized myself with some technical basics of the wiki building site but mostly kept referring students to the tutorials on website for the technical aspects of building the wiki. How much help you give them will depend on their own computer knowledge. In my classroom most students were very computer fluent and therefore I just kept referring them to tutorials because I knew they could figure it out

Tip: Specifically go over the "SARS" link indicated on the website. It provides an excellent example of how students should cite references. It is important for students to understand that they are not simply copying and pasting information to construct the wiki. The text must be written in their own words and the assignment requires them to create at least 2 original items.

Tip: Copyright information has been included on the website about what is legally allowed for students to use. It would be a good idea to go over this specifically to clarify any questions.

Hint: Only one student at a time can edit the wiki. If they are given class time to work on it one student will need to act as an editor.

Tip: You cannot lose information in the wiki building it can always be recovered under the "history" tab.

Tip: Have one student set up the wiki site and e mail you the site link so you have a list of the wikis for grading latter and later review/evaluation by students.

Tip: They can make the wiki private where only members of their group can edit it although it does take one extra step in the process of setup.

Survey for Facilitator

Please return to awranic@csulb.edu .

Time spent for Lesson 1

Time spent for Lesson 2

What is the average class level of the students?

Were there any other means of assessment on this material beyond what was included in the cLO, for example a unit test, if so please include the test.

Did the students have access to any other materials on the topic of plate tectonics such as a lecture or textbook?

What is your attitude about technology in the classroom?

Please discuss any technical difficulties with the cLO.

Please discuss any suggestions for improving the cLO.

References

Doering, A., and Veletsianos, G. (2007). An investigation in the use of real-time authentic geospatial data in the K-12 classroom. *Journal of Geography* 106 (6): 217-225.

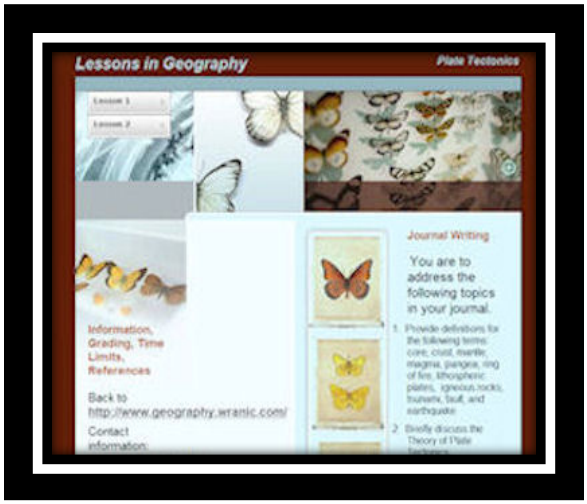
Edsall, R., and Wentz, E. (2007). Comparing strategies for presenting concepts in introductory undergraduate geography: Physical models vs. computer visualization. *Journal of Geography in Higher Education* 31(3): 427-444.

Koohang, A., and Harman, K. (2007). *Learning objects and instructional design.* Santa Rosa, CA: Informing Science Press.

Nash, S. M. (2005). Learning objects, learning objects repositories and learning theory: Preliminary best practices for online courses. *nterdisciplinary Journal of Knowledge and Learning Objects* 1: 217-228.

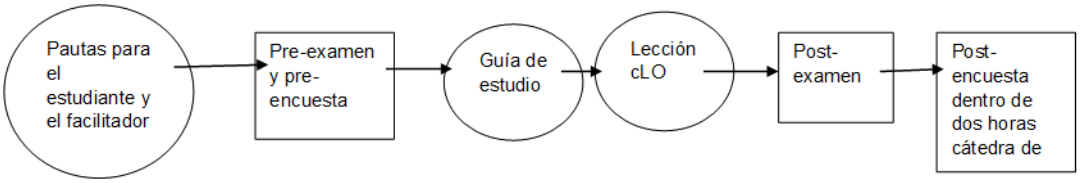
Lecciones en Geografía: Tectónica de Placas
Guía del facilitador

Costa Rica



http://platetectonics.wranic.com/

La secuencia de eventos se indica a continuación; luego se brinda una explicación del proceso.



Le enviaré una versión traducida del pre-examen al facilitador y al asistente de investigación por correo electrónico. El facilitador le informa brevemente a la clase que la lección en clase y la investigación van por separado y su participación en la investigación no tiene efecto en la calificación de la clase. El asistente de investigación administra el pre-examen y el post-examen de acuerdo a las "Pautas del Asistente de Investigación." Por favor, vea las "Pautas del Asistente de Investigación" para verificar su parte en la recolección y distribución de la información del estudiante. Las pautas para estudiantes y la guía de estudio se entregarán a los estudiantes y el facilitador las revisará luego de que los estudiantes hayan completado el pre-examen y la pre-encuesta.

Luego, el facilitador guía a los estudiantes en la lección cLO. Los estudiantes deberán realizar sus tareas en español. Usted deberá ocupar su puesto durante este momento para que podamos monitorear quién ha estado participando. El sitio web es un objeto instructivo y colaborativo; brinda un lugar para que los estudiantes trabajen de manera colaborativa y como una manera de entrega de conocimiento. El sitio web cuenta con un diseño tradicional de conductismo desde abajo. Los estudiantes comienzan con tareas más fáciles y proceden a proyectos más difíciles. El cLO demuestra un acercamiento constructivista social moderado en pedagogía el cual se ha desarrollado históricamente como una refutación a la respuesta pobre del estudiante a la instrucción didáctica. Para usar con éxito este cLO, el instructor debe darse cuenta del papel cambiante del instructor en esta lección en particular en comparación con una lección tradicional donde el instructor da clase sobre un tema específico. Aquí los estudiantes explorarán el material de contenido y construirán su propio conocimiento a partir de ese material. Esto no significa que puedan realizar la lección completamente solos. Esta lección se presenta de mejor manera en un ambiente de aprendizaje mezclado donde los estudiantes aún tienen acceso a la guía de un instructor, y para asegurarse de que los estudiantes tengan un acceso consistente a una computadora. Se ha incluido una rúbrica (sistema de evaluación paralas actividades) en el sitio web. Es importante que siga este procedimiento de calificación para que los dos grupos que compararé en mi investigación tengan experiencia con los mismos procedimientos de calificación y lección. El plan de calificación en general para el cLO completo en lo que respecta al crédito total en su clase es a discreción personal aunque yo requeriría que tuviera el suficiente crédito para que los estudiantes tomaran la tarea seriamente. Los resultados de los ensayos

necesitarán ser calificados por usted mismo y otra persona que brinde una verificación de resultados.

Luego de completar la lección, los estudiantes necesitan completar el post-examen que presenté. El post-examen puede ser un examen independiente o parte de una unidad más grande. El post-examen debería contar como parte de su calificación. La administración del post-examen por el asistente de investigación deberá ocurrir dentro de las 2 semanas del post-examen.

Por favor, complete la encuesta a continuación y envíemela. Cualquier otra información de investigación me la transferirá el asistente de investigación. Es importante en este estudio hacer una distinción entre la investigación que se realiza y la participación del estudiante en la lección. La lección es parte de la calificación del estudiante pero la participación es completamente voluntaria. La función principal del asistente de investigación será proteger la identidad del estudiante en cuanto al investigador y el facilitador, administrar los instrumentos requeridos para la investigación, reunir y almacenar información para el investigador, y ofrecer la información al investigador después de que el facilitador dé las calificaciones a los estudiantes. Los resultados que necesita ofrecer al asistente de investigación, quien a su vez me lo ofrecerá a mí solamente como números al azar no por nombre de estudiante,incluye lo siguiente: resultados del pre-examen, resultados de post-examen, resultados de las actividades, lista de ausencias. Los resultados de la pre y post-encuesta se transfieren automáticamente a través de SurveyMonkey.

Encuesta para el Facilitador

Favor de regresar a awranic@csulb.edu.

Tiempo que tomó la Lección 1

Tiempo que tomó la Lección 2

¿Cuál es el nivel promedio de los estudiantes en la clase?

¿Se incluyó el pre-examen como parte de una unidad más grande o por separado? Por favor, incluir el examen de la unidad si se utilizó esta opción. ¿Tuvieron los estudiantes acceso a cualquier otro material sobre el tema de placas tectónicas tales como una clase o un libro de texto?

¿Cuál es su actitud acerca de la tecnología en el salón de clases?

Por favor, conversar acerca de cualquier dificultad técnica con el cLO.

Por favor, conversar acerca de cualquier sugerencia para mejorar el cLO.

Research Assistant Guide
United States and Costa Rica

You are being asked to help with the research of Angela Wranic in order to help fulfill the requirements of her PhD at Texas State University-San Marcos. The purpose of the study is indicated below.

The study is to compare cognitive and affective learning and attitudes toward technology and the facilitator between two technology enhanced classrooms; one located in the U.S. and another in Middle America. The technologically enhanced lesson will use a cLO (composite learning object), in the form of a website, on plate tectonics which was developed for use in the research study. The classroom settings for both location areas are in a undergraduate university setting. The following research questions guide this study. Question 1. What are the differences in student learning outcomes for cognitive learning using a cLO between a student population in Costa Rica and a student population in the U.S.? Question 2. What are the differences in affective learning, student attitudes toward technology, and student attitudes toward the facilitator, using a cLO, between a student population in Costa Rica and a student population in the U.S? The cognitive learning outcomes will be measured with a multiple choice exam and short essay questions. The student learning outcomes for affective learning will be measured using a survey instrument. The student attitudes toward technology and the facilitator will also be measured using a survey instrument.

It is important in this study to make a distinction between the research being conducted and the participation of the student in the lesson. The lesson is part of the student's grade but participation in the research is completely voluntary. The main function of the research assistant will be to protect the identity of the student, administer the instruments required for the research, to gather and store information required for the research, and release the data to the researcher after the assignment of student grades. The following procedures are required to be followed for the research to be valid.

<u>Procedures</u>

1. Students will meet you in the computer lab. This is important so that they have access to the survey.

2. Please read the following statement aloud to the students.

   You are asked to participate in a research study conducted by Angela Wranic, ABD Geography, from the Geography department at Texas State University, San Marcos. The results of the research will be contributing to completion of her dissertation. You were selected as a possible participant in this study because you are from a population of students who are taking a course that addresses material in the field of physical geography. Please note the distinction between the research study and your participation in the lesson. Participation in

the lesson is part of the required curriculum planned for this course but the participation in the survey and release of your test and activity scores are completely voluntary. The result of your participation or non-participation in the survey and release of your scores will in no way affect your final grade in the class. The instructor of the class will not be able to identify any individual participant because every participant will be assigned a random number by the research assistant. Even if you do not consent to participate in the study you are to remain in the classroom. All students will complete the pre-test as part of the curriculum. Only students who give consent will have their scores used in the dissertation study. These scores will only be released as an average for the class. Students participating in the study will complete both the pre-test and the pre-survey. The pre-survey will take only 10 minutes of your time.

3. Students are now to complete the pre-test and pre-survey. All students will complete the pre-test. The pre-test should be given in a hard copy format so that questions cannot be saved electronically by the students. Students will turn the pre-test back to you with their name in pencil. As students hand in the pre-test, double check that they have included their name. Once the pre-test is complete only students participating in the study are to do the pre-survey. The survey will take about 10 minutes to complete. Students not participating in the study are required to stay in class and begin looking at the plate tectonics lesson at http://platetectonics.wranic.com/. The link to the survey will be e mailed by Angela Wranic after receiving the e mail list of students in the class from Gustavo. They are to follow the link and complete the survey. The survey is done through SurveyMonkey and the results are recorded anonymously. The pre-survey will include a consent waiver. Rather than have a consent form signed by students a waiver of signed consent will be used. The consent form will be posted at the beginning of the pre-survey and in lieu of the Signature Line the following statement has been substituted: "By proceeding to the next page, I attest that I have read this and consent to participate. Only class averages will be used in the research study for all data.

4. Pre-test results will be transferred to Angela Wranic.

5. The instructor will be conducting the lesson which takes 5 weeks. The researcher will release to you (via a spreadsheet) the activity grades of students and the post-test results to you. These results are to be transferred to Angela Wranic.

Within 2 weeks of the post-test you will revisit the computer lab and direct the students to an e mail link that contains the post-survey. As with the pre-survey you will need to e mail the link of the post-survey to students. The survey is through SurveyMonkey where class averages will be used. Students not participating in the

research are required to remain in class and begin preparing for the next topic. Results of the post-survey will be automatically stored in SurveyMonkey. Please read the following statement to students: If you wish to see the results of this study you may visit the site www.platetectonics.wranic.com where a copy of the dissertation will be placed.

APPENDIX B

Cognitive Test and Key (English and Spanish), Study Guide (English and Spanish)

Multiple Choice Part 1 - 15 pts

Please answer all questions in the multiple choice and short essay parts of the exam. You will have 30 minutes to complete the pre-test.

1. Place the following internal layers of the Earth into the proper order from the center to the surface.
    a. crust, mantle, liquid core, solid core
    b. solid core, liquid core, mantle, crust
    c. mantle, solid core, crust, mantle
    d. liquid core, solid core, crust, mantle
2. In a divergent plate boundary what type of tectonic activity and movement is taking place?
    a. two plates colliding and creating mountains
    b. two plates that are sliding horizontally past one another
    c. two plates that are moving apart and new crust is being created
    d. one plate is subducting under another plate.
3. When an oceanic and continental plate converge what is the result?
    a. a volcanic arc is formed
    b. subduction takes place
    c. a trench is formed
    d. all of the above
    e. none of the above.
4. Which of the following were precursor events to the 1980 eruption of Mt. St. Helens?
    a. steam eruptions
    b. earthquakes
    c. bulge of volcano’s flank

d. fissure development

e. all of the above

5. Since lithospheric plates move around, most mountain building activity occurs:

   a. in the middle of continents

   b. on the edges of plates

   c. in the mantle

   d. in the middle of plates

6. What is the source of heat that drives mantle convection?

   a. hot springs

   b. gravity

   c. volcanoes

   d. the sun

   e. radioactive decay

7. What theory was the forerunner to the theory of plate tectonics?

   a. theory of uniformitarianism

   b. theory of catastrophism

   c. theory of the magnetic Earth

   d. theory of continental drift

8. The theory of plate tectonics

   a. is the belief that continents and oceans are permanent features on the Earth's surface.

   b. states that the Earth's outermost layer is fragmented into a dozen or more large and small plates and they are moving relative to one another as they ride atop hotter, more mobile material.

   c. is the principal that the present is the key to the past.

   d. states that life is diverse and is supported by the natural selection process.

9. Tsunamis are seismic waves that travel through the Earth's core.

    a. True

    b. False

10. What characterizes the composition of a shield volcano?

    a. Made almost entirely of fluid lava flows

    b. Built of alternating layers of lava flow, volcanic ash, cinders, blocks and bombs.

    c. Made of small bulbous masses of lava.

    d. Characterized by molten lava formed by cinders.

11. Mount Pelee in Martinique, Lesser Antilles and Lassen Peak in California are what type of volcanoes?

    a. Shield volcano

    b. Stratovolcano

    c. Cinder cone

    d. Plug dome

    e. Hot spot.

12. The most powerful types of volcanic eruptions that ejects viscous lava are called:

    a. Strombolian

    b. Vesuvian

    c. Plinian

    d. Cinders

    e. Composite volcano

13. Tsunamis are caused by :

    a. Displacement of water

    b. Change in weather

    c. Hurricane

    d. None of the above

    e. All of the above

14. What was the biggest flaw in Wegener's proposed theory:

    a. his matching of fossil occurrences was incorrect

    b. the fit of South American and African continents were incorrect

    c. his explanation that solid rock could plow through the ocean floor was incorrect

    d. failure to explain the forces that would cause solid rock to move over large distances.

    e. Both c and d

15. A feature formed by the collapse of a volcano is known as a

    a. Fault

    b. Cinder cone

    c. Plug

    d. Caldera

    e. Vent

Part 2 Short Essay- 26 points total

Please give responses to the following questions.

16. Illustrate the three basic types of plate movement. 3 points

17. Summarize how the theory of plate tectonics was developed. (5 pts)

18. Discuss what communities and authorities can do to prepare for an earthquake or volcanic eruption. (6 pts)

19. Compare and contrast the earthquake and tsunami in Japan. Which do you believe was more devastating to the people of Japan? (6 pts)

20. Which volcano type would you classify as the most dangerous and why? (6 pts)

Key Multiple Choice

1. B
2. C
3. D
4. D
5. B
6. D
7. C
8. B
9. B
10. A
11. D
12. C
13. A
14. D
15. D

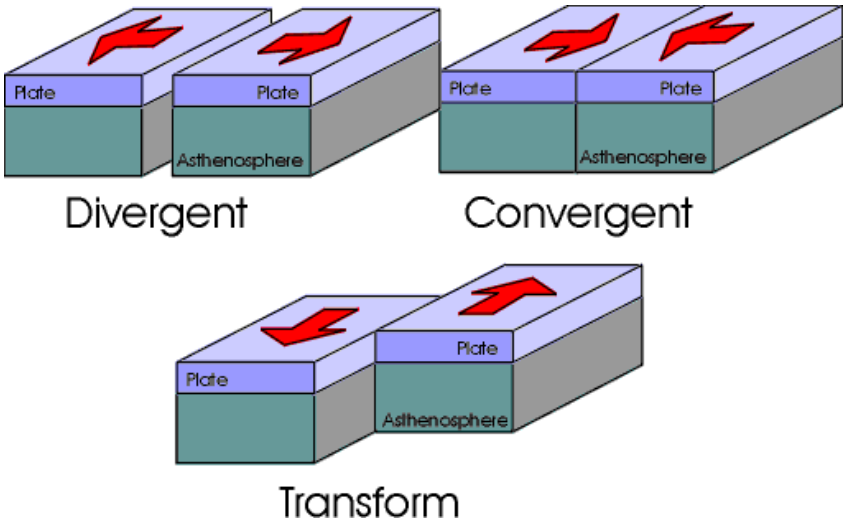
Key

Short Essay Part 2 - 26 points total

Please give responses to the following questions.

I am primarily concerned with the content of answers here not grammar or organization of the responses for the purpose of this study.

1. Illustrate the three basic types of plate movement. (3) points



2. Summarize how the theory of plate tectonics was developed. (5 pts)

   Points that should be discussed:
   - Alfred Wegner theory of continental drift which is primarily based on the jigsaw shape of the continents.
   - Alfred Wegner and paloclimitology- fossils remains that have been found but don't make sense in terms of climatic zones that we see today.
   - Mountain ranges that match up across oceans.
   - 1920s and the idea that earthquakes and plate movement is connected.
   - Magnetic striping and polar reversals.

3. Discuss what communities and authorities can do to prepare for an earthquake or volcanic eruption. (6 pts) Wide variety of content; rubric below should be used.

4. Compare and contrast the earthquake and tsunami in Japan. Which do you believe was more devastating to the people of Japan? (6 pts) Wide variety of content; rubric below should be used.

5. Which volcano type would you classify as the most dangerous and why? (6 pts) Wide variety of content; rubric below should be used.

Rubric

Point Value	6	4	2	0
Content	Provides comprehensive insight, understanding, and examples about topic.	Provides moderate insight, understanding, and examples about topic.	Provides minimal insight, understanding, and examples about topic.	Provides no insight, understanding, or examples about topic.

(http://www2.uwstout.edu/content/profdev/rubrics/blogrubric.html accessed on 4/20/11)

Nombre: _____

Por favor responda todas las partes del examen en las preguntas de selección múltiple y ensayos cortos. Usted tendrá 30 minutos para completar el pre-examen.

Parte 1

Selección Múltiple (15 puntos)

Cada pregunta vale 1 punto. Haga un círculo claramente en la letra de cada respuesta correcta. Cada pregunta de selección múltiple tiene solamente 1 respuesta correcta.

1. Ponga las siguientes capas internas de la Tierra en el orden apropiado desde el centro a la superficie.
    a. corteza, manto, centro líquido, centro sólido
    b. centro sólido, centro líquido, manto, corteza
    c. manto, centro sólido, corteza, manto
    d. centro líquido, centro sólido, corteza, manto

2. ¿Qué tipo de actividad tectónica y movimiento se desarrolla en el límite de una placa divergente?
    a. dos places chocando y creando montanas
    b. dos places que se deslizan horizontalmente entre sí
    c. dos places que se separan y una nueva corteza se comienza a crear
    d. una placa es subducida bajo la otra placa

3. ¿Cuál es el resultado cuando una placa oceánica y continental convergen?
    a. se forma un arco volcánico
    b. se produce una subducción
    c. se forma una trinchera
    d. todas las anteriores

4. ¿Cuáles de los siguientes fueron precursores de los eventos de la erupción del Monte St. Helens de 1980?
    a. erupciones de vapor
    b. terremotos
    c. formación de una protuberancia en el flanco del volcán
    d. todas las anteriores

5. ¿Donde ocurre la mayoría de las formaciones de montana?
    a. En el medio de los continentes
    b. Sobre los límites de las placas de la litosfera
    c. En el manto de la tierra
    d. En el medio de las placas de la litosfera

6. ¿Cuál es la fuente de calor que produce la convección del manto en la tierra?
    a. Hot springs
    b. Gravedad
    c. Volcanes
    d. Desintegración radioactive

7. ¿Cuál teoría fue la precursora de la teoría de tectónica de placas?
    a. Teoría del uniformitarianismo
    b. Teoría del catastrofismo
    c. Teoría de la deriva de los continentes
    d. Teoría de la Tierra magnética

8. La teoría de la tectónica de placas:
    a. Es la creencia de que los continentes y los océanos son características permanentes en la superficie terrestre.
    b. Afirma que la capa más externa de la Tierra está fragmentada en una docena o mas de placas grandes y pequeñas y que se mueven una con respecto a la otra mientras ellas derivan sobre un material más caliente y móvil.
    c. Es el principio de que el presente es la clave de los eventos geológicos pasados.
    d. Afirma que la vida es diversa y está basada en el proceso de selección natural.

9. Los tsunamis son olas sísmicas que viajan a través del núcleo de la tierra.
    a. Verdadero
    b. Falso

10. ¿Qué caracteriza la composición de un escudo volcánico?
    a. Esta hecho casi totalmente de flujos de lava.
    b. Esta construido de capas alternativas de flujo de lava, ceniza volcánica, cenizas, bloques y bombas.
    c. Esta hecho de masas redondas pequeñas de lava.
    d. Esta caracterizado por lava derretida formada por cenizas.

11. ¿Qué tipos de volcanes son el Monte Pelee en la Martinica, Antillas Menores y el Pico Lassen en California?
    a. Escudo volcánico
    b. Volcán estrato
    c. Cono de ceniza volcanica
    d. Volcán de cupula plug

12. Los tipos más poderosos de erupciones volcánicas que eyectan lava viscosa se llaman:
    a. Estromboliano
    b. Vesuviano
    c. Pliniano
    d. Cenizas

13. Los tsunamis son causados por:
    a. El traslado de agua
    b. Un cambio en el tiempo atmosférico
    c. Huracanes
    d. Todas las anteriores

14. ¿Cuál es la falla más grande en la teoría de la deriva de los continentes propuesta por Wegener?
    a. Los registros de fósiles no apoyan su teoría.
    b. La forma de rompecabezas que ajusta los continentes de América del Sur y Africa fue incorrecta.
    c. Su propuesta de la separación de Pangea fue incorrecta.
    d. El fallo en explicar las fuerzas de movimiento de las placas.

15. Una característica física formada por el desmoronamiento de un volcán es conocida como una:
    a. Falla
    b. Cono de cenizas
    c. Enchufe
    d. Caldera

Nombre:_____
Parte 2

***Ensayo Breve* (26 puntos)**

Por favor escriba las respuestas a las preguntas siguientes. Usted puede utilizar el reverso de la hoja si necesita más espacio.

16. Ilustre los tres tipos básicos de movimiento de placas. (3 puntos)

17. Resuma como la teoría de tectónica de places fue desarrollada. (5 puntos)

18. Discuta que pueden hacer las comunidades y autoridades para prepararse para un terremoto o erupción volcánica. (6 puntos)

19. Compare y contraste el terremoto y tsunami de Japón. ¿Cuál cree usted que fue más devastador para la población de Japón?

20. ¿Cuál tipo de volcán usted clasificaría como el más peligroso y por qué?

Cuando usted haya completado el pre-examen no olvide de verificar que ha puesto su nombre en ambas partes. Por favor entregue sus respuestas a la persona encargada

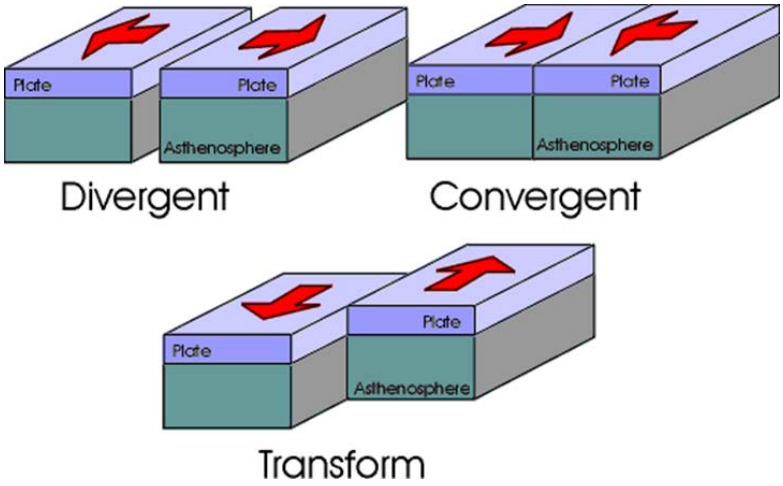
Prueba Maestra (respuestas)
Parte 1 (15 puntos)
Selección Múltiple

1. B
2. C
3. D
4. D
5. B
6. D
7. C
8. B
9. B
10. A
11. D
12. C
13. A
14. D
15. D

Ensayo Breve Parte 2 (26 puntos)

(Lo más importante es el contenido, no la gramática u organización de la respuesta).

1. (3 puntos)



2. (5 puntos) Materias posibles que podrían ser discutidas

   - La teoría de la deriva de los continentes de Alfred Wegener que es básicamente fundamentada en el formación de rompecabezas de los continentes
   - Alfred Wegener y paleoclimatología- restos de fósiles que han sido encontrados pero que no dan sentido en término de las zonas climáticas que vemos hoy.
   - Cadenas montañosas que encajan de un océano a otro.
   - La década de 1920 y la idea de que los terremotos y el movimiento de placas están relacionados.
   - Bandas magnéticas e inversión de los polos.

3. 18. (6 puntos) Amplia variedad de contenidos (Usar la rúbrica indicada más abajo)
4. 19. (6 puntos) Amplia variedad de contenidos (Usar la rúbrica indicada más abajo)
5. (6 puntos) Amplia variedad de contenidos (Usar la rúbrica indicada ms abajo)

Rúbrica

Puntos	6	4	2	0
Contenido	Entrega información completa y completa comprensión y ejemplos acerca del tema.	Entrega información moderada y moderada comprensión y ejemplos acerca del tema.	Entrega información mínima y mínima comprensión y ejemplos acerca del tema.	No da información ni comprensión o ejemplos acerca del tema.

(http://www2.uwstout.edu/content/profdev/rubrics/blogrubric.html accessed on 4/20/11)

Study Guide for Post-Test

Know the answers to all of the questions you answered in the journal, which are listed below.

1. Provide definitions for the following terms: core, crust, mantle, magma, Pangea, ring of fire, lithospheric plates, igneous rocks, tsunami, fault, and earthquake.

2. Briefly discuss the Theory of Plate Tectonics.

3. Briefly discuss the tectonic plate structure of the Earth and formulate some thoughts on how these plates affect the Earth.

4. Briefly discuss the four types of plate boundaries and what physical processes occur at each type.

5. Know the internal layers of the Earth.

6. What are some precursor events to the different types of volcanic action?

7. Discuss the processes associated with the following volcano types: lava domes, cinder cones, composite volcanoes, and shield volcanoes.

8. What is the source of heat that drives mantle convection?

9. What type of volcanoes are the following: Mount Pelee in Martinique, Lesser Antilles, Lassen Peak in California, and Mt. St. Helens in Washington?

10. Know how the Theory of Plate Tectonics developed.

11. Be familiar with the results of your wiki project. Be able to discuss what communities and authorities can do to prepare for an earthquake or volcanic eruption.

12. Compare and contrast the earthquake and tsunami of 2011 in Japan. Which do you believe was more devastating to the people of Japan?

Guía para el Post-test

Conozca las respuestas a todas las preguntas que usted respondió en el periódico. Estas están listadas más abajo.

1. Defina los siguientes términos: núcleo, corteza, manto, magma, Pangea, anillo de fuego, placas de la litosfera, rocas ígneas, tsunami, falla, caldera, y terremoto.

2. Haciendo uso de al menos cuatro argumentos, explique la Teoría de la Tectónica de Placas.

3. Describa la estructura de la tectónica de placa de la Tierra y formule algunas ideas de cómo estas placas afectan la Tierra.

4. Describa los cuatro tipos de límites de placas y mencione los procesos físicos ocurren en cada tipo de borde.

5. Nombre las capas internas de la Tierra.

6. ¿Cuáles son los eventos precursores a los diferentes tipos de actividad volcánica?

7. Analice los procesos asociados con los siguientes tipos de volcanes: domos de lava, conos de ceniza, volcanes compuestos y volcanes en escudo

8. ¿Cuál es la fuente de calor que origina la convección del manto?

9. ¿Qué tipos de volcanes son los siguientes: Monte Pelee en Martinica, Antillas Menores, Pico Lassen en California y el Monte St. Helens en Washington?

10. Narre, con al menos 6 hechos, como se desarrolló la Teoría de Tectónica de Placas.

11. Con base en su proyecto wiki, discuta sobre lo que las comunidades y las autoridades pueden hacer para prepararse en caso de un terremoto o erupción volcánica.

12. Compare y contraste el terremoto con el tsunami de Japón en el 2011. Por medio de tres argumentos conteste a la pregunta ¿Cuál cree usted que fue más devastador para la población de Japón?

APPENDIX C

Pre-Survey (English and Spanish) and Post-Survey (English and Spanish)

Pre-Survey English

Consent to Participate in Research

Title of study: Composite Learning Objects in Geographical Sciences: A Comparison Study of the Learning Process between a Costa Rican and United States University Classrooms

Subtitle: Consent for CSULB students.

You are asked to participate in a research study conducted by Angela Wranic, ABD Geography, Texas State University- San Marcos. The results of the research will be contributing to completion of her dissertation. You were selected as a possible participant in this study because you are from a population of students who are taking a course that addresses material in the field of physical geography. Please note the distinction between the research study and your participation in the lesson. Participation in the lesson is part of the curriculum planned for this course; the participation in the survey and release of your test and activity scores are completely voluntary. The result of your participation or non-participation in the survey or release of your scores will in no way affect your final grade in the class. The instructor of the class will not be able to link the research data and your identity. Every person will be assigned a random number by the administrator of this consent form to protect their identity. The administrator will not release any results to the researcher with the participants name but rather the random number. As an extra precaution results of the study will not be released to the instructor until after a final grade has been assigned to all students. You are free to opt out of the study at any time without penalties or consequences. If you wish to opt out please contact the research assistant at ulassiter@csulb.edu.

Purpose of the Study

This study will systematically compare cognitive learning, affective learning, attitudes toward the facilitator, and attitudes toward technology between two technology enhanced university classrooms; one that is located in Costa Rica and the other in the United States.

Procedures

If you volunteer to participate in this study, you will do the following things:

Completion of Pretest, Pre-survey, and Learning Module

1. The research assistant will administer the pre-test and pre-survey not the instructor.
2. All students will complete the pre-test. The pre-test is in a hard copy format. Students will turn the pre-test back to the research assistant with their name in pencil. The research assistant will remove the student name and replace it with their random number.
3. Once the pre-test is complete only students participating in the study will complete the pre-survey. The survey will take about 10 minutes to complete. The link to the survey is in your e mail box. You are to follow the link and complete the survey. The survey is done through SurveyMonkey and the results are recorded anonymously. Only class averages will be used in the research study.
4. Participation in plate tectonics unit. This will take place in the geography computer lab and will take 5 weeks to complete this module. Completion of the module is part of the curriculum for this class. The module is located at www.platetectonics.wranic.com.

Completion of Post-Test and Post-Survey

1. All students take the post-test which is included in your regular unit test.
2. Within 2 weeks of the post-test you will revisit the computer lab to complete the post-survey. The research assistant will be there to guide you. The survey will be found as an e mail link and directs you to SurveyMonkey. Results are recorded anonymously and only class averages will be used in the research study. Students not participating in the research are required to remain in class and begin preparing for the next topic. This will take approximately 20 minutes.

Potential Risks and Management

Risk 1. There instructor could bias students' grades based on students' participation in the research.

Management 1. The instructor will not know who has participated in the research. Results collected will not be linked to a participant's name. A research assistant will collect the cognitive test results and activity results and replace student names with random numbers. SurveyMonkey will be used for collection of the pre and post survey. The results of the survey are collected anonymously. Rather than have consent forms signed by students, a waiver of signed consent will be used. This is another way to protect student identity. Furthermore, results will not be released to the researcher until after assignment of the students' final grades.

Risk 2. Students could be uncomfortable with the idea of evaluating the lesson and instructor prior to assignment of their final class grade.

Management 2. Please note the distinction between the research study and your participation in the lesson. Participation in the lesson is part of the curriculum planned for this course but the participation in the survey and release of your test and activity scores are completely voluntary. The result of your participation or non-participation in the survey or release of your scores will in no way affect your final grade in the class. The instructor of the class will not be able to identify who each individual is because every person will be assigned a random number by the administrator of the consent form. The administrator will not release any results to the researcher with the participant's name but rather the random number. As an extra precaution results will not be released to the instructor until after a final grade has been assigned to all students. You are free to opt out of the study at any time by contacting the research assistant. There are no penalties or consequences to opting out of the study.

Risk 3. Students could feel uncomfortable with the results of cognitive tests being released on a public basis.

Management 3. Cognitive test results are not released on an individual basis but rather as a class average.

Risk 4. The technology based lesson follows a student-center rather than instructor-center style. This type of teaching may cause students to experience some anxiety as more college level classes tend to emphasize instructor-centered lesson such as lecturing.

Management 4. The learning process is a well-known and accepted learning style. Students will have a written guide to the lesson and the instructor will be present to guide students in each session.

If there are significant physical, psychological, or social risks to participation that might cause the researcher to terminate the study, please describe them.

None

Potential Benefits to Subjects and/or to Society

There is no personal benefit associated with this study. The societal impact is to aide instructors in development of geographical technology use in the classroom both nationally and internationally.

Payment for Participation

No payment.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

Participation and Withdrawal
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Participation or non-participation will not affect your grade or any other personal consideration or right you usually expect. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise, which in the opinion of the researcher warrant doing so.

Identification of Investigators
If you have any questions about this study, please contact the researcher at:

Wranic, Angela, Principal Investigator
email: awranic@csulb.edu
California State University-Long Beach
Department of Geography,
1250 Bellflower Blvd. Long Beach, CA USA 90840

You may also contact the researcher's Advisor and Dissertation Committee Chairperson at:
Dr. Osvaldo Muniz, Associate Professor
Texas State University-San Marcos
Department of Geography, 601 University Drive
San Marcos, TX 78666, USA
email: os14@txstate.edu
phone: 512-245-0375
fax: 512-245- 8353

Rights of Research Subjects
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office of University Research, CSU Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840; Telephone: (562) 985-5314 or email to research@csulb.edu.

WAIVER OF SIGNED CONSENT
By proceeding to the next page, I attest that I have read this and consent to participate.

Section 1. Academic and Personal Information

The following questions are to obtain a little information about you, your attitudes toward technology, and your attitude toward the instructor. I would ask that you complete this survey honestly. Your identity will be protected as this survey is to be completed anonymously. Group results will be used for the purpose of a dissertation research study.

Section1. Academic and Personal Information

1. What is your year of university-level study?

- ◯ First-year
- ◯ Second-year
- ◯ Third-year
- ◯ Fourth-year
- ◯ Fifth-year
- ◯ Other (please specify)

* 2. What is your ethnicity?

- ◯ Hispanic
- ◯ Asian American
- ◯ African American
- ◯ Native American
- ◯ Caucasian/White
- ◯ Other (please specify)

* 3. How many languages can you read, write, and speak fluently?

- ◯ One
- ◯ Two
- ◯ Three or more

4. What is your gender?

- ◯ Male
- ◯ Female

5. What degree are you working towards?

6. What is your first language?

7. In what country were you born?

8. In what country do you reside?

9. What is your major?

10. How old are you?

Section 2. Student Attitudes Toward Technology

This part of the survey is to measure your attitude regarding technology. Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

*11. I enjoy using technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*12. I do not have enough computer access at school and feel I cannot effectively complete lessons involving technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*13. I do not have enough computer access at home and feel I cannot effectively complete lessons involving technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*14. Technology can help me prepare for a test better.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*15. Technology can help me understand concepts of a lesson better.

- ○ Strongly Agree
- ○ Agree
- ○ Neither Agree Nor Disagree
- ○ Disagree
- ○ Strongly Disagree

*16. Technology can help me remember facts about the lesson better.

- ○ Strongly Agree
- ○ Agree
- ○ Neither Agree Nor Disagree
- ○ Disagree
- ○ Strongly Disagree

*17. Using technology causes me to experience anxiety.

- ○ Strongly Agree
- ○ Agree
- ○ Neither Agree Nor Disagree
- ○ Disagree
- ○ Strongly Disagree

*18. I would like to see more technology integrated into a standard lecture format.

- ○ Strongly Agree
- ○ Agree
- ○ Neither Agree Nor Disagree
- ○ Disagree
- ○ Strongly Disagree

*19. I would like to see technology replace the standard lecture format.

- ○ Strongly Agree
- ○ Agree
- ○ Neither Agree Nor Disagree
- ○ Disagree
- ○ Strongly Disagree

Section 3. Attitudes Toward Instructor

This part of the survey is intended to evaluate your experience with your instructor to this point in the class. Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box. The last question asks you to rate the overall performance of the instructor in your class ranging from excellent to very poor to this point in the class.

*20. The instructor has provided acceptable lessons.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*21. I would willingly take another class with my instructor.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*22. The instructor graded my work fairly.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*23. The instructor was clear about grading procedures.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*24. The instructor did not show a biased negative attitude toward technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*25. The instructor did not show a biased positive attitude toward technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*26. Rate the overall performance of the instructor.

- ◯ Excellent
- ◯ Average
- ◯ Very Poor

Pre-Survey Spanish

Las preguntas siguientes se hacen para obtener información acerca suyo, sus actitudes hacia el e-learning, aprendizaje afectivo y su actitud hacia el profesor. Se le pedirá que complete esta encuesta honestamente. Su identidad será protegida ya que esta encuesta debe ser completada anónimamente. Los resultados serán usados para los fines de un estudio de investigación de doctorado.

Sección 1. Información Personal y Académica

*1. ¿Cuál es su nivel de estudio universitario?

- ◯ Primer año
- ◯ Segundo año
- ◯ Tercer año
- ◯ Cuarto año
- ◯ Quinto año
- ◯ Otro, por favor indique:

*2. ¿Cuántos idiomas puede usted leer y escribir en forma fluida?

- ◯ Uno
- ◯ Dos
- ◯ Tres o más
- ◯ Por favor indique los idiomas:

*3. ¿Cuál es su género?

- ◯ Masculine
- ◯ femenino

4. ¿Qué edad tiene?

5. ¿Cuál es su idioma materno?

6. ¿En cuál país nació usted?

7. ¿En cuál país usted reside?

8. ¿Cuál es su carrera profesional?

9. ¿Cuántos años tienes?

Sección 2. Actitud del Estudiante hacia la Tecnología

Esta parte de la encuesta mide su actitud hacia la tecnología. Por favor evalúe cuan fuertemente está usted de acuerdo o en desacuerdo con cada uno de los siguientes planteamientos haciendo una marca en el recuadro apropiado.

*10. Me gusta usar la tecnología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*11. No tuve suficiente acceso computacional en la universidad y siento que no pude completar las lecciones de technología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*12. No tuve suficiente acceso computacional en la casa y siento que no pude completar las lecciones de technnología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*13. La technología me ayudó a prepararme mejor para el examen.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*14. La tecnología me ayudó a entender mejor los conceptos de las lecciones.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*15. La tecnología me ayudó a recodar mejor los hechos relacionados con la unidad.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*16. Usando la tecnología me hizo sentir ansiedad.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*17. Me gustaría ver más tecnología integrada en la clase tradicional.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*18. Me gustaría ver reemplazada la clase tradicional por la que tiene más tecnología incorporada.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

Sección 3. Actitudes hacia el Facilitador

Facilitador Esta parte de la encuesta es destinada a evaluar su experiencia con el instructor a este punto en la clase. Por favor evalúe cuan fuertemente usted está de acuerdo o en desacuerdo con cada uno de los siguientes planteamientos con cada uno de los siguientes planteamientos haciendo una marca en el recuadro apropiado o en el caso de la última pregunta evalúe el rendimiento de su profesor de excelente a muy pobre.

19. El profesor entregó una asistencia aceptable lecciones.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

20. Yo estaría dispuesto a tomar otra clase con el profesor.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

21. El facilitador evaluó mi trabajo en forma justa.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

22. El facilitador fue claro acerca de los procedimientos de evaluación.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*23. El profesor no mostró una actitud negativa hacia la tecnología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*24. El profesor no mostró una actitud positive hacia la tecnología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

25. Evalúe el rendimiento total del facilitador.

- ◯ Excelente
- ◯ Medio
- ◯ Muy Pobre

Post-Survey English

Consent to Participate in Research

Title of study: Composite Learning Objects in Geographical Sciences: A Comparison Study of the Learning Process between a Costa Rican and United States University Classrooms

Subtitle: Consent for CSULB students.

You are asked to participate in a research study conducted by Angela Wranic, ABD Geography, Texas State University-San Marcos. The results of the research will be contributing to completion of her dissertation. You were selected as a possible participant in this study because you are from a population of students who are taking a course that addresses material in the field of physical geography. Please note the distinction between the research study and your participation in the lesson. Participation in the lesson is part of the curriculum planned for this course; the participation in the survey and release of your test and activity scores are completely voluntary. The result of your participation or non-participation in the survey or release of your scores will in no way affect your final grade in the class. The instructor of the class will not be able to link the research data and your identity. Every person will be assigned a random number by the administrator of this consent form to protect their identity. The administrator will not release any results to the researcher with the participant's name but rather the random number. As an extra precaution, results of the study will not be released to the instructor until after a final grade has been assigned to all students. You are free to opt out of the study at any time without penalties or consequences. If you wish to opt out please contact the research assistant at ulassiter@csulb.edu.

Purpose of the Study

This study will systematically compare cognitive learning, affective learning, attitudes toward the facilitator, and attitudes toward technology between two technology enhanced university classrooms; one that is located in Costa Rica and the other in the United States.

Procedures

If you volunteer to participate in this study, you will do the following things: Completion of Pre-test, Pre-Survey, and Learning Module.

1. The research assistant will administer the pre-test and pre-survey not the instructor.
2. All students will complete the pre-test. The pre-test is in a hard copy format. Students will turn the pre-test back to the research assistant with their name in pencil. The research assistant will remove the student name and replace it with their random number.
3. Once the pre-test is complete only students participating in the study will complete the pre-survey. The survey will take about 10 minutes to complete. The link to the survey is in your e mail box. You are to follow the link and complete the survey. The survey is done through SurveyMonkey and the results are recorded anonymously. Only class averages will be used in the research study.
4. Participation in plate tectonics unit. This will take place in the geography computer lab and will take 5 weeks to complete this module. Completion of the module is part of the curriculum for this class. The module is located at www.platetectonics.wranic.com.

Completion of Post-Test and Post-Survey

1. All students take the post-test which is included in your regular unit test.
2. Within 2 weeks of the post-test you will revisit the computer lab to complete the post-survey. The research assistant will be there to guide you. The survey will be found as an e mail link and directs you to SurveyMonkey. Results are recorded anonymously and only class averages will be used in the research study. Students not participating in the research are required to remain in class and begin preparing for the next topic. This will take approximately 20 minutes.

Potential Risks and Management

Risk 1. There instructor could bias students' grades based on students' participation in the research.

Management 1. The instructor will not know who has participated in the research. Results collected will not be linked to a participant's name. A research assistant will collect the cognitive test results and activity results and replace student's names with random numbers. SurveyMonkey will be used for collection of the pre and post survey. The results of the survey are collected anonymously. Rather than have a consent form signed by students a waiver of signed consent will be used. This is another way to protect student identity. Furthermore, results will not be released to the researcher until after assignment of the students' final grades.

Risk 2. Students could be uncomfortable with the idea of evaluating the lesson and instructor prior to assignment of their final class grade.

Management 2. Please note the distinction between the research study and your participation in the lesson. Participation in the lesson is part of the curriculum planned for this course but the participation in the survey and release of your test and activity scores are completely voluntary. The result of your participation or non-participation in the survey or release of your scores will in no way affect your final grade in the class. The instructor of the class will not be able to identify who each individual is because every person will be assigned a random number by the administrator of the consent form. The administrator will not release any results to the researcher with the participant's name but rather the random number. As an extra precaution results will not be released to the instructor until after a final grade has been assigned to all students. You are free to opt out of the study at any time by contacting the research assistant. There are no penalties or consequences to opting out of the study.

Risk 3. Students could feel uncomfortable with the results of cognitive tests being released on a public basis.

Management 3. Cognitive test results are not released on an individual basis but rather as a class average.

Risk 4. The technology based lesson follows a student-center rather than instructor-center style. This type of teaching may cause students to experience some anxiety as more college level classes tend to emphasize instructor-centered lesson such as lecturing.

Management 4. The learning process is a well-known and accepted learning style. Students will have a written guide to the lesson and the instructor will be present to guide students in each session.

If there are significant physical, psychological, or social risks to participation that might cause the researcher to terminate the study, please describe them.

None.

Potential Benefits to Subjects and/or to Society

There is no personal benefit associated with this study. The societal impact is to aide instructors in development of geographical technology use in the classroom both nationally and internationally.

Payment for Participation

No payment.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

Participation and Withdrawal
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Participation or non-participation will not affect your grade or any other personal consideration or right you usually expect. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise, which in the opinion of the researcher, warrant doing so.

Identification of Investigators
If you have any questions about this study, please contact the researcher at:

Wranic, Angela, Principal Investigator
email: awranic@csulb.edu
California State University-Long Beach
Department of Geography,
1250 Bellflower Blvd.
Long Beach, CA USA 90840

You may also contact the researcher's Advisor and Dissertation Committee Chairperson at:
Dr. Osvaldo Muniz, Associate Professor
Texas State University-San Marcos
Department of Geography,
601 University Drive
San Marcos, TX 78666, USA
email: os14@txstate.edu
phone: 512-245-0375
fax: 512-245- 8353

Rights of Research Subjects
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office of University Research, CSU Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840; Telephone: (562) 985-5314 or email to research@csulb.edu.

WAIVER OF SIGNED CONSENT
By proceeding to the next page, I attest that I have read this and consent to participate.

Section 1. Academic and Personal Information

The following questions are to obtain a little information about you, your attitudes toward technology, and your attitude toward the instructor. I would ask that you complete this survey honestly. Your identity will be protected as this survey is to be completed anonymously. Group results will be used for the purpose of a dissertation research study.

Section1. Academic and Personal Information

1. What is your year of university-level study?

- ◯ First-year
- ◯ Second-year
- ◯ Third-year
- ◯ Fourth-year
- ◯ Fifth-year
- ◯ Other (please specify)

* 2. What is your ethnicity?

- ◯ Hispanic
- ◯ Asian American
- ◯ African American
- ◯ Native American
- ◯ Caucasian/White
- ◯ Other (please specify)

* 3. How many languages can you read, write, and speak fluently?

- ◯ One
- ◯ Two
- ◯ Three or more

4. What is your gender?

- ◯ Male
- ◯ Female

5. What degree are you working towards?

6. What is your first language?

7. In what country were you born?

8. In what country do you reside?

9. What is your major?

10. How old are you?

Section 2. Student Attitudes Toward Technology

This part of the survey is to measure your attitude regarding technology. Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

*11. I enjoyed using the cLO.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*12. I did not have enough computer access at school and feel I could not effectively complete lessons.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*13. I did not have enough computer access at home and felt I could not effectively complete the lessons.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*14. The cLO helped me prepare for the test better.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*15. The cLO technology helped me to understand the concepts of the lesson better.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*16. The cLO helped me remember the facts about the unit better.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*17. Using the technology in the cLO caused me to experience anxiety.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*18. I experienced technical difficulties with the cLO technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*19. Technical difficulties impeded my learning experience.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*20. I would like to see more technology integrated into a standard lecture format.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*21. I would like to see technology replace the standard lecture format.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

Section 3. Affective Learning

*22. The material in the lessons stimulated my interest.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*23. The lessons motivated me to spend more time than I normally would with this subject.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*24. I would enjoy spending time outside of class discussing what I have learned from this lesson.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*25. I would be more likely now to spend more time outside of class keeping abreast of this subject.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*26. I would want to enroll in another course with similar content.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*27. I feel more self-confident about performing a task requiring the same skills as in this lesson.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*28. The lessons made me feel more self-confident about my academic abilities.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*29. The lesson has prompted me to change my behaviors in regard to preparedness for natural disasters.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*30. The exercises allowed me to use more problem solving techniques.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*31. I would be likely to use the behaviors or skills taught in this lesson in a future or present job situation.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*32. I gained insight in regards to working cooperatively in a group.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

Section 4. Attitudes Toward Facilitator

(Please note the different type of learning style used in this learning experience and grade the facilitator accordingly. This type of learning may be a different experience for you because it is more student-centered rather than instructor-centered. Your instructor is there to help and guide you but the experience should be more participatory for you since you will be constructing your own knowledge.) Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box or in the case of the last question rate your instructor's performance ranging from excellent to very poor.

*33. The instructor provided acceptable facilitation (acting as a guide rather than a regular lecture) to the lessons.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*34. I would willingly take another class with my instructor.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*35. The facilitator graded my work fairly.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*36. The facilitator was clear about grading procedures.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*37. The facilitator did not show a biased negative attitude toward technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*38. The facilitator did not show a biased positive attitude toward technology.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree Nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree

*39. Rate the overall performance of the facilitator.

- ◯ Excellent
- ◯ Average
- ◯ Very Poor

Please enter your responses in the comment box.

40. What did you like and dislike about using the plate tectonics computer unit?

41. If you have any other comments please write them here. Thank you for your participation!

Post-Survey Spanish

Las preguntas siguientes se hacen para obtener información acerca suyo, sus actitudes hacia el e-learning, aprendizaje afectivo y su actitud hacia el profesor. Se le pedirá que complete esta encuesta honestamente. Su identidad será protegida ya que esta encuesta debe ser completada anónimamente. Los resultados serán usados para los fines de un estudio de investigación de doctorado.

Sección 1. Información Personal y Académica

* 1. ¿Cuál es su nivel de estudio universitario?

- ◯ Primer año
- ◯ Segundo año
- ◯ Tercer año
- ◯ Cuarto año
- ◯ Quinto año
- ◯ Otro, por favor indique:

* 2. ¿Cuántos idiomas puede usted leer y escribir en forma fluida?

- ◯ Uno
- ◯ Dos
- ◯ Tres o más
- ◯ Por favor indique los idiomas:

* 3. ¿Cuál es su género?

- ◯ Masculine
- ◯ Femenino

4. ¿Qué edad tiene?

5. ¿Cuál es su idioma materno?

6. ¿En cuál país nació usted?

7. ¿En cuál país usted reside?

8. ¿Cuál es su carrera profesional?

9. ¿Cuántos años tienes?

Sección 2. Actitud del Estudiante hacia la Tecnología

Esta parte de la encuesta mide su actitud hacia la tecnología usada en las lecciones sobre tectónica de placas en www.geography.wranic.com. Abajo se refiere a al objeto de aprendizaje compuesto o cLO. Por favor evalúe cuan fuertemente está usted de acuerdo o en desacuerdo con cada uno de los siguientes planteamientos haciendo una marca en el recuadro apropiado.

*10. Me gusta usar el cLO.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*11. No tuve suficiente acceso computacional en la universidad y siento que no pude completar las lecciones efectivamente.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*12. No tuve suficiente acceso computacional en la casa y siento que no pude completar las lecciones efectivamente.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*13. El cLO me ayudó a prepararme mejor para el examen.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*14. La tecnología del cLO me ayudó a entender mejor los conceptos de las lecciones.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*15. El cLO me ayudó a recodar mejor los hechos relacionados con la unidad.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*16. Usando la tecnología en el cLO me hizo sentir ansiedad.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*17. Yo experimente dificultades técnicas con la tecnología del cLO.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*18. Dificultades técnicas obstruyeron mi aprendizaje.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*19. Me gustaría ver más tecnología integrada en la clase tradicional.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*20. Me gustaría ver reemplazada la clase tradicional por la que tiene más tecnología incorporada.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

Sección 3. Aprendizaje Afectivo

Esta parte de la encuesta mide el aprendizaje afectivo experimentado con el uso del cLO. El aprendizaje afectivo es un tipo de aprendizaje específico que consiste de actitudes, emociones, valores y creencias adquiridas en las lecciones. Por favor evalúe cuan fuertemente está usted de acuerdo o en desacuerdo con cada uno de los siguientes planteamientos haciendo una marca en el recuadro apropiado.

*21. El material en las lecciones estimulo mi interés.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*22. Las lecciones me motivaron a usar más tiempo que el normalmente ocuparía en este tema.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*23. Gozaría usando un tiempo extra fuera de la clase discutiendo lo que he aprendido en las lecciones.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*24. Estaría más bien inclinado a usar un tiempo extra fuera de la clase para adelantar en el tema.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*25. Me gustaría tener otra clase con un contenido similar.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*26. Me siento más en confianza para desarrollar una tarea que requiera las mismas destrezas que en estas lecciones.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

27. Las lecciones me hacen sentir más en confianza acerca de mis habilidades académicas

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*28. Las lecciones me han sugerido cambiar mi conducta en relación a la preparación ante los desastres naturales.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*29. Los ejercicios me permitieron usar más técnicas de resolución de problemas.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*30. Estaría dispuesto a usar las destrezas ensenadas en esta material en un actual o futuro trabajo.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*31. Gane comprensión en el trabajo cooperativo en un grupo.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

Sección 4. Actitudes hacia el Facilitador

(Por favor note los diferentes tipos de estilo de aprendizaje usados en esta experiencia de aprendizaje y evalúe al facilitador de acuerdo a ellos. Este tipo de aprendizaje podría ser para usted una experiencia diferente ya que es más centrada en el estudiante que en el profesor. Su profesor esta para ayudarlo y guiarlo, pero la experiencia debería ser de mayor participación suya ya que usted estará construyendo su propio conocimiento.) Por favor evalúe cuan fuertemente usted está de acuerdo o en desacuerdo con cada uno de los siguientes planteamientos con cada uno de los siguientes planteamientos haciendo una marca en el recuadro apropiado o en el caso de la última pregunta evalúe el rendimiento de su profesor de excelente a muy pobre.

*32. El profesor entregó una asistencia aceptable (actuando más bien como un guía en vez de ser profesor regular) en las lecciones.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

33. Yo estaría dispuesto a tomar otra clase con el profesor.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

34. El facilitador evaluó mi trabajo en forma justa.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

35. El facilitador fue claro acerca de los procedimientos de evaluación.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*36. El profesor no mostró una actitud negativa hacia la tecnología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

*37. El profesor no mostró una actitud positive hacia la tecnología.

- ◯ Muy de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Muy en desacuerdo

38. Evalúe el rendimiento total del facilitador.

- ◯ Excelente
- ◯ Medio
- ◯ Muy Pobre

Sección 5. Idioma Ingles

Esta parte de la encuesta es para medir el efecto de tener algunos de los materiales de objeto de aprendizaje escritos en inglés. Por favor evalúe cuan fuertemente usted está de acuerdo o en desacuerdo con cada uno de los planteamientos siguientes haciendo una marca en el recuadro apropiado.

*39. El traductor online me permitió entender el contenido de las lecciones.

- ◯ Fuertemente de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Fuertemente en desacuerdo

*40. Habría rendido mejor en el examen si el material hubiera sido presentado completamente en español.

- ◯ Fuertemente de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Fuertemente en desacuerdo

41. No estuve motivado a trabajar en las lecciones a causa de esfuerzo extra requerido para traducir el material.

- ◯ Fuertemente de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Fuertemente en desacuerdo

*42. Entiendo inglés y no use el traductor online.

- ◯ Fuertemente de acuerdo
- ◯ De acuerdo
- ◯ Ni de acuerdo ni en desacuerdo
- ◯ En desacuerdo
- ◯ Fuertemente en desacuerdo

Comentarios Abiertos

43. ¿Qué le gustó o no sobre el uso de la unidad computacional sobre tectónica de places?

44. Si usted tiene cualquier comentario adicional por favor escríbalo aquí. Gracias por su participación.

APPENDIX D

IRB Approval

IRB Approval for CSULB and Texas State University, San Marcos

CALIFORNIA STATE UNIVERSITY, LONG BEACH

OFFICE OF UNIVERSITY RESEARCH

October 24, 2011

Angela Wranic
Department of Geography

Re: "Composite Learning Objects in Geographical Sciences: A Comparision Study of the Learning Process between a Costa Rican and United States University Classrooms" PHS 12-074

Dear Ms. Wranic:

This is to advise you that the Institutional Review Board for the Protection of Human Subjects (IRB) of California State University, Long Beach, has reviewed your protocol application.

Your application is approved. The requested revisions have been received, reviewed, and accepted.

Approval is for a period of one year from the date of this letter and conditional upon your willingness to carry out your continuing responsibilities under University policy. If you would like to continue this research after this one year period, please submit a renewal application and an annual report to the Office of University Research two months prior to your expiration date of October 23, 2012.

1. You must clearly indicate in the header or footer of each page of your approved Informed Consent Form the approval and expiration dates of the protocol as follows: "**Approved from October 24, 2011 to October 23, 2012 by the CSULB IRB".**
2. You are required to inform the Director or Senior Associate Director, Office of University Research, in writing (email is acceptable) within twenty-four hours of any adverse event in the conduct of research involving human subjects. The report shall include the nature of the adverse event, the names of the persons affected, the extent of the injury or breach of security, if any, and any other information material to the situation.
3. You may not change your research procedure involving human subjects without written permission from the Director, Office of University Research or the Chair of the IRB. Please use the Protocol Modification Form to request any changes.
4. Maintain your research records as detailed in the protocol.

In accordance with 45 CFR 46.117(c/2), the IRB waives the requirement to obtain a signed consent form from your online survey subjects. You will provide subjects with a written statement regarding the research.

Should you have any questions about the conduct of your research under this protocol, particularly about providing informed consent and unexpected contingencies, please do not hesitate to call the Office of University Research at (562) 985-5314. We wish you the best of success in your research.

Sincerely,

Paulette M. Stark

Paulette McIntosh, M.S.
Senior Associate Director
Office of University Research

PM/rlm
c: Dr. Muniz

1250 BELLFLOWER BOULEVARD · LONG BEACH, CALIFORNIA 90840 · 562/985-5314 · FAX 562/985-8665

TEXAS STATE UNIVERSITY
SAN MARCOS
The rising STAR of Texas

Institutional Review Board

Request For Exemption

Certificate of Approval

Applicant: Angela Wranic

Request Number : EXP2011G2168

Date of Approval: 04/01/11

Assistant Vice President for Research and Federal Relations

Chair, Institutional Review Board

Return to IRB Home

APPENDIX E

Cognitive Test Results

Table E1. Results of multiple choice exams as percentages. Student ID coding is first number is the random number assigned to the student, letters represent United States or Costa Rica, and last number represents the trial run.

Student ID	Pretest	Posttest	Gainscore
1cr2	40	67	27
2cr2	53	60	7
3cr2	40	60	20
5cr2	33	60	27
6cr2	53	73	20
7cr2	67	73	7
8cr2	27	60	33
9cr2	40	47	7
10cr2	33	67	33
11cr2	40	53	13
12cr2	33	40	7
13cr2	27	73	47
14cr2	40	67	27
15cr2	40	73	33
16cr2	60	73	13
17cr2	40	67	27
18cr2	33	73	40
19cr2	53	80	27
20cr2	60	80	20
21cr2	47	73	27
22cr2	40	60	20
24cr2	67	60	-7
25cr2	40	47	7
26cr2	27	67	40
27cr2	27	67	40
28cr2	47	73	27
29cr2	60	67	7
30cr2	53	80	27
31cr2	27	47	20
32cr2	40	53	13
33cr2	20	60	40

Table E1. Continued

Student ID	Pretest	Posttest	Gainscore
34cr2	60	73	13
05919us3	87	87	0
06315us3	33	67	33
07383us3	80	87	7
14455us3	53	67	13
19391us3	40	47	7
20459us3	40	67	27
23000us3	60	60	0
30477us3	47	67	20
31141us3	40	67	27
32209us3	73	73	0
52908us3	73	60	-13
53571us3	60	80	20
55044us3	53	80	27
67457us3	47	60	13
72798us3	73	73	0
73202us3	33	60	27
74530us3	47	67	20
81343us3	40	80	40
84143us3	33	53	20
86020us3	27	47	20
96701us3	60	80	20
99906us3	53	67	13
2us2	53	80	27
4us2	53	53	0
5us2	60	80	20
7us2	60	87	27
12us2	60	73	13
14us2	60	67	7
15us2	53	80	27
19us2	53	80	27
21us2	33	67	33
25us2	20	67	47
26us2	47	67	20
27us2	53	67	13
29us2	47	80	33
35us2	33	47	13

Table E1. Continued

Student ID	Pretest	Posttest	Gainscore
37us2	20	67	47
38us2	47	73	27
40us2	53	87	33
43us2	27	87	60
47us2	67	67	0
48us2	40	73	33
52us2	47	80	33
53us2	67	73	7
54us2	73	67	-7
59us2	73	87	13
60us2	53	87	33
1us1	53	80	27
8us1	80	87	7
18us1	53	80	27
19us1	53	80	27
20us1	27	60	33
23us1	67	80	13
28us1	47	80	33
30us1	47	67	20
31us1	53	60	7
32us1	47	87	40
33us1	47	93	46
36us1	73	67	-6
39us1	67	60	-7
46us1	47	60	13
49us1	47	67	20
50us1	60	87	27
55us1	20	67	47

Table E2. Results of essay exams as percentages. Student ID coding is first number is the random number assigned to the student, letters represent United States or Costa Rica, and last number represents the trial run.

Student ID	Pre-test	Post-test	Improve
1cr2	19.2	73.0	53.8
2cr2	0.0	22.2	22.2
3cr2	7.7	70.6	62.9
5cr2	11.5	36.5	25.0
6cr2	26.9	64.3	37.4
7cr2	7.7	81.0	73.3
8cr2	19.2	49.2	30.0
9cr2	0.0	51.6	51.6
10cr2	11.5	73.0	61.5
11cr2	11.5	65.9	54.3
12cr2	23.1	46.0	23.0
13cr2	7.7	66.7	59.0
14cr2	23.1	44.8	21.8
15cr2	0.0	60.3	60.3
16cr2	26.9	63.5	36.6
17cr2	19.2	65.9	46.6
18cr2	15.4	89.7	74.3
19cr2	19.2	66.3	47.0
20cr2	30.8	56.3	25.6
21cr2	15.4	59.5	44.1
22cr2	26.9	57.1	30.2
24cr2	23.1	36.5	13.4
25cr2	15.4	39.3	23.9
26cr2	7.7	46.8	39.1
27cr2	15.4	57.1	41.8
28cr2	26.9	71.4	44.5
29cr2	26.9	46.0	19.1
30cr2	50.0	41.3	-8.7
31cr2	15.4	81.0	65.6
32cr2	7.7	53.2	45.5
33cr2	26.9	63.5	36.6
34cr2	42.3	77.8	35.5
1us12	30.8	62.5	31.7
2us12	30.8	98.1	67.3
4us12	46.2	66.3	20.2
5us12	43.5	75.0	31.7

Table E2. Continued

Student ID	Pre-test	Post-test	Improve
7us12	58.7	86.5	27.9
8us12	71.2	95.2	24.0
12us12	65.4	92.3	26.9
14us12	42.3	71.2	28.8
15us12	50.0	80.8	30.8
18us12	7.7	92.3	84.6
20us12	35.6	78.8	43.3
21us12	26.9	75.0	48.1
23us12	35.6	92.3	56.7
25us12	11.5	76.9	65.4
26us12	36.5	52.5	26.0
27us12	18.3	73.1	54.8
28us12	54.8	76.9	22.1
29us12	53.8	88.5	34.6
30us12	38.5	75.0	36.5
31us12	34.6	63.5	28.8
32us12	39.4	84.6	45.2
33us12	44.2	82.7	38.5
35us12	21.2	73.1	51.9
36us12	53.8	76.9	23.1
37us12	39.4	78.8	39.4
38us12	21.2	82.7	61.5
39us12	44.2	63.5	19.2
40us12	18.3	76.9	58.7
43us12	32.7	86.5	53.8
46us12	28.8	65.4	36.5
47us12	55.8	79.8	24.0
48us12	46.5	72.1	26.0
49us12	35.6	64.4	28.8
50us12	57.7	93.3	35.6
52us12	28.8	82.7	53.8
53us12	8.7	70.2	61.5
54us12	51.0	88.5	37.5
55us12	34.6	70.2	35.6
59us12	58.7	96.2	37.5
60us12	51.0	86.5	35.6
06315us3	25.0	84.6	59.6

Table E2. Continued

Student ID	Pre-test	Post-test	Improve
07383us3	46.2	63.5	17.3
14455us3	32.7	71.2	38.5
19391us3	21.2	51.9	30.8
20459us3	32.7	55.8	23.1
23000us3	11.5	63.5	51.9
30477us3	25.0	80.8	55.8
31141us3	36.5	65.4	28.8
32209us3	44.2	82.7	38.5
52908us3	42.3	63.5	21.2
53571us3	57.7	80.8	23.1
55044us3	46.2	76.9	30.8
67457us3	34.6	67.3	32.7
72798us3	28.8	78.8	50.0
73202us3	23.1	90.4	67.3
74530us3	40.4	76.9	36.5
81343us3	28.8	78.8	50.0
84143us3	15.4	51.9	36.5
86020us3	23.1	73.1	50.0
96701us3	42.3	71.2	28.8
99906us3	34.6	84.6	50.0

Table E3. Results of journal, wiki, and discussion board as percentages. Student ID coding is first number is the random number assigned to the student, letters represent United States or Costa Rica, and last number represents the trial run.

Student ID	Journal	Wiki	Discussion Board
25us2	86	100	100
48us2	90	98.5	100
21us2	88	92	60
27us2	98	92	60
43us2	88	90	100
39us2	68	100	0
19us2	53	0	0
34us2	92	98.5	100
4us2	92	98.5	0
35us2	80	98.5	60
45us2	68	98.5	0
60us2	88	98.5	60
32us2	90	98.5	100
55us2	92	98.5	100
31us2	70	100	100
59us2	92	90	100
49us2	90	98.5	100
30us2	90	98.5	100
47us2	88	98.5	60
53us2	76	90	60
54us2	80	90	60
3us2	90	100	100
22us2	100	98.5	100
40us2	88	92	0
50us2	90	98.5	100

Table E3. Continued

Student ID	Journal	Wiki	Discussion Board
1us2	66	100	100
28us2	90	100	100
56us2	66	100	100
58us2	66	100	0
36us2	46	100	0
5us2	90	92	60
15us2	0	92	0
38us2	32	90	100
29us2	98	98.5	60
37us2	88	90	100
26us2	76	98.5	100
33us2	88	98.5	100
2us2	88	90	100
41us2	66	100	100
52us2	66	100	60
30us2	98	100	100
46us2	90	100	100
23us2	70	98.5	100
51us2	66	0	100
14us2	98	98.5	100
18us2	90	100	100
12us2	98	90	100
6us2	86	98.5	0
13us2	80	100	0
8us2	90	98.5	60
7us2	98	100	100
05919us3	94	85	100

Table E3. Continued

Student ID	Journal	Wiki	Discussion Board
06315us3	90	98	100
07383us3	84	85	100
14455us3	0	71	100
19391us3	82	98	0
20459us3	100	100	100
23000us3	100	89	100
30477us3	91	71	0
31141us3	90	100	100
32209us3	68	89	10
52908us3	74	88	100
53571us3	100	100	100
55044us3	86	98	100
67457us3	95	89	100
72798us3	100	100	100
73202us3	100	100	100
74530us3	80	79	60
81343us3	92	98	100
84143us3	92	85	100
86020us3	100	100	100
96701us3	88	98	100
99906us3	94	61	100
1cr2	100	60	0
2cr2	0	0	100
3cr2	100	100	70
4cr2	0	100	20
5cr2	100	60	80
6cr2	0	80	60

Table E3. Continued

Student ID	Journal	Wiki	Discussion Board
7cr2	100	80	90
8cr2	90	70	100
9cr2	0	60	100
10cr2	0	70	0
11cr2	90	70	90
12cr2	90	80	100
13cr2	70	70	100
14cr2	100	80	60
15cr2	60	90	80
16cr2	100	100	100
17cr2	90	100	80
18cr2	90	90	80
19cr2	100	60	80
20cr2	90	70	80
21cr2	0	100	90
22cr2	90	0	100
23cr2	0	80	40
24cr2	100	80	100
25cr2	100	70	90
26cr2	0	70	30
27cr2	80	90	50
28cr2	90	0	100
29cr2	80	80	50
30cr2	100	100	70
31cr2	90	100	90
32cr2	80	70	90
33cr2	100	100	70
34cr2	90	80	100

Table E4. Contingency tables for participation rate in activities of Costa Rica and U.S. Students.

Journal	CR	US	Total
No participate	26	71	97
Participate	8	2	10
Total	34	73	107

Wiki	CR	US	Total
No participate	31	71	102
Participate	3	2	5
Total	34	73	107

Discussion Board	CR	US	Total
No participate	32	61	93
Participate	2	12	14
Total	34	73	107

APPENDIX F

Rubrics for Grading Activities (English and Spanish)

Grading of Journal

DIRECTIONS: The journal will be graded according to the criteria listed below: 1=Weak; 2= Somewhat Weak; 3=Average; 4=Strong 5=Very Strong.

1. The journal meets the requirement of 5 pages double spaced and typed. This is about 1200 words long. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
2. The journal correctly answers the questions. (40%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
3. The journal provides a very descriptive explanation of the questions. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
4. The organization of the journal is clear and easy to follow; the journal entries flow smoothly from one idea to another. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
5. Citations are included in the journal. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
6. The spelling, grammar, and punctuation in the journal are accurate. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
7. The journal is neatly typed or handwritten. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Calificación del Diario

INDICACIONES: El diario se calificará de acuerdo con los siguientes criterios: 1=Pobre; 2= Algo pobre; 3=Promedio; 4=Bueno 5=Muy bueno.

1. El diario satisface el requisito de 5 páginas a doble espacio y tipeado. Es de alrededor de 1200 palabras de extensión. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
2. El diario responde correctamente las preguntas. (40%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
3. El diario ofrece una explicación muy descriptiva de las preguntas. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
4. La organización del diario es clara y fácil de seguir; las anotaciones en el diario se expresan con fluidez de una idea a otra. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
5. Se incluyen citas en el diario. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
6. La ortografía, gramática y puntuación del diario son correctas. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
7. El diario está tipeado o escrito a mano con prolijidad. (10%)
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Wiki Rubric (English and Spanish)

This rubric may be used for assessing individual and group Wiki contributions.

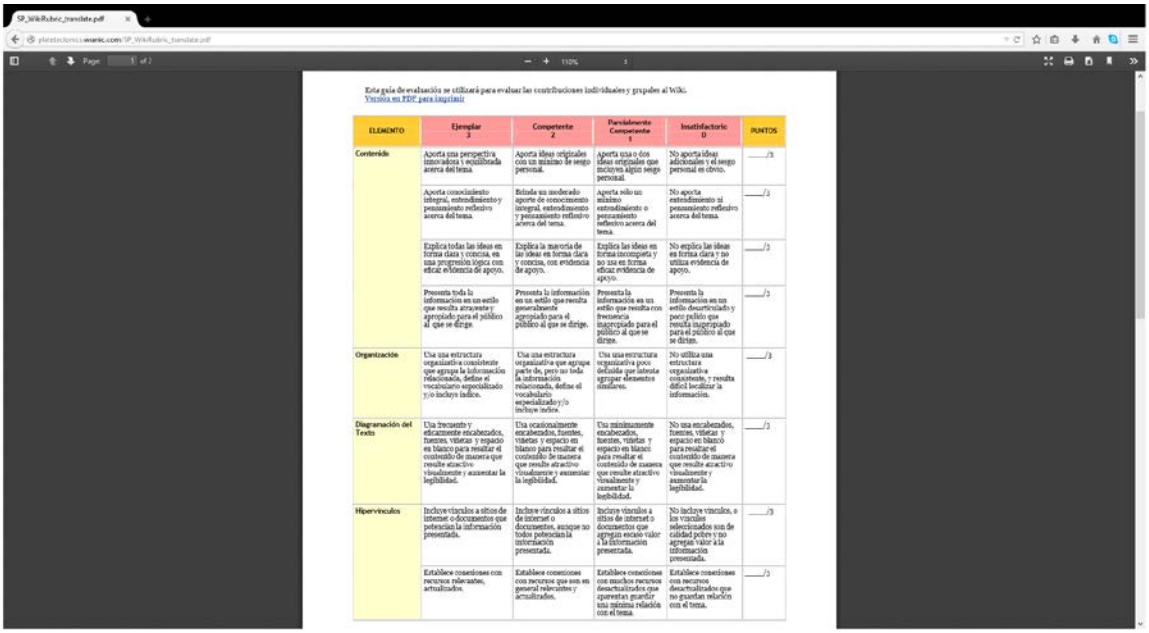
PDF version for printing

ELEMENT	Exemplary 3	Proficient 2	Partially Proficient 1	Unsatisfactory 0	POINTS
Content	Provides a fresh and balanced perspective on the topic.	Provides original ideas with a minimum of personal bias.	Provides one or two original ideas which include some personal bias.	Does not provide any original ideas and personal bias is obvious.	____/3
	Provides comprehensive insight, understanding, and reflective thought about the topic.	Provides a moderate amount of insight, understanding, and reflective thought about the topic.	Provides only minimal understanding, or reflective thought about the topic.	Provides no understanding or reflective thought about the topic.	____/3
	Explains all ideas clearly and concisely in a logical progression with effective supporting evidence.	Explains most ideas clearly and concisely with supporting evidence.	Incompletely explains ideas and does not effectively use supporting evidence.	Fails to explain ideas clearly, and does not use any supporting evidence.	____/3
	Presents all information in a style that is appealing and appropriate for the intended audience.	Presents information in a style that is generally appropriate for the intended audience.	Presents information in a style that is often inappropriate for the intended audience.	Presents information in a disjointed, unpolished style which is inappropriate for the intended audience.	____/3

ELEMENT	Exemplary 3	Proficient 2	Partially Proficient 1	Unsatisfactory 0	POINTS
Organization	Uses a consistent organizational structure that includes grouping related information, defines specialized vocabulary and/or provides a table of contents.	Uses an organizational structure which groups some but not all, related information, defines specialized vocabulary and/or provides a table of contents.	Uses a loosely defined organizational structure which attempts to group similar items.	Fails to provide a consistent organizational structure, and information is difficult to locate.	____/3
Text Layout	Makes frequent and effective use of headings, fonts, bullet points and white space to enhance the content's visual appeal and increase readability.	Makes occasional use of headings, fonts, bullet points and white space to enhance the content's visual appeal and increase readability.	Makes minimal use of headings, fonts, bullet points and white space to enhance visual appeal and readability.	Makes no use of headings, fonts, bullet points or white space to enhance visual appeal and readability.	____/3
Hyperlinks	Includes links to websites or documents that enhance the information presented.	Includes links to websites or documents, but not all links enhance the information presented.	Includes links to websites or documents which add little value to the information presented.	Does not include any links, or the links selected are of poor quality and do not add any value to the information presented.	____/3
	Connects to relevant, up-to-date resources.	Connects to resources which are usually relevant and up-to-date.	Connects to many outdated resources which appear to have only a minimal connection to the topic.	Connects to outdated resources which have no connection to the topic.	____/3

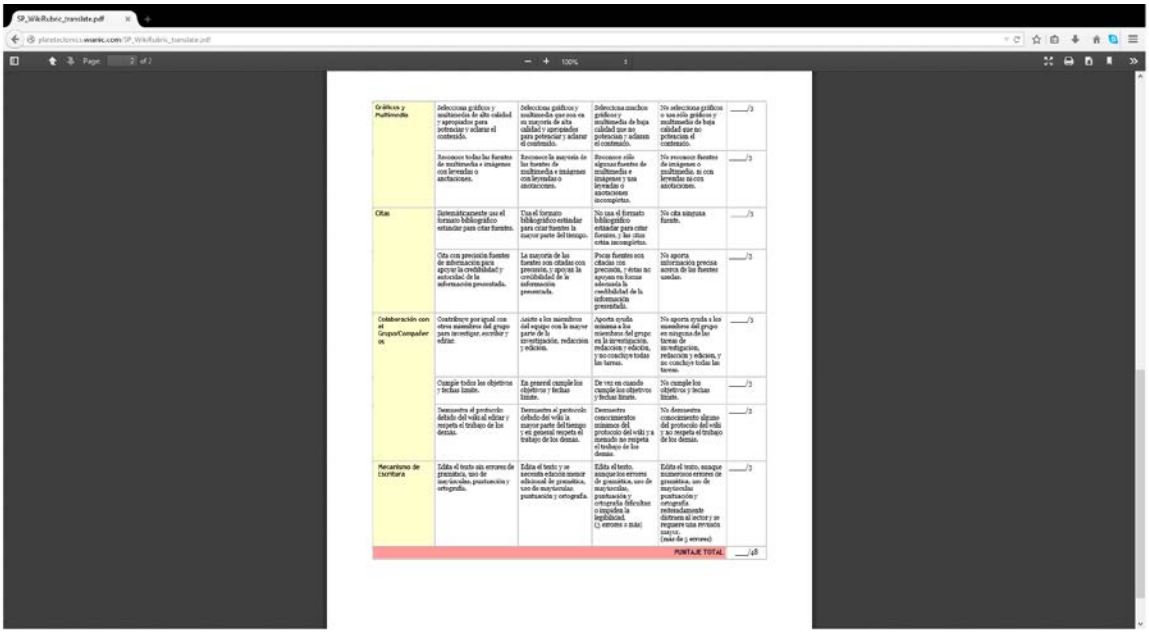
ELEMENT	Exemplary 3	Proficient 2	Partially Proficient 1	Unsatisfactory 0	POINTS
Graphics and Multimedia	Selects high quality graphics and multimedia when appropriate to enhance and clarify the content.	Selects graphics and multimedia which are mostly high quality and enhance and clarify the content.	Selects many low-quality graphics and multimedia which do not enhance the content.	Selects no graphics, or uses only low-quality graphics and multimedia which do not enhance the content.	____/3
	Acknowledges all image and multimedia sources with captions or annotations.	Acknowledges most image and multimedia sources with captions or annotations.	Acknowledges only a few multimedia and image sources and uses incomplete captions or annotations.	Fails to acknowledge any image or multimedia sources, either with a caption or an annotation.	____/3
Citation	Consistently uses standard bibliographic format to cite sources.	Uses standard bibliographic format to cite sources most of the time.	Does not use standard bibliographic format to cite sources, and citations are incomplete.	Does not cite any sources.	____/3
	Accurately cites all sources of information to support the credibility and authority of the information presented.	Most sources are cited accurately, and support the credibility of the information presented.	Few sources are cited accurately, and they fail to adequately support the credibility of the information presented.	Does not provide any accurate information about sources used.	____/3

ELEMENT	Exemplary 3	Proficient 2	Partially Proficient 1	Unsatisfactory 0	POINTS
Group/Partner Collaboration	Contributes equally with other group members in researching, writing, and editing.	Assists group members with most of the researching, writing and editing.	Provides minimal assistance to group members in researching, writing and editing, and does not follow through with all tasks.	Provides no assistance to group members in any of the researching, writing and editing and does not follow through with any of the tasks.	____/3
	Meets all goals and deadlines.	Usually meets goals and deadlines.	Occasionally meets goals and deadlines.	Does not meet goals and deadlines.	____/3
	Exhibits appropriate wiki etiquette when editing and respects the work of others.	Exhibits appropriate wiki etiquette most of the time and generally respects the work of others.	Exhibits a minimal knowledge of wiki etiquette and often fails to respect the work of others.	Exhibits no knowledge of wiki etiquette and fails to respect the work of others.	____/3
Writing Mechanics	Edits the text with no errors in grammar, capitalization, punctuation, and spelling.	Edits the text with minor additional editing required for grammar, capitalization, punctuation, and spelling.	Edits the text, but errors in grammar, capitalization, punctuation and spelling distract or impair readability. (3 or more errors)	Edits the text but numerous errors in grammar, capitalization, punctuation, and spelling repeatedly distract the reader and major revision is required. (more than 5 errors)	____/3
				TOTAL POINTS	___/48



Esta guía de evaluación se utilizará para evaluar las contribuciones individuales y grupales al Wiki.
Versión en PDF para imprimir

ELEMENTO	Ejemplar 3	Competente 2	Parcialmente Competente 1	Insatisfactorio 0	PUNTOS
Contenido	Aporta una perspectiva innovadora y equilibrada acerca del tema.	Aporta ideas originales con un mínimo de sesgo personal.	Aporta una o dos ideas originales que incluyen algún sesgo personal.	No aporta ideas adicionales y el sesgo personal es obvio.	____/3
	Aporta conocimiento integral, entendimiento y pensamiento reflexivo acerca del tema.	Estimula un moderado aporte de conocimiento integral, entendimiento y pensamiento reflexivo acerca del tema.	Aporta solo un mínimo entendimiento o pensamiento reflexivo acerca del tema.	No aporta entendimiento ni pensamiento reflexivo acerca del tema.	____/3
	Explica todas las ideas en forma clara y concisa, en una progresión lógica con eficaz evidencia de apoyo.	Explica la mayoría de las ideas en forma clara y concisa, con evidencia de apoyo.	Explica las ideas en forma incompleta y no usa en forma eficaz evidencia de apoyo.	No explica las ideas en forma clara y no utiliza evidencia de apoyo.	____/3
	Presenta toda la información en un estilo que resulta atrayente y apropiado para el público al que se dirige.	Presenta la información en un estilo que resulta generalmente apropiado para el público al que se dirige.	Presenta la información en un estilo que resulta con frecuencia inapropiado para el público al que se dirige.	Presenta la información en un estilo descortés y poco pulido que resulta inapropiado para el público al que se dirige.	____/3
Organización	Usa una estructura organizativa consistente que agrupa la información relacionada, define el vocabulario especializado y/o incluye índice.	Usa una estructura organizativa que agrupa parte de, pero no toda la información relacionada, define el vocabulario especializado y/o incluye índice.	Usa una estructura organizativa poco definida que intenta agrupar elementos similares.	No utiliza una estructura organizativa consistente, y resulta difícil localizar la información.	____/3
Diagramación del Texto	Usa frecuente y eficazmente encabezados, fuentes, viñetas y espacio en blanco para resaltar el contenido de manera que resulte atractivo visualmente y aumentar la legibilidad.	Usa ocasionalmente encabezados, fuentes, viñetas y espacio en blanco para resaltar el contenido de manera que resulte atractivo visualmente y aumentar la legibilidad.	Usa mínimamente encabezados, fuentes, viñetas y espacio en blanco para resaltar el contenido de manera que resulte atractivo visualmente y aumentar la legibilidad.	No usa encabezados, fuentes, viñetas y espacio en blanco para resaltar el contenido de manera que resulte atractivo visualmente y aumentar la legibilidad.	____/3
Hipervínculos	Incluye vínculos a sitios de internet o documentos que potencian la información presentada.	Incluye vínculos a sitios de internet o documentos, aunque no todos potencian la información presentada.	Incluye vínculos a sitios de internet o documentos que agregan escaso valor a la información presentada.	No incluye vínculos, o los vínculos seleccionados son de calidad pobre y no agregan valor a la información presentada.	____/3
	Establece conexiones con recursos relacionados, actualizados.	Establece conexiones con recursos que son en general relacionados y actualizados.	Establece conexiones con muchos recursos desactualizados que aparentan guardar una mínima relación con el tema.	Establece conexiones con recursos desactualizados que no guardan relación con el tema.	____/3



Gráficos y Multimedia	Selecciona gráficos y multimedia de alta calidad y apropiados para potenciar y aclarar el contenido.	Selecciona gráficos y multimedia que son en su mayoría de alta calidad y apropiados para potenciar y aclarar el contenido.	Selecciona muchos gráficos y multimedia de baja calidad que no potencian y aclaran el contenido.	No selecciona gráficos o usa sólo gráficos y multimedia de baja calidad que no potencian el contenido.	____/3
	Reconoce todas las fuentes de multimedia e imágenes con leyendas o anotaciones.	Reconoce la mayoría de las fuentes de multimedia e imágenes con leyendas o anotaciones.	Reconoce sólo algunas fuentes de multimedia e imágenes y usa leyendas o anotaciones incompletas.	No reconoce fuentes de imágenes o multimedia, ni con leyendas ni con anotaciones.	____/3
Citas	Sistemáticamente usa el formato bibliográfico estándar para citar fuentes.	Usa el formato bibliográfico estándar para citar fuentes la mayor parte del tiempo.	No usa el formato bibliográfico estándar para citar fuentes, y las citas están incompletas.	No cita ninguna fuente.	____/3
	Cita con precisión fuentes de información para apoyar la credibilidad y autoridad de la información presentada.	La mayoría de las fuentes son citadas con precisión, y apoyan la credibilidad de la información presentada.	Pocas fuentes son citadas con precisión, y éstas no apoyan en forma adecuada la credibilidad de la información presentada.	No aporta información precisa acerca de las fuentes usadas.	____/3
Colaboración con el Grupo/Compañeros	Contribuye por igual con otros miembros del grupo para investigar, escribir y editar.	Asiste a los miembros del equipo con la mayor parte de la investigación, redacción y edición.	Aporta ayuda mínima a los miembros del grupo en la investigación, redacción y edición, y no concluye todas las tareas.	No aporta ayuda a los miembros del grupo en ninguna de las tareas de investigación, redacción y edición, y no concluye todas las tareas.	____/3
	Cumple todos los objetivos y fechas límite.	En general cumple los objetivos y fechas límite.	De vez en cuando cumple los objetivos y fechas límite.	No cumple los objetivos y fechas límite.	____/3
	Demuestra el protocolo debido del wiki al editar y respeta el trabajo de los demás.	Demuestra el protocolo debido del wiki la mayor parte del tiempo y en general respeta el trabajo de los demás.	Demuestra conocimientos mínimo del protocolo del wiki y a menudo no respeta el trabajo de los demás.	No demuestra conocimiento alguno del protocolo del wiki y no respeta el trabajo de los demás.	____/3
Mecanismo de Escritura	Edita el texto sin errores de gramática, uso de mayúsculas, puntuación y ortografía.	Edita el texto y se necesita edición menor adicional de gramática, uso de mayúsculas, puntuación y ortografía.	Edita el texto, aunque los errores de gramática, uso de mayúsculas, puntuación y ortografía dificultan o impiden la legibilidad. (3 errores o más)	Edita el texto, aunque numerosos errores de gramática, uso de mayúsculas, puntuación y ortografía entorpecen gravemente la capacidad del lector y se requiere una revisión mayor. (más de 3 errores)	____/3
				PUNTAJE TOTAL	____/48

Rubric Discussion Board (English and Spanish)

Individual posting
0 %: Student does not post a message.
10%: Student posts an answer to 1 question.
20%: Student posts an answer to 2 questions.
30-60%:Student answers all questions.
Does not post a significant response to other
students. Some concepts and information are used incorrectly.
70-90%: Student answers all questions.
Some concepts and information are used
incorrectly. Student posts a significant response to other students.
100%: Student answers all questions, correctly presents concepts or information, and responds to classmates messages

Resumen de puntaje por actividades en el pane
l de mensajes
Puntos
0: El estudiante no pone mensajes.
1: El estudiante da respuesta a 1 pregunta.
2: El estudiante da respuestas a 2 preguntas.
3-6: El estudiante responde a todas las preguntas.
No da respuestas significativas a sus compañeros.
Algunos conceptos e información son usados incorrectamente.
7-9: El estudiante responde todas las preguntas.
Algunos conceptos e información son usados
incorrectamente. Las respuestas a otros estudiantes son significativas.
10: El estudiante responde todas las preguntas. Presenta conceptos e información correctamente

APPENDIX G

Chi -Square Contingency Tables

for survey data for trials 1 and 2 in Costa Rica and trials 1, 2, and 3 in the United States and graphs for Costa Rican survey questions.

SURVEY SECTION: STUDENT ATTITUDES TOWARD TECHNOLOGY

VARIABLE: ENJOYMENT

Question 11: I enjoy using technology

Question 11 (Pre-survey)	CR	US	Total
Agree	58	66	124
Disagree & Neutral	3	1	4
Total	61	67	128

Question 11 (Post-survey)	CR	US	Total
Agree	39	39	78
Disagree & Neutral	19	27	46
Total	58	66	124

VARIABLE: ACCESS

Question 12: I do not have enough computer access at school and feel I cannot effectively complete lessons involving technology.

Question 12 (Pre-survey)	CR	US	Total
Agree	10	3	13
Neutral	14	9	23
Disagree	37	55	92
Total	61	67	128

Question 12 (Post-survey)	CR	US	Total
Agree	9	7	16
Neutral	14	7	21
Disagree	38	52	90
Total	61	66	127

Question 13: I do not have enough computer access at home and feel I cannot effectively complete lessons involving technology.

Question 13 (Pre-survey)	CR	US	Total
Agree	14	8	22
Neutral	12	2	14
Disagree	35	57	92
Total	61	67	128

Question 13 (Post-survey)	CR	US	Total
Agree	8	3	11
Neutral	13	5	18
Disagree	40	58	98
Total	61	66	127

VARIABLE: FACILITATE LEARNING

Question 14: Technology can help me prepare for a test better.

Question 14 (Pre-survey)	CR	US	Total
Agree	44	52	96
Neutral/Disagree	17	15	25
Total	61	67	128

Question 14 (Post-survey)	CR	US	Total
Agree	29	35	64
Neutral	24	21	45
Disagree	9	10	19
Total	62	66	128

Question 15: Technology can help me understand concepts of a lesson better.

Question 15(Pre-survey)	CR	US	Total
Agree	49	50	99
Neutral/Disagree	13	17	30
Total	62	67	129

Question 15(Post-survey)	CR	US	Total
Agree	43	37	80
Neutral	11	21	32
Disagree	7	8	15
Total	61	66	127

Question 16: Technology can help me remember facts about the lesson better.

Question 16(Pre-survey)	CR	US	Total
Agree	45	43	88
Neutral	13	17	30
Disagree	3	7	10
Total	61	67	128

Question 16(Post-survey)	CR	US	Total
Agree	37	38	75
Neutral	18	22	40
Disagree	6	6	12
Total	61	66	127

VARIABLE: STRESS

Question 17: Using technology causes me to experience anxiety.

Question 17 (Pre-survey)	CR	US	Total
Agree	16	5	21
Neutral	22	13	35
Disagree	23	49	72
Total	61	67	128

Question 17: Using the technology in the cLO caused me to experience anxiety.

Question 17 (Post-survey)	CR	US	Total
Agree	7	11	18
Neutral	26	17	43
Disagree	28	38	66
Total	61	66	127

VARIABLE: TECHNICAL DIFFICULTIES

Question 18: I experienced technical difficulties with the cLO technology.

Question 18 (Post-survey)	CR	US	Total
Agree	15	8	23
Neutral	17	13	30
Disagree	29	45	74
Total	61	66	127

Question 19: Technical difficulties impeded my learning experience.

Question 19 (Post-survey)	CR	US	Total
Agree	14	3	17
Neutral	16	19	35
Disagree	31	44	75
Total	61	66	127

VARIABLE: FUTURE USE

Question 20: I would like to see more technology integrated into a standard lecture format.

Question 20 (Pre-survey)	CR	US	Total
Agree	43	38	81
Neutral/Disagree	18	29	47
Total	61	67	128

Question 20 (Post-survey)	CR	US	Total
Agree	43	37	80
Neutral	13	18	31
Disagree	4	11	16
Total	61	66	127

Question 21: I would like to see technology replace the standard lecture format

Question 21 (Pre-survey)	CR	US	Total
Agree	24	18	42
Neutral	22	29	51
Disagree	15	20	35
Total	61	67	128

Question 21 (Post-survey)	CR	US	Total
Agree	26	18	44
Neutral	21	22	43
Disagree	14	26	40
Total	61	66	127

SURVEY SECTION: AFFECTIVE LEARNING

VARIABLE: MOTIVATION

Question 22: The material in the lessons stimulated my interest.

Question 22 (Post-survey)	CR	US	Total
Agree	48	48	96
Neutral	9	9	18
Disagree	4	7	11
Total	61	64	125

Question 23: The lessons motivated me to spend more time than I normally would with this subject.

Question 23 (Post-survey)	CR	US	Total
Agree	32	32	64
Neutral	18	18	36
Disagree	11	14	25
Total	61	64	125

VARIABLE: FUTURE INTEREST

Question 24: I would enjoy spending time outside of class discussing what I have learned in this lesson.

Question 24 (Post-survey)	CR	US	Total
Agree	32	25	57
Neutral	20	24	44
Disagree	9	15	24
Total	61	64	125

Question 25: I would be more likely now to spend more time outside of class keeping abreast of the subject.

Question 25(Post-survey)	CR	US	Total
Agree	33	26	59
Neutral	25	24	49
Disagree	3	14	17
Total	61	64	125

Question 26: I would want to enroll in another course with similar content.

Question 26(Post-survey)	CR	US	Total
Agree	41	31	72
Neutral	14	21	35
Disagree	6	12	18
Total	61	64	125

VARIABLE: SELF-CONFIDENCE

Question 27: I feel more self-confident about performing a task requiring the same skills as in this lesson.

Question 27 (Post-survey)	CR	US	Total
Agree	33	44	77
Neutral	22	15	37
Disagree	6	5	11
Total	61	64	125

Question 28: The lessons made me feel more self-confident about my academic abilities

Question (Post-survey)	CR	US	Total
Agree	36	33	69
Neutral/Disagree	23	31	54
Total	59	64	123

VARIABLE: BEHAVIOR HAZARDS

Question 29: The lesson has prompted me to change my behaviors in regard to preparedness for natural disasters.

Question (Post-survey)	CR	US	Total
Agree	45	44	89
Neutral/Disagree	16	20	36
Total	61	64	125

VARIABLE: REAL LIFE

Question 30: The exercises allowed me to use more problem solving techniques.

Question 30 (Post-survey)	CR	US	Total
Agree	43	34	77
Neutral	14	23	37
Disagree	4	7	11
Total	61	64	125

Question 31: I would be likely to use the behaviors or skills taught in this lesson in a future or present job situation.

Question 31 (Post-survey)	CR	US	Total
Agree	43	43	86
Neutral	12	17	29
Disagree	7	4	11
Total	62	64	126

Question 32: I gained insight in regards to working cooperatively in groups.

Question 32(Post-survey)	CR	US	Total
Agree	47	45	92
Neutral/Disagree	14	19	33
Total	61	64	125

SURVEY SECTION: STUDENT ATTITUDES TOWARD FACILITATOR

VARIABLE: FACILITATOR

Question 33: The instructor has provided acceptable lessons.

Question 33 (Pre-survey)	CR	US	Total
Agree	53	61	114
Neutral/Disagree	7	6	13
Total	60	67	127

Question 33: The instructor provided acceptable facilitation (acting as a guide rather than a regular lecture) to the lessons.

Question 33 (Post-survey)	CR	US	Total
Agree	49	55	104
Neutral/Disagree	12	9	21
Total	61	64	125

VARIABLE: TAKE ANOTHER CLASS

Question 34: I would willingly take another class with my instructor.

Question 34 (Pre-survey)	CR	US	Total
Agree	54	52	106
Neutral	4	6	10
Disagree	2	9	11
Total	60	67	127

Question 34 (Post-survey)	CR	US	Total
Agree	50	45	95
Neutral	7	10	17
Disagree	4	11	15
Total	61	66	127

VARIABLE: ASSESSMENT

Question 35: The facilitator graded my work fairly.

Question 35(Pre-survey)	CR	US	Total
Agree	46	64	110
Neutral/Disagree	5	14	19
Total	51	78	129

Question 35 (Post-survey)	CR	US	Total
Agree	54	58	112
Neutral/Disagree	7	8	15
Total	61	66	127

Question 36: The facilitator was clear about grading procedures.

Question 36(Pre-survey)	CR	US	Total
Agree	53	63	116
Neutral/Disagree	7	4	11
Total	60	67	127

Question 36 (Post-survey)	CR	US	Total
Agree	53	54	107
Neutral/Disagree	8	10	18
Total	61	64	125

VARIABLE: NEGATIVE BIAS

Question 37: The facilitator did not show a biased negative attitude toward technology.

Question 37 (Pre-survey)	CR	US	Total
Agree	49	59	108
Neutral/Disagree	11	8	19
Total	60	67	127

Question 37: The facilitator did not show a biased negative attitude toward technology.

Question 37 (Post-survey)	CR	US	Total
Agree	55	57	112
Neutral/Disagree	7	7	14
Total	62	64	126

VARIABLE: POSITIVE BIAS

Question 38: The facilitator did not show a biased positive attitude toward technology.

Question38 (Pre-survey)	CR	US	Total
Agree	11	50	61
Neutral	9	13	22
Disagree	40	4	44
Total	60	67	127

Question 38 (Post-survey)	CR	US	Total
Agree	8	46	54
Neutral	8	11	19
Disagree	46	7	53
Total	62	64	126

VARIABLE: OVERALL PERFORMANCE

Question 39: Rate the overall performance of the facilitator.

Question 39 (Pre-survey)	CR	US	Total
Excellent	41	43	84
Average/Poor	19	26	45
Total	60	69	129

Question 39 (Post-survey)	CR	US	Total
Excellent	39	40	79
Average/Poor	22	26	45
Total	61	66	127

SURVEY SECTION: DEMOGRAPHIC DATA

VARIABLE: UNIVERSITY LEVEL

University level (Post-survey)	CR	US	Total
1 year	1	9	10
2 years	49	25	74
3 years	10	17	27
4-5 years	2	16	18
Total	62	67	129

VARIABLE: LANGUAGES SPOKEN

Languages Spoken (Post-survey)	CR	US	Total
1	46	42	88
2 or >	17	26	43
Total	63	68	131

VARIABLE: GENDER

Gender (Post-survey)	CR	US	Total
Male	37	27	64
Female	25	39	64
Total	62	66	128

VARIABLE: FIRST LANGUAGE

First Language (Post-survey)	CR	US	Total
English	1	56	57
Spanish	60	8	68
Total	61	64	125

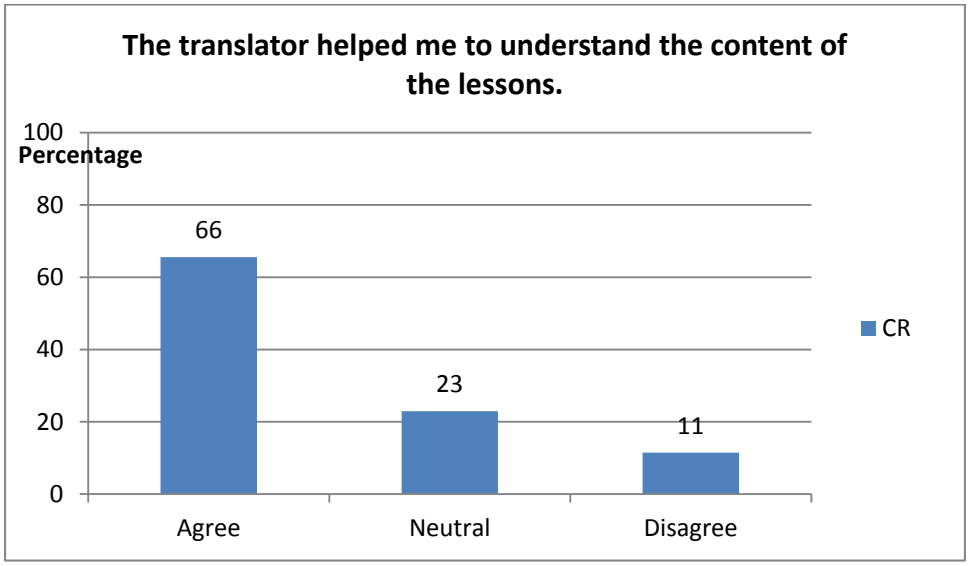
VARIABLE: COUNTRY BORN

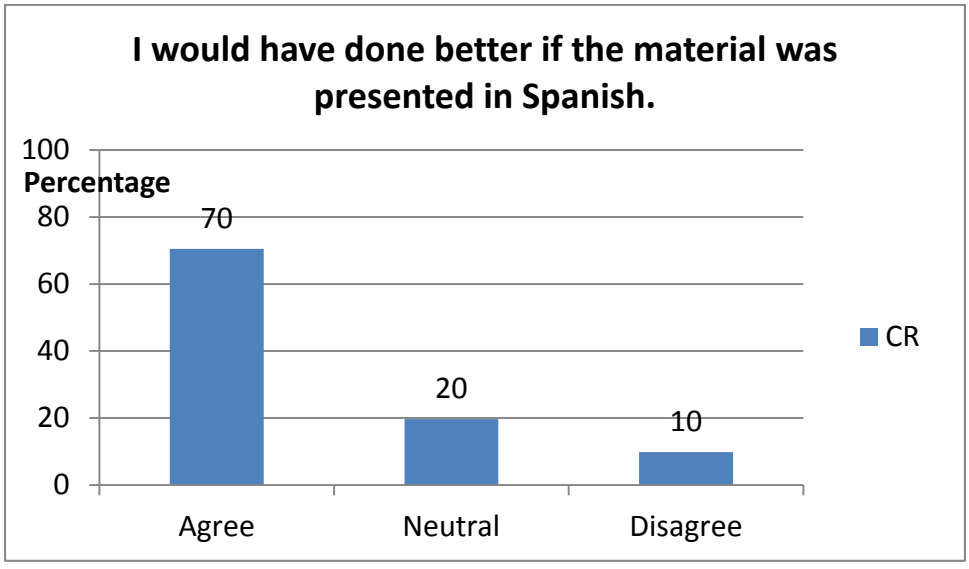
Country Born (Post-survey)	CR	US	Total
Costa Rica	58	0	58
United States	1	62	63
Total	59	62	121

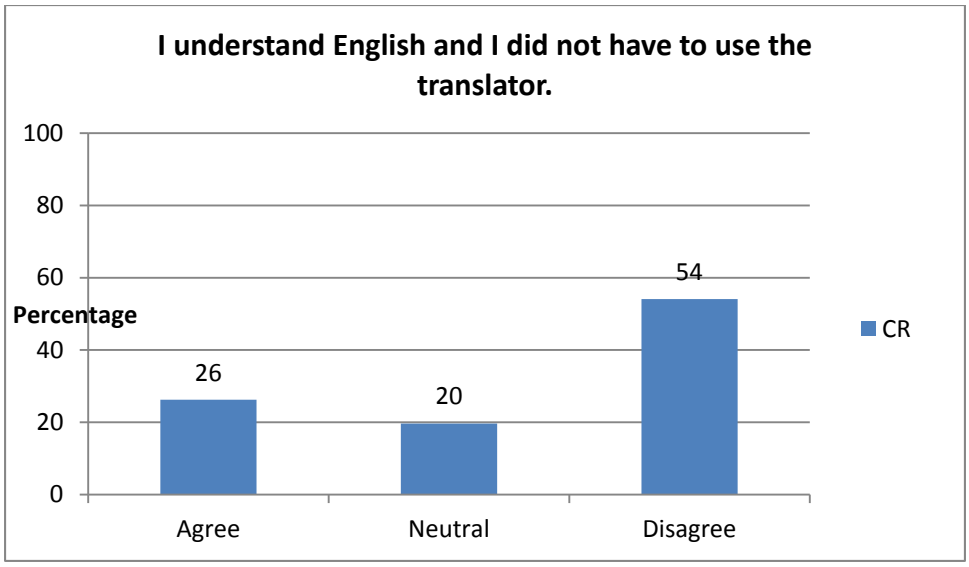
VARIABLE: MAJOR

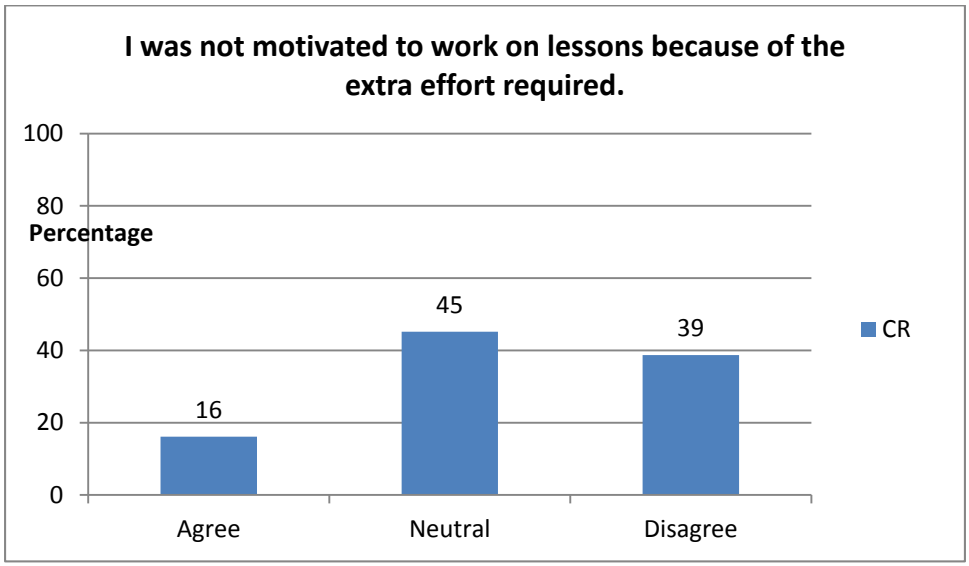
Major (Post-survey)	CR	US	Total
Geography	58	8	66
Environmental Studies	2	10	12
Undeclared/Other	1	45	46
Total	61	63	124

SURVEY SECTION: TRANSLATOR QUESTIONS POSED ONLY TO THE COSTA RICAN STUDENTS






I understand English and I did not have to use the translator.
100
80
60
40
20
0
Percentage
26
20
54
Agree
Neutral
Disagree
CR


I was not motivated to work on lessons because of the extra effort required.
100
80
60
40
20
0
Percentage
16
45
39
Agree
Neutral
Disagree
CR

REFERENCE LIST

Anderson, Lorin W., and David R. Krathwohl. 2011. *A Taxonomy for Learning, Teaching, and Assessing*. New York: Longman.

Anonymous students. 2014. Interview by author. University of Costa Rica, Heredia. June 12.

Barrantes, Gustavo, and Lilliam Quirós-Arias. 2014. Interview by author. University of Costa Rica Heredia. June 12.

Bloom, Benjamin Samuel, M.D. Englehart, and D.R. Krathwohl. 1956. *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook 1: Cognitive Domain*. New York: McKay.

Bos, Beth. 2007. "The Effect of the Texas Instrument Interactive Instructional Environment on the Mathematical Achievement of Eleventh Grade Low Achieving Students." *Journal of Educational Computing Research* 37, no. 4: 351-368.

Brunn, Stanley D. 2003. "The New World of Electronic Geography." *GeoTrópico* 1, no. 1: 11-29. Accessed February 4, 2015. http://www.geotropico.org/1_1_Brunn.html.

Chadha, Dessha, David Faraday, and Gillian Nicholls. 2001. "Transferable Skills Teaching in Chemical Engineering Education-The Investigation of a Constructivist Theory." *International Conference on Engineering Education*, 24-26. Oslo, Norway.

Cohen, Jacob. 1988. *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, N.J.: L. Erlbaum Associates.

Collis, Betty, and Jeff Moonen. 2008. “Web 2.0 Tools and Processes in Higher Education: Quality Perspectives.” *Educational Media International* 45, no. 2 (2008): 93-106.

Connell, Christopher. 2014. “New Windows on the World.” *International Educator*, no. May & June (2014): 26-38. Accessed February 3, 2015. http://www.nafsa.org/Find_Resources/Publications/Periodicals/International_Educator/Windows_on_the_World/

Conway-Gómez, Kristen, and F. A. Palacios. 2011. “Discussing the Geography of Sustainable Development Through an International Online Collaboration with Students in Chile and the USA.” *Journal of Geography in Higher Education* 35, no. 2 (2011): 265-279.

Creswell, John W. 2008. *Educational Research*. 3rd ed. Upper Saddle River, N.J.: Pearson/Merrill Prentice Hall.

Creswell, John W. 2014. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4th ed. Thousand Oaks, California: SAGE Publications.

Daniel, Wayne W. 1990. *Applied Nonparametric Statistics*. 2nd ed. Pacific Grove, CA: Duxbury Thomson Learning.

Doering, A, and George Veletsianos. 2008. “An Investigation of the Use of Real-Time, Authentic Geospatial Data in the K-12 Classroom.” *Journal of Geography* 106, no. 6 (2008): 217-225.

Downs, Roger M. 1994. “The Need for Research in Geography Education: It Would be Nice to Have Some Data.” *Journal of Geography* 93, no. 1 (1994): 57-60.

Edsall, Robert, and Elizabeth Wentz. 2007. “Comparing Strategies for Presenting Concepts in Introductory Undergraduate Geography: Physical Models Vs. Computer Visualization.” *Journal of Geography in Higher Education* 31, no. 3 (2007): 427-444.

*G*Power*. 2007. Windows. Düsseldorf, Germany: Universitat Düsseldorf.

Goodboy, Alan K., Matthew M. Martin, and San Bolkan. 2009. “The Development and Validation of the Student Communication Satisfaction Scale.” *Communication Education* 58, no. 3 (2009): 372-396.

Haigh, Martin J. 2002. “Internationalisation of the Curriculum: Designing Inclusive Education for a Small World.” *Journal of Geography in Higher Education* 26, no. 1 (2002): 49-66.

Hamilton, Chad, Douglas Fuchs, Lynn S. Fuchs, and Holley Roberts. 2000. “Rates of Classroom Participation and the Validity of Sociometry.” *School Psychology Review* 29, no. 2 (2000): 251-266.

Hill, A. David, and Michael N. Solem. 1999. “Geography on the Web: Changing the Learning Paradigm?” *Journal of Geography* 98, no. 3 (1999): 100-107.

Hofstede, Geert. 1986. “Cultural Differences in Teaching and Learning.” *International Journal of Intercultural Relations* 10, no. 3 (1986): 301-320.

Hurley, James M., James D. Proctor, and Robert E. Ford. 1999. “Collaborative Inquiry at a Distance: Using the Internet in Geography Education.” *Journal of Geography* 98, no. 3 (1999): 128-140.

Internetworldstats.com. 2015. “Internet World Stats-Usage and Population Statistics.” Last modified 2015. Accessed January 27, 2015. http://www.internetworldstats.com/.

Jahng, Namsook, Don Krug, and Zuochen Zhang. 2007. “Student Achievement in Online Distance Education Compared to Face-To-Face Education.” *European Journal of Open Distance and E-Learning* 1 (2007). Accessed March 24, 2015. http://www.eurodl.org/materials/contrib/2007/Jahng_Krug_Zhang.pdf.

Jonassen, David H. 2000. *Computers as Mindtools for Schools*. 2nd ed. Upper Saddle River, N.J.: Merrill.

Klein, Phil, and Michael Solem. 2008. “Evaluating the Impact of International Collaboration on Geography Learning.” *Journal of Geography in Higher Education* 32, no. 2 (2008): 245-267.

LACLO.org. “Latin-American Community on Learning Objects.” Last modified 2015. Accessed January 27, 2015. http://www.laclo.org.

Lane, David. 2013. *Hyperstat Online Statistic* 1st ed. Accessed August 13, 2015. http://davidmlane.com/hyperstat/index.html.

Latinproject.org. “Project LATIn”. Last modified 2015. Accessed January 27, 2015. http://www.latinproject.org/index.php/en/.

Littlejohn, Allison. 2003. *Reusing Online Resources*. London: Kogan Page.

Liu, Xiaojing, Shijuan Liu, Seung-hee Lee, and Richard J. Magjuka. 2010. “Cultural Differences in Online Learning: International Student Perceptions.” *Educational Technology & Society* 13, no. 3 (2010): 177-188.

Lowry, Richard. 1998-2015. *Vassarstats*. Windows. Vassar College, Poughkeepsie, New York.

Lynch, Kenneth, Bob Bednarz, James Boxall, Lex Chalmers, Derek France, and Julie Kesby. 2008. "'E-Learning for Geography's Teaching and Learning Spaces." *Journal of Geography in Higher Education* 32, no. 1 (2008): 135-149.

Marks, Peter E. L., Ben Babcock, Antonius H. N. Cillessen, and Nicki R. Crick. 2012. "The Effects of Participation Rate on the Internal Reliability of Peer Nomination Measures." *Social Development* 22, no. 3 (2012): 609-622.

Marlow-Ferguson, Rebecca, and Chris Lopez. 2002. *World Education Encyclopedia: A Survey of Educational Systems Worldwide*. 2nd ed. Detroit, MI: Thomas Gale. Accessed January 27, 2015. http://go.galegroup.com/ps/retrieve.do?sgHitCountType=None&isETOC=true&inPS=true&prodId=GVRL&userGroupName=long89855&resultListType=RELATED_D.

Mateo, J., and A. Sangra. 2007. "'Designing Online Assessments Through Alternative Approaches: Facing the Concerns." *European Journal of Open, Distance and E-Learning*, no.II (2007). Accessed March 25, 2015. http://www.eurodl.org/materials/contrib/2007/Mateo_Sangra.pdf.

McCroskey, James C. 2007. "'Raising the Question #8 Assessment: Is it Just Measurement?" *Communication Education* 56, no. 4 (2007): 509-514.

Mohan, Audrey M., and Richard G. Boehm. 2009. “K-12 Geography Education in the United States.” In *Geography Education Pan American Perspectives*, edited by Osvaldo Muñiz-Solari and Richard G. Boehm, 300-320. San Marcos Texas: Grosvenor Center for Geographic Education.

Morgan, Christopher K., and Maureen Tam. 1999. “Unravelling the Complexities of Distance Education Student Attrition.” *Distance Education* 20, no. 1 (1999): 96-108.

Mottet, Timothy P., and Virginia P. Richmond. 1998. “Newer is not Necessarily Better a Reexamination of Affective Learning Measurement.” *Communication Research Reports* 15, no. 4 (1998): 370-378.

Muñiz-Solari, Osvaldo, and C. Coates. 2009. “Integrated Networks: National and International Online Experiences.” *International Review of Research in Open and Distance Learning* 10, no. 1 (2009): 91-109. Accessed March 24, 2015. http://www.irrodl.org/index.php/irrodl/article/view/609/1166.

Muñiz-Solari, Osvaldo, and Angela D. Wranic. 2008.“Composite Learning Objects in Geographical Sciences: Experience from On-Line Collaboration.” In *Third Conference of Latin American Learning Objects*, 205-211. Aguascalientes, Mexico: Latin American Conference of Learning Objects.

Muñiz-Solari, Osvaldo. 2009. “Geographic Education: 'The North' and 'the South'.” In *Geography Education Pan American Perspectives*, edited by Osvaldo Muñiz-Solari and Richard G. Boehm, 4-33. San Marcos, Texas: The Grosvenor Center for Geographic Education.

Nash, Susan. 2005. “Learning Objects, Learning Objects Repositories and Learning Theory: Preliminary Best Practices for Online Courses.” *Interdisciplinary Journal of Knowledge and Learning Objects* 1 (2005): 217-228. Accessed March 18, 2015. http://www.ijello.org/Volume1/v1p217-228Nash.pdf.

National Center for Education Statistics. 2014. *Public High School Four-Year On-Time Graduation Rates and Event Dropout Rates: School Years 2010-11 And 2011-12 First Look* U.S. Department of Education. Accessed April 1, 2015. http://nces.ed.gov/pubs2014/2014391.pdf.

National Science Board. 2008. *International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation's Innovation Enterprise*. NSB-08-04. Washington, D. C.: National Science Foundation. Accessed February 3, 2015. http://www.nsf.gov/pubs/2008/nsb084/nsb084.pdf.

NCES.ed.gov. “National Center for Education Statistics (NCES) Home Page.” A Part of the U.S. Department Of Education. Last modified 2015. Accessed February 3, 2015. http://nces.ed.gov/.

Nellis, M. Duane. 1994. “Technology in Geographic Education: Reflections and Future Directions.” *Journal of Geography* 93, no. 1 (1994): 36-39.

Nurmi, Sami, and Tomi Jaakkola. 2006. “Promises and Pitfalls of Learning Objects.” *Learning, Media and Technology* 31, no. 3 (2006): 269-285.

Ochoa, X, A.S. Sprock, and I.F. Silveira. 2011. “Colloborative Open Textbooks for Latin America-The Latin Project.” In *2011 International Conference*, 398-40. Information Society (i-Society), 2011.Accessed April 1, 2015. http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5978479&url=http%3A%2F%2Fieeexplore.ieee.org%2Fstamp%2Fstamp.jsp%3Ftp%3D%26arnumber%3D5978479.

Pett, Marjorie A. 1997. *Nonparametric Statistics for Health Care Research*. Thousand Oaks, Calif.: Sage Publications.

Pitchford, Nicola. 2014. *Unlocking Talent: Evaluation of Tablet-Based Masamu Intervention in a Malawian Primary School*. Nottingham, United Kingdom: University of Nottingham, 2014. Accessed January 27, 2015. https://onebillion.org.uk/downloads/unlocking-talent-final-report.pdf.

Quirós-Arias, Lilliam. 2009. “Geography Education in Costa Rica'.” In *Geography Education Pan American Perspectives*, edited by Osvaldo Muñiz-Solari and Richard G. Boehm, 205-230. San Marcos, Texas: The Grosvenor Center for Geographic Education.

Razali, Normadiah Mohd, and Yap Bee Wah. 2011. “Power Comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling Tests.” *Journal of Statistical Modeling and Analytics* 2, no. 1 (2011): 21-33. Accessed August 13, 2015. http://www.instatmy.org.my/downloads/e-jurnal%202/3.pdf.

Reeve, Derek, Susan Hardwick, Karen Kemp, and Teresa Ploszajska. 2000. “Delivering Geography Courses Internationally.” *Journal of Geography in Higher Education* 24, no. 2 (2000): 228-237.

Rich, David C., Geoffrey Robinson, and Robert S. Bednarz. 2000. “Collaboration and the Successful Use of Information and Communications Technologies in Teaching and Learning Geography in Higher Education. *“Journal of Geography in Higher Education* 24, no. 2 (2000): 263-270.

Rodrigue, Christine M. 2002. “Assessment of an Experiment in Teaching Geography Online.” In *Annual Meeting of the California Geographical Society (56Th)*. Accessed March 24, 2015. http://eric.ed.gov/?id=ED481430.

Rodrigue, Christine. 2011. *Chi-Square Modeling Spreadsheet*. Windows. California State University Long Beach, Geography Department.

Rodrigue, Christine. 2003. *Representation of the September 11th Terrorists Attacks in the Online Edition of the Los Angeles Times*. University of Colorado Natural Hazards Research and Application Information Center. Accessed March 30, 2015. http://www.colorado.edu/hazards/publications/sp/sp39/sept11book_ch20_rodrigue.pdf.

Rovai, Alfred P., and Mervyn J. Wighting. 2005. “Feelings of Alienation and Community Among Higher Education Students in a Virtual Classroom.” *The Internet and Higher Education* 8, no. 2 (2005): 97-110.

Rowe, Kenneth R., and Jason Berv. 2000. “Constructing Constructivism, Epistemologial and Pedagogical.” In *Constructivism in Education Opinions and Second Opinions on Controversial Issues*, edited by D. C. Phillips, 1st ed. Chicago, Illinois: University of Chicago Press.

Rutherford, D. J. 2000. “Assessing a Computer Aided Instructional Strategy in Geographic Education.” Master’s thesis, California State University Fullerton.

Schunk, Dale H. 2000. *Learning Theories an Educational Perspective*. 3rd ed. Upper Saddle River, New Jersey: Merrill.

Schwartz, Daniel L., Robb Lindgren, and Sarah Lewis. 2009. "Constructivism in an Age of Non-Constructivist Assessments." In *Constructivist Instruction: Success or Failure?* edited by Sigmund Tobias and Thomas M. Duffy, 34-62. 1st ed. New York: Taylor & Francis.

Slavin, R. E. 2006. *Education Psychology: Theory and Practice*. 8th ed. San Francisco, CA: Pearson.

Solem, Michael. 2001. "Choosing the Network Less Traveled: Perceptions of Internet-Based Teaching in College Geography." *The Professional Geographer* 53, no. 2 (2001): 195-206.

SPSS. 2013. Windows. Chicago, Illinois: IBM.

Universidad Nacional Costa Rica. 2014? *Bachillerato y Licenciatura en Ciencias Geográpficas con énfasis en Ordenamiento del Territorio*, pamphlet, Costa Rica: Programa Publicaciones Universidad Nacional.

U.S. Department of Labor. 2014. "*College Enrollment and Work Activity of 2013 High School Graduates*." Accessed March 30, 2015. http://www.bls.gov/news.release/hsgec.nr0.htm.

Uzuner, Sedef. 2009. "Questions of Culture in Distance Learning: A Research Review." *International Review of Research in Open and Distance Learning* 10, no. 3 (2009): 1-19. Accessed August 31, 2015. http://www.irrodl.org/index.php/irrodl/article/view/690/1273.

Zhang, Qin. 2009. "Perceived Teacher Credibility and Student Learning: Development of a Multicultural Model." *Western Journal of Communication 73*, no. 3 (2009): 326-347.