AN INVESTIGATION INTO STUDENT ENGAGEMENT WITH AN ONLINE COLLABORATION PLATFORM (EDMODO) IN A HIGH SCHOOL ENVIRONMENTAL SCIENCE COURSE

by

Peter G. Olson

An executive position paper submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Education in Educational Leadership

Summer 2014

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

AN INVESTIGATION INTO STUDENT ENGAGEMENT WITH AN ONLINE COLLABORATION PLATFORM (EDMODO) IN A HIGH SCHOOL ENVIRONMENTAL SCIENCE COURSE

by

Peter G. Olson

Approved: _____
Ralph P. Ferretti, Ph.D.
Director School of Education

Approved: _____
Lynn Okagaki, Ph.D.
Dean of the College of Education and Human Development

Approved: _____
James G. Richards, Ph.D.
Vice Provost for Graduate and Professional Education

I certify that I have read this executive position paper and that in my opinion it meets the academic and professional standard required by the University as an executive position paper for the degree of Doctor of Education.

Signed: _____

Zoubeida R. Dagher, Ph.D.
Professor in charge of executive position paper

I certify that I have read this executive position paper and that in my opinion it meets the academic and professional standard required by the University as an executive position paper for the degree of Doctor of Education.

Signed: _____

Danielle J. Ford, Ph.D.
Member of executive position paper committee

I certify that I have read this executive position paper and that in my opinion it meets the academic and professional standard required by the University as an executive position paper for the degree of Doctor of Education.

Signed: _____

William R. Hall, Ed.D.
Member of executive position paper committee

I certify that I have read this executive position paper and that in my opinion it meets the academic and professional standard required by the University as an executive position paper for the degree of Doctor of Education.

Signed: _____

Fred T. Hofstetter, Ph.D.
Member of executive position paper committee

ACKNOWLEDGMENTS

Thank you to everyone who has helped me make it this far. Much of this would not have been possible without the support of my committee. Your guidance and encouragement kept me on track to make the effort to complete this work. A special thanks goes to Dr. Dagher -Your coaching kept me going. Your kindness and patience is really wonderful. I also want to thank my family and friends who supported me along the way and told me to keep going when I thought the end was nowhere in sight.

To my wife Andrea, who without constant reminders and loving encouragement, motivated me to finish what I started so long ago. Your patience and sacrifice of time for me will always be remembered. Finally, this is dedicated to our new baby, Alexandria, who arrived here at the end of my project and provided me with a strong incentive to complete my final defense and paper.

TABLE OF CONTENTS

LIST OF TABLES vii
LIST OF FIGURES ix
ABSTRACT x

Chapter

1. INTRODUCTION 1

    Problem Statement 1
    Goals for the Study 4
    Contextual Information 5

2. CONCEPTUAL FRAMEWORK 7

    Technology Defined 8
    Theories of Technology Use in Education 9
    Technology Use and Gender 12
    Technology Use and its Impact on Collaboration 14
    Technology and Effects on Attitude and Performance 15
    Limitations of Technology in Instructional Settings 17
    Potential Roles of Teachers Using Technology 19
    Summary 21

3. METHODOLOGY 25

    Context 25
    Research Questions 27
    Participants 29
    Description of Instructional Context 30
    Description of Research Tools 32

        Rubric 1 33
        Rubric 2 37
        Rubric 3 41
        Attitude Survey 42

Unit Exam 43

Implementation of Project 44

4. ANALYSIS 50

Background Information 50
Quality and Quantity of Online Posts Comparison 52

Extending Uzuner's Rubric 71

Analysis of Usefulness of Rubrics 79
Inter-rater Reliability 81
Analysis of Student Attitudes 83
Exam Performance and Quantity of Response Comparison 87

5. DISCUSSION AND CONCLUSIONS 92

Discussion 92
Conclusions 99

REFERENCES 104

Appendices

A EDMODO SCREENSHOT 110
B SAMPLE WEBQUEST 111
C SAMPLE WEBQUEST 1 AND WEBQUEST 3 ONLINE POSTS 117
D ATTITUDES TOWARD ONLINE COLLABORATION LEARNING SURVEY 119
E SAMPLE UNIT EXAM 122
F EXAM ESSAY GRADING RUBRIC 130
G STUDENT POSTING RUBRIC 131
H COMPARISON OF PERCENTAGE RESPONSES FOR SURVEY 132
I HUMAN SUBJECTS FORMS 133
J COPYRIGHT PERMISSIONS 139

LIST OF TABLES

Table 3.1 Research Questions 29

Table 3.2 Cognitive Presence Rubric (CPR) 35

Table 3.3 Online Conversations and Educationally Valuable Talk (EVT) 38
and Educationally Less Valuable Talk (ELVT) Indicators

Table 3.4 Evaluating Students' Online Discussions Rubric (EOD) 41

Table 3.5 Timeline for Instruction and Data Collection 49

Table 4.1 Online Post Examples from Webquest 1 (W1) and Webquest 3 (W3) 53
using Cognitive Presence Rubric

Table 4.2 Comparisons of Quality Indicators for Cognitive Presence Rubric 55

Table 4.3 Online Post Examples from Webquest 1 (W1) and Webquest 3 (W3) 56
using the Educationally Valuable Talk (EVT) Indicators

Table 4.4 Online Post Examples from Webquest 1 (W1) and Webquest 3 (W3) 59
using the Educationally Less Valuable Talk (ELVT) Indicators

Table 4.5 Comparison of EVT Indicators Webquest 1 (N=6) vs. 61
Webquest 3 (N=6)

Table 4.6 Comparison of ELVT Indicators Webquest 1 (N=6) vs. 63
Webquest 3 (N=6)

Table 4.7 Tukey HSD Test of Significant Differences for EVT/ELVT Rubric 65

Table 4.8 Online Post Examples from Webquest 1 (W1) vs. Webquest 3 (W3) 67
for Evaluating Online Discussion Rubric

Table 4.9 Comparison between Webquest 1 (W1) vs. Webquest 3 (W3) for 70
Evaluation of Online Discussions

Table 4.10 Tukey HSD Test of Significant Differences for EOD 71

Table 4.11 Additions to EVT/ELVT Rubric 72

Table 4.12 Online Post Examples from Webquest 1 (W1) and Webquest 3 (W3) using Additions of New Indicators to EVT/ELVT Rubric 73

Table 4.13 Comparison of Modified EVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6) 75

Table 4.14 Comparison of Modified EVT/ELVT Rubric Both Webquest 1 (N=6) vs. Webquest 3 (N=6) 77

Table 4.15 Tukey HSD Test of Significant Differences for Modified EVT/ELVT Rubric 78

Table 4.16 Comparison of Pearson Correlation between Researcher and Outside Evaluator 82

Table 4.17 Attitudes Toward Online Collaboration Survey Corresponding Questions 84

Table 4.18 Comparison of Positive and Negative Question Responses (*N*=22) 86

Table 4.19 Comparison of Pearson Correlation r-values for Exam Information 89

LIST OF FIGURES

Figure 3.1 Frequency of Cognitive Presence by Instructional Method 36

Figure 4.1 Cognitive Presence Indicators Webquest 1 (N=6) vs. Webquest 3 (N=6) 54

Figure 4.2 EVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6) 60

Figure 4.3 ELVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6) 62

Figure 4.4 Comparison Using EOD Rubric for Webquest 1 (N=6) vs. Webquest 3 (N=6) 69

Figure 4.5 Modified EVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6) 74

Figure 4.6 Modified ELVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6) 76

ABSTRACT

The purpose of this investigation was to examine student engagement with the online collaboration platform (Edmodo) by analyzing the quality and quantity of their online posts while assessing their performance and attitudes toward its use within an introductory high school Environmental Science class as they participated in two webquests. Students from one College Preparatory class consisting of mixed level abilities and consisting primarily of 9th and 10th graders participated in this investigation. All students participated in teacher provided instructional interventions between the first and last webquests while completing the same webquests and unit exams. Data sources included: student online communication, pre-post data from an attitude survey and student performance on final unit exams. Analysis of the data consisted of an examination of the quality and quantity of student communication (online posts) during the completion of these units. I used three existing analytical frameworks (rubrics) to analyze the quality and quantity of the student online posts. Noting that none of them accounted for some student posts noted in this study, I adapted Uzuner's rubric (2007) by adding three additional indicators. The new indicators were: Content Information Resources for Computer Links, Content Information Resources for Pasting of Pictures and New Information, and Organizing.

The main conclusions derived from this investigation were: 1. Student online posts became more diverse as the study progressed, but stayed relatively stable across the two webquests. 2. The Educationally Valuable Talk / Educationally Less Valuable Talk (EVT/ELVT) and the Evaluating Students' Online Discussions (EOD) Rubrics were found to be effective for analysis of student online posts. The EOD rubric was the easiest and most practical for teacher use. 3. Despite conducting the study at the end of the school year, the students maintained interest and engagement during the online learning platform exercise and viewed its use in a positive manner. 4. Higher unit exam scores, even when broken down into multiple choice and essay components, showed a positive correlation with groups who posted most often and those groups with the greatest variety of posts. This investigation suggests that the use of online collaboration platforms could potentially be useful to classroom teachers not just as a motivator, but also to help close the learning gap for special needs students. Edmodo appeared to provide a flexible and user-friendly environment that encourages student learning and engagement in this study, which was limited to one science class. Based on my findings, I recommend further experimentation with Edmodo. The experience gained in implementing and evaluating this online collaborative tool will enable me to expand its use to other courses and support other teachers in my school/district by adapting it to their needs.

Chapter 1

INTRODUCTION

Problem Statement

Throughout my teaching experience, I have had an ongoing interest in using technology. Earlier in my career, the best available technologies for use in the classroom were an overhead projector and VCR. The student level of interaction with these instruments was minimal. Students did not have the opportunity to create and study with these machines. They merely had to absorb the information that presented to them. In general, it was not very exciting or motivating. As a result, I have constantly searched for better ways to engage students, help them in the learning process, and subsequently make my job easier.

Currently, I use and have used a variety of hands-on laboratories, written assignments, videos, Internet research, and an interactive whiteboard to deliver content to my students in Environmental Science. While classes are very much teacher-centered, with me delivering content and answering student questions, students appear to be less interested in learning than in the past. My personal observation is that today's students gravitate toward a faster paced world delivered to them via the Internet. Instantaneous social interaction via texting and surfing the Web for both information and their independence motivate them. The use of social media such as

Facebook remains popular by allowing students to share, create, and organize their day-to-day activities.

Because of these observations and experiences, I began to wonder how harnessing technology could bring my students' attention back to the subject matter. A quick look or search on the Internet produced a myriad of services and ways in which infusing technology into classroom teaching is currently happening. The educational community is going through a stage of instructional innovation brought about by quickly advancing technologies. The ability to access information through the digital world is unparalleled to any other time in history. According to Andrew Churches (2008), a modernized and revised look at Bloom's Taxonomy shows how integration of today's technologies are being used presently to develop various levels of cognition. For example, bookmarking, highlighting ideas, or searching may develop lower level thinking skills related to "remembering." In addition, programming, blogging, posting, and collaborating may develop higher-level thinking skills such as "creativity and evaluating." For me, many questions developed about how I might use these technologies to improve students' engagement and learning.

A comprehensive question was and is "Are students really learning anything despite the use of various technologies within the classroom?" Development of new technologies to deliver quality education to a diverse audience is continually evolving. The use of computers for instruction is a rapidly improving and a significantly more available means to address the issue of providing different methods of instruction (Barbour & Reeves, 2009). Overall, how effective are the emerging technologies? Is

it possible that online collaboration could accomplish the same results as traditional paper, pencil, and classroom group work?

Perhaps the motivation generated by the use of something new and novel is driving student learning. Over time, massive use of technology could become much like the use of old-fashioned study techniques we currently have today. Students may still lack personal motivation and interest regardless of what is before them. However, do students develop better attitudes toward learning when using online collaboration?

Each person develops his or her own perception of the world, essentially forming an internal schema, according to Vygotsky (1978). Collaboration among peers allows for the exchange of ideas and provides opportunities for students to experience the perspectives of others, furthering the development of each person's individual comprehension of the world around them (i.e. a more comprehensive view based on additional data). Collaboration is a 21st-Century skill that students need as they grow older and have to work with others. (Assessment & Teaching of 21st Century Skills, 2012).

My search for optimal use of technology continued because of these questions and thoughts. During my quest to improve my teaching, I found a website describing various online services such as Edublogs. Some were free but limited in their capabilities, and others were free for the teachers but not students. Since many of my students are poor and budgets are tight, I decided that a free online service would be best to pursue. Edmodo came to my attention because it was free, secure, and allowed teachers to have great flexibility in creating collaborative environments. Since my

students had to work in small groups to complete lab work and other small assignments, a website that would allow them to communicate easily while encouraging learning sounded like a good fit. The classes I teach in Environmental Science and Agriculture consist of a mixed enrollment of students ranging from grades nine through twelve. Therefore, I needed an online platform that would work with a variety of students simultaneously.

Goals for the Study

While I recognize that the use of technology in the classroom will not meet all of the needs and demands of students and parents, I decided that Edmodo would provide the platform for facilitating my students' learning and motivation while allowing me to explore its impact on student learning and attitudes. If this type of online platform was beneficial for engaging and helping my students in one of my courses, then I hoped that it might be possible to use that platform in my other courses and encourage more of my colleagues to use it. The purpose of this study was to investigate the quality and quantity of student online posts as an indicator of student engagement and interest while assessing their performance and attitudes toward online collaboration within an introductory high school Environmental Science class.

This investigation focused on four main questions:

1. How do students engage in an online collaboration platform (Edmodo) as indicated by the quality and quantity of their online posts?
2. How useful are some available evaluative rubrics for characterizing student online posts?
3. What are students' attitudes toward learning science while utilizing an online collaboration platform?
4. Do the quality and/or quantity of students' online posts correlate with their performance on their final unit exams?

Contextual Information

The subject of this study was a mixed-level introductory Environmental Science course. The majority of students tended to be in the ninth and tenth grades, although some older students took the course to fill their schedules. The number of students was 24 students, two of whom entered the class midway through the study. Specifically the number of students who participated was as follows: 24 students were included in the evaluation, 22 completed the entire study and two completed the second half only. This study used two units. The breakdown for completion of each unit was as follows (n=22 for part 1 and n=24 for part 2). Access to computer technology was limited at times due to scheduling conflicts with the library computer lab, sharing of laptop carts between teachers within our science department, and state testing schedules.

I have carried out small webquests in the past with my classes, but not while using an online collaborative platform with the students. The students completed them on an individual basis or shared computers and worked in teams. Overall, the students enjoyed completing the assignments. The basis for this is unclear and inferences are only speculative, however one possible explanation for student enjoyment may be due to the ability to work independently or in small groups. Since Smartphone use has been on the increase with better, faster, and cheaper phones, I permitted their use for the completion of the online collaboration work with the principal's permission. Edmodo had a free downloadable application (App) that allowed students, teachers, or parents the opportunity to access the assignments. This allowed greater flexibility to students who did not have consistent access to the Internet through computer access and would potentially limit bias toward students that had greater access to one form of Internet access. My belief was that the students would be excited to try Edmodo during this study.

Chapter 2

CONCEPTUAL FRAMEWORK

For many years, teaching has had to adapt to the demands of many groups espousing how delivery of instruction should occur in our nation's schools. Many groups ranging from the American Association for the Advancement of Science to the neighbor next door have stated what schools should do and how they should operate. Over time, it has led to many innovations and discussions about how to improve the learning process. A large part of modern teaching has involved the use of technology. During the past fifty years, the development of new, computerized technologies has increased rapidly. Digital technologies such as computers, social networking, mobile devices, and video games have each contributed vastly to changing the educational landscape. We must consider the effectiveness in improving student learning before implementing technology for augmenting the learning process. How should teaching use technology?

A review of the literature, as summarized later in this chapter, has produced some interesting insights into both how technology development has evolved as well as how its incorporation into the educational landscape might occur. Learning theory has informed the development of new learning software and, in return, new technological applications are contributing to further understanding how people learn. Clearly, motivation is important for encouraging students at all levels of ability.

While technology is continuing to evolve and develop, it is still only part of the solution to improving student learning.

Questions will always arise about the role that technology will and should play in the educational process. What is the role of future teachers in the coming years? Will machines and remote learning replace them? Are teachers going to have the important role that they have today, or will they become facilitators of technology use? Are schools as we currently know them going to remain? It is important to remember that we are still developing a better understanding of learning. Potential technology use is developing as well.

Technology Defined

Technology is constantly evolving and is changing exponentially. Because of the rapid increase in innovative technologies, designing and developing educational tools is naturally happening in a similar fashion. Current technology has developed to the point where it allows people to communicate in many ways such as in real-time via instant messaging, blogging, Voice over Internet protocol (VoIP), and video conferencing (Techterms.com, 2012). The term "Information Communication Technologies (ICT) includes the Internet, wireless networks, cell phones, and other communication mediums" (Techterms.com, 2012). Technology as defined by Webster's Dictionary (1999) is "the body of knowledge available to a civilization that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials." For the purposes of this project, I am defining technology as the

use of computer aided instruction through the implementation of software, hardware, and sampling devices.

Theories of Technology use in Education

Early discussion about the development of computers to aid higher-level instruction occurred in the mid 1960's with the Robbins and Hale reports in England (Hartley, 2010). The question at the time was about how to actually design an effective delivery system that utilized computer technology into something that was useful and effective in the educational realm. As a result, software design was dependent upon developing an understanding of how people learn. With the input of teachers and psychologists, computer scientists began to create software that utilized learning theory as a framework and basis for their programming. A basic division of learning theories that impacted the development of technology evolved over time, and appears to fall within three main groups: behaviorist, constructivist, and socio-cultural, with activity theory and situated learning as subgroups of socio-cultural.

So, what are the differences in and contributions of these theories with respect to the design of learning environments? Behaviorist learning theories influenced design of software into programs aimed at practice and skill development (Hartley, 2010). Behaviorist theories were the first theories used as frameworks to describe software for learning by associating matches between questions and answers, with reinforcement occurring with a correct match (Gleitman, 1995). The weakness of behaviorist theories has been described as being too reliant on drill and practice rather

than on developing understanding and thinking (Okan, 2003). After all, the ultimate goal of education is to produce citizens who are capable of making rational decisions.

The capabilities of early software were limited in their ability to encourage thinking. Researchers, using a pedagogical approach to technology design, worked to develop software that could give students more control over their learning (Hartley, 2010). Cognitive researchers approached the development of software that would enable students to build and reflect on concrete models that represented their understanding of a subject (Hartley, 2010). A way to improve intrinsic motivation for learning while using cognitive theory involved using individual student perceptions of realistic situations (Egenfield-Nielsen, 2006). In general, the evolution of technology to this point involved increasing student interaction with software to improve learning.

As time progressed, the theoretical use of constructivist teaching methods emphasized the use of virtual objects to increase knowledge gain, creativity, and enthusiasm in students, which led to the invention of virtual worlds through game invention (Papert, 1998). According to Egenfield-Nielsen (2006), the use of video games in learning was like a "lost paradise" to some constructivists because of the flexibility given to the students to create connections between objects and their interactions. One of the most important contributors was Yasmin Kafai, who developed the concept of letting children design games and thereby produce more intrinsic knowledge during play with computerized objects in varied ways (Egenfield-Nielsen, 2006).

Interestingly, a common phenomenon observed in children simply playing in their backyards is that they make up their own games and activities. According to Paraskeva, Mysirlaki and Papagianni (2010), the socio-cultural application of learning theories such as those advocated by Vygotsky, Lave, Wertsch, Wenger, and Leontjev, view activities as being moderated by knowledge. These theoreticians developed activity theory, socio-cultural theory, and situated learning (Paraskeva, Mysirlaki, and Papagianni, 2010). The broadest orientation of these constructs about learning is socio-cultural, which emphasizes activity as the unit of analysis. Situated learning depends on the community in which learning happens, and activity theory focuses on tools and labor for evaluating learning (Egenfield-Nielsen, 2006).

The main idea behind activity theory is that "human behavior is situated within a social context which influences actions. Actions are mediated by the rules of the community and the division of labor within the community influences the ways in which we behave" (Scanlon and Issoff, 2005). While the development of many theories of learning is important, a question arises in determining the most accurate and effective model for implementation. A great amount of research still needs to occur.

Of the theories previously mentioned, activity theory provides some promise in supporting a modification of online gaming for application to educational environments. Activity theory could develop a framework for developing online multiplayer educational games as a complex learning system. Students would interact with their peers, objects, and tools in the game, all while following a prescribed set of

rules. These virtual communities from a division of labor would then lead to the desired learning outcome (Paraskeva et al, 2010). This system represents the interactions between many types of factors that affect game playing such as the subjects, objects, tools, rules, community, and division of labor. The addition of psychosocial issues such as gender differences and preferences, computer self-efficacy, academic performance, and self-esteem are then included as a further modification to the activity model to improve its applicability to creating useful educational software. In essence, assumptions from activity theory can facilitate the creation of a virtual world utilizing flexible controls of many inputs to potentially reach a desired outcome.

Technology Use and Gender

Consideration of the psychosocial effects on technology design is important because of the variation in pupil approaches to learning in areas such as gender. Findings show that men are more strongly influenced by the usefulness of new software as compared to women who were more influenced by an ease of use that diminished over time, as found in a study of technology use in the workplace (Venkatesh, 2000).

In an examination of differences between male and female perceptions of computer self-efficacy, women with high self-efficacy were, unlike men, less likely to have a higher intention to play online computer games (Wang and Wang, 2008). Additionally, anxiety regarding computer gaming was higher in women and led to

further reduction in interest to play online games versus low-anxiety females, while no difference was found in desire to play online games between males with higher anxiety as compared to males having low computer anxiety (Wang and Wang, 2008).

In another study, males viewed games as being cool and exciting if they involved shooting and good graphics and females viewed games as fun when they involved having to think or strategize (Yelland and Margaret, 2001). There were no significant differences between adolescent boys and girls playing computer games, but the boys liked violent games while the girls liked games with fun characteristics (Griffiths, 1995).

The delivery of materials through web-based courses has had no significant effect on student performance; however, gender influence appears unconnected (Lam, 2009). Contrary to this, Gefen (2007) conducted a study in which online posts were examined for differences in language use between males and females: It was found that there were enough differences enabling researchers to distinguish between the posts by male students as compared to the female students. For example, males were more responsive to other males' online posts than to female posts among students who participated most actively in online discussions (Gefen, 2007). Clearly, gender differences do play some role in how people interact with technology. This is just one important aspect when considering technological implementation and design for the educational setting. It is important to consider other factors such as the interactions between peers and small groups. The difficulty resides in creating computer programs

capable of dealing with varied personalities of learners in differing social settings delivered by the software. Mobile applications (Apps) may aid in clearing this hurdle.

Technology Use and its Impact on Collaboration

Further discussion regarding the design of effective instruction involving the use of collaboration, found through an examination of computer use via Massive Multiplayer Online Gaming (MMOG) shows that MMOG can mimic collaboration if the design of the software is appropriate for learning and ties into activity learning theory mentioned previously. Collaborative learning is beneficial to both high-achieving and low-achieving students, but it is difficult to design computer environments that encourage this discourse (So, Seah, and Toh-heng, 2010). This hindrance in design may have a solution by utilizing ontologies to represent collaboration, while learning theories could be used to frame effective learning scenarios in computer-supported collaborative learning (Isotani, Mizoguchi, Inaba, and Mitsuru, 2010).

Many software packages have yet to integrate technology into collaborative and inquiry-based instruction (Wang, Kinzie, McGuire, and Pan, 2010). Beginning research in the area of computer-supported collaborative learning has led to the development of "theory-aware" computer systems, and used with some initial success allowing teachers to better match learning scenarios to student activities (Isotani, et al., 2010). The use of classroom response systems has had a positive effect on English language learners by providing more opportunities for interaction and discourse to

occur in their learning (Langman and Carmen, 2010). Kickmeier-Rust and Albert (2010) suggest that software that uses micro-adaptivity to monitor and change based upon the users' interactions shows potential for future use in learning systems. Currently, many new sites are evolving greater capabilities and more flexibility for use in the classroom. Some examples include Edublogs, Edmodo, Writeboard, and Redline. This list continues to grow. In general, software is becoming more interactive for the users. This appears to be a key to enhancing student desire to learn.

Technology and Effects on Attitude and Performance

Examination of the computer use on student motivation demonstrates their advantages for use as an instructional tool. Many kids get bored in school for a variety of reasons. A positive benefit of computers is that they allow for differentiation for the delivery of material to the students. Technology may be useful for enhancing project-based learning by sustaining motivation and thinking over longer time periods (Blumenfeld, Fishman, Krajcik, Marx, and Soloway, 1991). While no significant difference in the level of performance was measured in a university Physics classroom delivering web-based homework compared to a group given paper and pencil assignments, both groups viewed the use of web-based homework in a positive way (Demirci, 2007). When given the opportunity to create, customize, and share their projects via a program called Netlogo, senior high school students demonstrated positive motivation for learning and understanding (Pfaffman, 2004).

According to Vanderwaetere and Clarebout (2011), students at the university level who were given more control over the pacing of their learning and general autonomy were more satisfied with their experiences. In a study involving the evaluation of a software program designed for learning disabled students called K-3000, results showed that the treatment group using the program outperformed the non-treatment group both in reading competence and in filling out an education and work-experience information section of the exam (Chiang and Jacobs, 2009).

Marino and Dunn (2010) found that using pictorial representations, video captions, and interactive tutorials enhanced post-test reading scores in students with severe reading problems. In a comparison of students using a 3-D educational video game utilizing narratives and a group using non-narrative approaches to learning, the results showed that the treatment group became more efficient in their use of instructional constructs than the non-treatment group who learned more by trial and error (Koenig, 2008). Additionally, the study found some indications, though not statistically significant, that the narrative treatment group performed better on a post-test, took less time to complete the project, and felt it was easier to learn than the non-treatment group (Koenig, 2008).

Chang and Tsai (2005) found that depending on the learning preference of students, whether it is toward a more teacher-centered type of instruction or student-centered instruction, attitudes toward learning were independent of computer-aided instruction use. Furthermore, fear of and the perception of the importance of learning mathematics was found to have more influence on student learning than the use of

virtual manipulatives in junior high school students in Taiwan (Lee and Chen, 2010). The use of multiple representations may be of benefit to the instructor as well to learners' performance and motivation (Ainsworth, 1999). The interest of students is an important consideration in technological application in the classroom. However, it is not the only factor affecting individual or school performance.

Limitations of Technology in Instructional Settings

Technology, defined earlier in this chapter as the use of computer-aided instruction through the implementation of software, hardware, and sampling devices such as Vernier probes, has the potential for improving the educational process, but what are the potential problems with using it? As with most things, technology is not perfect for every task. In addition, the manner of delivery of course content plays an important role in student engagement. However, one of the problems in technological content delivery is that online courses tend to have a high drop-out rate, with those students having a significantly lower satisfaction rate than students who do complete their online coursework (Levy, 2007). Controlling student interactions online in a constructive manner can be difficult (McCrory, Putnam, and Jansen, 2008). Teacher experience is another consideration, as student teachers may have low self-efficacy in encouraging and using technology with students (Benzce, 2010).

The cost of acquiring and maintaining hardware and software is very high. Some of these issues may be addressed by careful selection of the type of technology to be used with the learners, as a one size fits all approach may not work due to

inherent personality differences in the learners (Waite, Wheeler and Bromfield, 2007). Problems are not just associated with the software design, but also in applying it as well.

Furthermore, a new potential conflict may be on the horizon: As delivery of content has become more efficient, it is then more difficult to assign and determine the proper volume of work for students to complete within a particular timeframe. The use of more advanced technological delivery (i.e. through more appropriately designed modalities) may mitigate some of this impending conflict. The use of computers for instruction is becoming a rapidly improved and readily available means to address the issue of providing a different method of instruction (Barbour and Reeves, 2009).

Many parents want their children to be moving along at the same pace as their peers without consideration for the actual differences between student abilities. Computers provide the opportunity for differentiation of instruction, but how can a guarantee of educational equity occur for all students? Thomas Jefferson and Horace Mann believed that the goal of education should be to develop good citizens and help them conform to a common culture; however, the use of technology may cause students to integrate less (Collins, 2010). While this view is plausible, the use of the Internet may actually lead people from many cultures to develop better awareness of each other through broader communication. In a way, the use of the Internet has made the world smaller. Furthermore, development of technology may also force parents to purchase newer devices and software for their children, due to concerns about preparing them for the future causing the gap between the “haves” and have “nots” to

widen (Collins, 2010). As with the advancement of new ideas, there will always be challenges to overcome.

Potential Roles of Teachers using Technology

The increasing use of technology has also changed, or has the potential to change the role of the teacher in the classroom setting. What is the role of the teacher or what should it be? Egenfield-Nielsen (2006) states that many edutainment software systems utilizing behaviorist and constructivist ideas neglect the role of the teacher as a facilitator and mediator in the learning process, unlike the socio-cultural approach. Furthermore, to what extent can the technology address students' complex cognitive perspectives about science, given their varied backgrounds and experiences? (Bell, 2002).

Is it within the future capabilities of technology to be able to supplant the role of an instructor? Technology does improve the role of a teacher as a facilitator, which is beneficial to students who are at risk of academic failure (Waxman, 2001). The task of the teacher can be broken down into two phases during the use of technology in the classroom: first, the teacher remotely moderates the activities of students by merely being present through the introduction of rules and procedures, and secondly, the teacher (or school) provides the actual technology to for use (Warwick, Mercer, Kershner, and Staarman, 2010). Teacher expectations were directly correlated with both students' ability beliefs and perceptions of learning activities as creative and personally meaningful, and acted as an important predictor of students' interests in

computing (Vekiri, 2009). Rohaan, Taconis, and Jochems (2010) state that six aspects of technology-specific teacher knowledge influence student attitudes toward learning. They are: general subject matter knowledge (SMK), concept of technology, knowledge of pupils' concepts of technology, knowledge of pedagogical approaches and teaching strategies for technology education, knowledge about the nature and purpose of technology education, and attitude towards technology and confidence in teaching technology.

Rohaan, et al. (2010), maintain that there is need for more research to occur in this area to confirm the theoretical view of the influences of teacher knowledge on pupils' attitude. The use of technology should enable students to become independent lifelong learners if they have access to learning technologies that allow it. If students become more independent, then the role of the teacher will become more of a facilitator rather than a provider of information. Understanding how teachers influence students to learn is not clear, however. Apparently, if an understanding of how teacher and student interactions drive learning is not well understood, then the task of determining effective technology utilization in the classroom becomes less obvious.

One of the challenges is selecting the right tool to characterize student online posts and interactions among students and teachers. Gauging student performance objectively can be difficult in a classroom setting. Students need clear expectations, and teachers need to be able to offer useful feedback to the students to help them learn. Developed rubrics are commonly available for a wide variety of subjects, and are

available for many situations ranging from grading individual posts to the characterization of interactions among many groups or individuals. Also, rubrics may answer the question of how technologies used for instruction are affecting student learning.

Summary

If a clear understanding of how learning occurs develops into an efficient system, then how does one scale up the use of technology? As with any new technology, limitations exist in the initial setup cost. Many developments in software design are improving and ongoing. Is it possible to deliver this new technology to underprivileged students and schools? While many people in society want their children to attend quality institutions of education, they may not want to pay for it. It may be possible to teach subjects to students without a lot of technology, thereby negating the need for more and more technology in schools.

The question to be answered is: "if there is a lot of investment technological implementation within schools, then will there be a parallel payoff in results?" Will learning improve? Virtual labs can be cheaper than conducting real life activities with materials, but the elimination of smells, a sense of texture, and feeling limits the experiences of students during the learning process. The use of virtual learning environments also may enlarge the divide between good students and disengaged ones (Maltby, 2009). Students capable of learning in the virtual environment could accelerate the rate of their learning beyond students who have no desire to perform.

Delivery of course materials and the complexity of virtual learning environments may influence how students interact with the software (Persky, 2009). Animations of complex subject matter can be beneficial and ease the learning process for students if the cognitive fit is appropriate (Li, 2009). By providing an environment, that instructors can control and monitor closely, virtual worlds may provide the adaptability needed in schools. Technology may provide teachers with more opportunities to customize lessons that may help struggling students to reach their maximum learning potential.

Currently, the advance of technology has caused the creation of social media sites like Facebook, which many people use for communication and sharing information. It is hard to find someone, in particular among the Millennials and generation Y (those youths of the late 70's to the early 2000's), who does not use Facebook as a tool to communicate. Due to these changes in current technologies, more and more students are becoming accustomed to accessing information they need to learn in a much more connected way than previous generations. Most students appear to enjoy and remain interested in using technology in its various forms during their daily learning experience. An examination of the updated Bloom's Digital taxonomy reveals an expanded application of new technologies that have begun to change the educational and interactive landscape as expanded by Churches (2008). This newly adapted taxonomy parallels the original Bloom's Taxonomy, adding verbs to describe the learning process with digital tools. A sample of the key terms and some of the associated verbs added are as follows: Creating – blogging, programming,

podcasting; Evaluating – posting, moderating, collaborating, networking; Analyzing – linking, tagging, cracking; Applying – playing, operating, hacking, uploading, sharing; Understanding – commenting, annotating, twittering, Remembering – highlighting, bookmarking, googling, searching (Churches, 2008).

It is necessary for constant evaluation of the effects of new technologies on the educational landscape to continuously occur due to constant evolution and development of innovative instructional tools. Schools are under increasing pressure to improve the caliber of student preparedness from many groups, and the solution to this dilemma may be the use of technology. As the literature reveals, the advancement of technology shows future promise for improving student learning, but it also raises many complex questions. The development of the various theories about learning appears to be evolving into a more concise description of how people learn. New technologies are allowing further development of these theories as well as providing a means for their evaluation.

Of course, from my perspective as a high school teacher, technologies may be of benefit. However, careful evaluation of how to effectively infuse technology into the classroom environment is critical. Upon reviewing the literature, I believe that using Edmodo as a collaboration platform to support student learning at the high school level could be beneficial. The literature clearly demonstrates that technology development continues to evolve into more complex and customizable tools with potential to enhance student learning. Socio-cultural learning theory and the updated Bloom's Taxonomy underscored my use of Edmodo as a collaborative tool for

supporting student learning. Edmodo provided a broad and customizable environment in which all of my students, who varied in their abilities, were able to collaborate in a social environment while providing an opportunity for observations of higher-level thinking to occur. The potential for using Edmodo to improve student learning and to enhance my teaching as well as that of my coworkers are the reasons why I developed an interest in its use and application.

Chapter 3

METHODOLOGY

Context

The intent of this investigation was to determine the impact of using an online collaboration platform (Edmodo) on the quality and quantity of student posts online and to assess their performance and attitudes toward its use within an introductory Environmental Science class. My thoughts about this topic developed over time while teaching science for the past sixteen years and my general awe and amazement at the speed of current technological advancements. I noticed through my experience that students had been adopting new technologies at a quicker pace than what schools were providing. I wondered if the use of these new technologies could improve the quality of my instruction as well as that of my colleagues.

At the start of my career, I was lucky to have a laptop computer for my use in the classroom, let alone having access to a computer lab for the students to use. Available software and access to computers for student use was minimal or even nonexistent. At the time of this study, the students in my high school had one well-equipped library computer lab and mobile carts with approximately 30 Apple computers for teachers to share within each department. There were approximately nine teachers in each department. All of the technology was Internet ready. Furthermore, many students owned their own smartphones, allowing them wireless access to the Internet at various locations and times of day. At the beginning of my career, the proliferation of smartphones was nonexistent. However, they may have

proved to be a useful tool to bridge the technological divide separating students who had all the technology they needed at home with the student whose only advanced technology access was his or her smartphone, obtained at a lesser cost. The social aspects of using technology seemed to gain the attention of all students easily, and they appeared to have a positive attitude about its use in general as well.

Software used to enhance student learning has also advanced tremendously. The overall goal of this study was to study high school student engagement with the Environmental Science content when using Edmodo as an online collaboration platform. Many questions arose in my mind such as: Will students produce quality interactions among each other within small groups? Will they have a positive outlook regarding the use of this technology? Will it enhance their performance too?

Access to this platform was reached via the website www.edmodo.com (See Appendix A). The service was free to schools, teachers, parents, and students to use. Edmodo designers created their service as a means to "provide a secure place to connect and collaborate, share content and educational applications, and access homework, grades, class discussions and notifications with the goal to help educators harness the power of social media to customize the classroom for each and every learner " (Edmodo.com, 2012).

This website was similar to Facebook, which many students used in their spare time. The key difference with Edmodo was that the teacher could control who entered a group discussion or classroom space via secure password protection. Parents also had the ability to have access to their child's' website simply by contacting the teacher for the password. Similarly, a school administrator also had the ability to designate a school or district as an Edmodo community for expansion beyond one or two

independently acting instructors. Therefore, the platform was flexible depending on the needs of the teachers, students, school, and parent communities. Nic Borg and Jeff O'Hara started Edmodo in 2008 to provide a way for helping schools and students connect in a current and popular mode of social media for communication. According to the developers, they designed Edmodo based upon teacher inputs, while taking into account the need for a secure Internet learning portal.

For this project, I used three webquests for topics of investigation while using the Edmodo platform. Webquests easily lend themselves to collaboration and discussion for students of many ages while using technology. The work of Bernie Dodge of San Diego University is the basis for the webquest format used in this study (Webquest.org, 2012). According to Kanuka et al. (2007), webquests produce a high level of cognitive response in university students. The main goal of many, if not all schools and educators, is to develop thoughtful and inquiring minds in their students.

Research Questions

After my initial observations from past years and based upon my curiosity, I developed four research questions for this study:

1. How do students engage in an online collaboration platform (Edmodo) as indicated by the quality and quantity of their online posts?
2. How useful are some available evaluative rubrics for characterizing student online posts?
3. What are students' attitudes toward learning science while utilizing an online collaboration platform?

4. Do the quality and/or quantity of students' online posts correlate with their performance on their final unit exams?

In order to investigate the effect of using Edmodo on student engagement as posed in questions one and three, I collected data from two webquests for analysis at the beginning and end of this investigation. I used an intermediate webquest to deliver instructional intervention, but the data were collected only for instructional purposes and were not included in this analysis. The first webquest covered the topic of climate change, the next one addressed forestry management, and the third webquest focused on investigating an invasive species. The chosen webquest topics met the State of Delaware Content Standards for Agriscience Education. To get different perspectives on how students engaged with Edmodo, I used three rubrics to code student posts. Additionally, I administered unit exams before the start of each webquest and upon their completion in a pre-test and post-test format. I also administered a survey, Attitudes Toward Online Collaboration; before the start of the first webquest and upon completion of the last webquest to attempt to answer research question three. Table 3.1 summarizes the research questions, sources of data, and methods of analysis.

Table 3.1

Research Questions and Methods

Question/Purpose	Data Source	Methods of Analysis	Value of Findings
1. How do students engage in an online collaboration platform (Edmodo) as indicated by the quality and quantity of their online posts?	Student online posts	Statistical analysis of frequency of responses via posts on different criteria within each rubric.	Analysis of quality and quantity of student on-line engagement allowed me to understand the depth and scope of their engagement and develop better scaffolds to support learning.
2. How useful are some available evaluative rubrics for characterizing student online posts?	Three literature-based rubrics to analyze student on-line posts.	a-Qualitative analysis of capacity of rubrics to subsume types of student online posts b-Inter-rater reliability.	Analysis of existing rubrics gave me the information I needed to select better tools to support learning through online collaboration.
3. What are students' attitudes toward learning science while utilizing an online collaboration platform?	Pre-& post-responses on an adapted version of "Attitudes Toward Online Collaboration" (Korkmaz, 2012).	Statistical analysis of pre-post responses to survey.	Findings helped me identify changes in students' attitudes towards on-line collaboration and to consider whether it was interfering with or promoting their engagement.
4. Do the quality and/or quantity of students' online posts correlate with their performance on their final unit exams?	Categorized student on-line, and exam scores.	Statistical analysis of frequency of responses via posts and exam scores.	Findings helped me consider ways to use on-line collaboration strategically in my instruction to boost student learning and subsequently their exam performance.

Participants

The participants in this investigation enrolled in an Introductory Environmental Science class at my high school. The course was an elective, and was the first course in the Natural Resources and Environmental Science career pathway. Each student at my high school was required to earn at least three credits of coursework in a pathway to graduate. The students enrolled in this course consisted mostly of ninth and tenth

graders. Five older students enrolled to fill empty slots within their schedules. Three of the older students were seniors and were unable to complete the third webquest due to graduation being earlier than the end of the school year. At the start of the instructional intervention period, I added two new students to the roster. One student in the class did not provide permission to participate in the study, and as a result, that student's data was unable to be collected. The student abilities ranged from special education to high functioning academic levels of classification. The average class size fluctuated from 22 students at the start of the study and climbed to 24 with the addition of the new students. The fact that there was only one female student enrolled in the course did not permit exploring gender factors. School demographics describe race and ethnicity during the 2012-2013 school year as 16.8% African American, 0.6% American Indian, 2.4% Asian, 0.1% Hawaiian, 8.9% Hispanic/Latino, 70.6% White, and 0.6% Multi-Racial. Even though considered rural, my high school is growing rapidly with an enrollment of 1,264 students.

Description of Instructional Context

Webquests provided a consistent instructional strategy for both presenting materials to the students and prompting them to collaborate online and post their ideas, questions, or suggestions. Using the Delaware State Agriscience standards, the webquests covered about one-half of the content for the units on each topic. The students were encouraged to go beyond rote recall of information by using broad topics in the webquests. Each webquest used the same structural format, with students

being required to provide their opinions and advice on how to solve a real-world problem. Each webquest used the same rubric for evaluation and grading. Each webquest 'package' contained a short introduction to the topic, a task to produce a 3-5-page paper and PowerPoint presentation consisting of 5-10 slides. Additionally the students received a process guide with hyperlinks to useful websites for help in conducting their research and for tips on identifying relevant information, guidance on setting up their PowerPoint slides, and finally a copy of the grading rubric that described how they were to be evaluated on their webquest project.

The first webquest covered the topic of climate change, and the students presented their views on whether or not it was real and how to deal with it. The next webquest was about forestry management, and the students developed a plan to manage a local forest so that opposing stakeholders such as townspeople and business representatives were satisfied with the outcome. Finally, during the third webquest, students investigated an invasive species of their choosing and discussed how to manage it. A sample webquest is located in Appendix B, and was based upon the work of Bernie Dodge at San Diego State University (Webquest.org, 2012) and adapted from the work of Anderson (2012). Each webquest covered topics that were purposely open-ended and encouraged students to develop an opinion or rationale for their decisions. The intent was to provide a structure that encouraged the students to collaborate on developing a solution to the problem presented as opposed to regurgitating facts.

According to Kanuka et al. (2007), students who were required to complete webquests and debates produced the highest levels of cognitive response in online postings during an investigation of online instructional methods at the university level. A Webquest is a problem-based or inquiry-based lesson that students complete by researching the given topic primarily from sources found on the Internet (webquest.org, 2012). Each group of students was required to produce one PowerPoint presentation and a final paper for each webquest for grades. A grade and feedback using the evaluation rubric included in the webquest sample provided the groups information about their performance for each webquest. See Appendix B. The first webquest established baseline data for comparison with data from the final webquest.

Description of Research Tools

I used three different analytical tools, or rubrics, to code for the quality and quantity of student online posts during the webquests to attempt to answer research questions one, two, and four. Next, I compared the first and last webquests for analysis. Since this study consisted of repeated-measure design, I used a *t* test to examine the data. Reviewing tabulated and coded data allowed for the detection of any patterns regarding the quality and quantity of student responses. Regression analysis reviewed the data further. If significant differences were found, then a Tukey HSD (Honestly Significant Difference) test was conducted Post Hoc to ascertain the sources of those differences.

Since language interpretation is a difficult task, I utilized three different coding rubrics as guides for my analysis of students' online posts. Each rubric provided slightly different ways to categorize students' posts. Therefore, each rubric served as a tool that I used to understand the data more clearly. The rubrics presented within this section demonstrate the development of my search for practical methods to evaluate the manner in which the students communicated online with each other. One goal of this study was to find a rubric that could provide teachers a useful and easy-to-use tool to better understand the quality of student communications on webquests in subjects that they teach. Ultimately, I extended one of the existing rubrics to accommodate types of online posts not accounted for in the three rubrics. In the following discussion, I will discuss each of the three rubrics used in this study.

Rubric 1. The first measure used to understand the quality and quantity of online students posts was the Cognitive Presence Rubric (CPR) developed by Kanuka et al. (2007) and used a frame of reference based upon Garrison et al. (2000) cognitive measurement analysis in "which learners are able to construct meaning through sustained reflection and discourse in a critical community of inquiry." Quantitative content analysis or QCA is the name of this process (Kanuka et al., 2007). Categorized student responses follow these structures: Phase 1-Triggering event, Phase 2-Exploration event, Phase 3-Integration event, and Phase 4-resolution. Information regarding the Cognitive Presence Rubric is in Table 3.2.

According to Kanuka et al. (2007), the rubric describes the process in which conversations and student interactions take place on a continuous cycle until reaching resolution. In order to code the online conversations, a corresponding number from the phase in which the online post best fit was recorded. See Appendix C.

Table 3.2

Cognitive Presence Rubric

Phases of Cognitive Presence	Description of Evidence of Process
Phase 1: Triggering Event	Student activities begin with a triggering event (Phase 1) followed by problem definition (Phase 2). There is evidence of directed and purposeful thinking, with a focus on the problem that is introduced as the triggering event. There is evidence of learners defining and redefining the problem presented. A critical spirit and intellectual autonomy is present, whereby learners critically assess the issues explored and are open to alternative explanations.
Phase 2: Exploration	There is evidence that learners are searching for explanations of the problem presented and are exploring relevant ideas. In addition to a critical attitude and expansive thinking, learners are divergently seeking for solutions; this is important in the development of critical thinking and problem solving, as ideas organize and make sense of contingent facts.
Phase 3: Integration	There is evidence of a conceptualization of the problem presented. Thinking is reflective and private, although reflection is socially shared with evidence of the individual tentatively making sense of the information that emerged during the exploratory phase. There is evidence of judgments and decisions being made and focused on an idea or emerging hypothesis.
Phase 4: Resolution	The idea or hypothesis is tested. The testing begins with an initial process of sharing the idea or hypothesis with peers who, in turn, provide insights. Learners become ready to act upon their understanding; if there is confirmation of the problem solution for resolution, understanding will result. An unsatisfactory resolution will trigger a renewed search and the process will begin anew.

Note. From "The influence of instructional methods on the quality of online discussion," by H. Kanuka, L. Rourke, & E. Laflamme, 2007, *British Journal of Educational Technology*, 38, p. 264. Copyright 2006, John Wiley and Sons. Reprinted with permission.

According to Kanuka et al. (2007), the online postings at the university level resulted in a ranking from most abundant to least common in the following: "exploration" phase, followed by an "integration" of concepts, "triggering events", with the least postings falling under the category of "resolution". Webquests had the largest number of posts in all phases when compared to interactions using other instructional methods such as debates, invited expert, nominal group technique, and reflective deliberation (Kanuka et al, 2007). The patterns of results are in Figure 3.1.

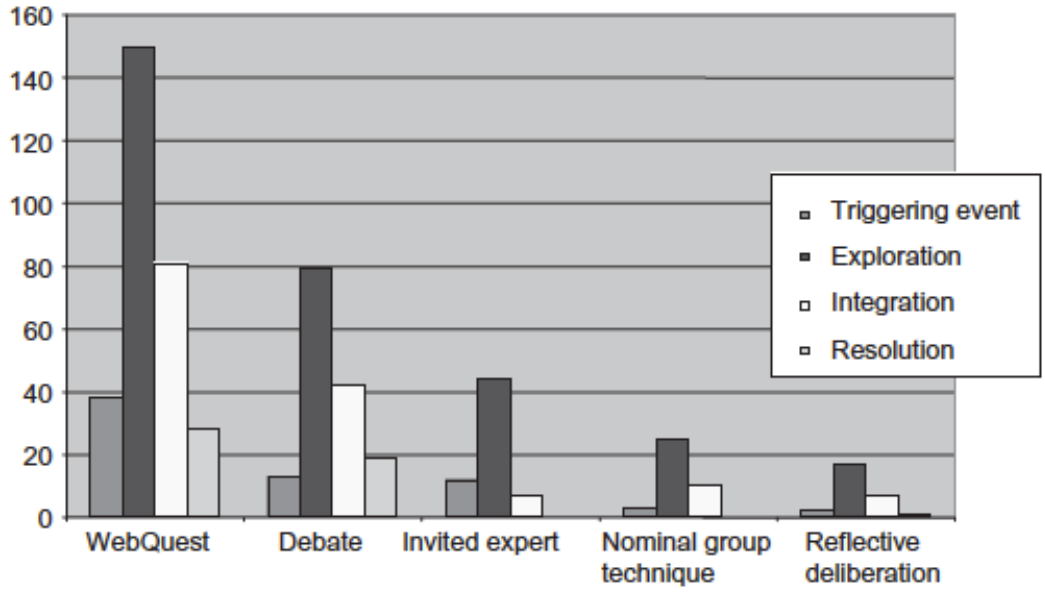


Figure 3.1. Frequency of Cognitive Presence by Instructional Method. From "The influence of instructional methods on the quality of online discussion," by Kanuka, H., Rourke, L., and Laflamme, E., 2007, *British Journal of Educational Technology*, 54, p. 267. Copyright 2006, John Wiley and Sons. Reprinted with permission.

The rubric provided a potentially useful way to measure student interactions while completing webquests suitable for students at the high school level. Additionally, the Cognitive Presence Rubric determined if high school student online posting data would generate a similar pattern of responses as those of university students.

Rubric 2. The second rubric, developed by Uzuner (2007), analyzed the content of the student online posts for quality and quantity in a different manner. The rubric examined the online conversations for Educationally Valuable Talk (EVT) and Educationally Less Valuable Talk (ELVT). Uzuner produced a rubric that provided a detailed breakdown of both EVT and ELVT. The benefit of this rubric was that it examined many detailed nuances of how people communicate, which provided a more thorough examination of the online posts produced by my students. The intent of Uzuner was to provide a broad yet functional framework for analysis of any online discussions for quality and quantity of posts with the potential for further customization. In addition, Uzuner provided examples for each indicator of EVT and ELVT within the rubric. See Table 3.3.

Table 3.3

Online Conversations and Educationally Valuable Talk (EVT) Indicators (Uzuner, 2007)

Indicator	Acronym	Defined	Examples
Exploratory	EPL	Recognition of some confusion/ curiosity or perplexity as a result of a problem/issue arising out of an experience/course readings; posing a problem and enticing others to take a step deeper into it.	"I wonder……." "I am not sure if what the author suggests……." "In the article X,the author said…. This brought up a few questions in my mind …."
Invitational	INVT	Inviting others to think together, to ponder, to engage by asking questions, requiring information, opinion or approval.	"Jane says ……..What do you think?" "Do you think……?" "The authors suggest …., no?"
Argumentation	ARG	Expressing reasoning (with analogies, causal, inductive and/or deductive reasoning etc) to trigger discussion.	"If teachers ……., then …….." "Teaching is like ……." "X is important because ……."
Critical	CRT	Challenging or counter-challenging statements/ideas proposed by others OR playing devil's advocate.	"I agree that …. However, ……."
Heuristic	HE	Expressing discovery (similar to "A ha!" moments or expressions like "I find it!"); directing others' attention to a newly discovered idea.	"I did not know that there is a name for XXX. I think XXX is…..Has anyone experienced that too?"
Reflective	REF	Examination of past events, practices (why/how they happened) or understandings in relation to formal content.	"I've noticed that I had a tendency to ….. After reading X's article, I've learned not to……"
Interpretive	INTP	Interpretation of formal content through opinions that are supported by relevant examples, facts, or evidence.	"In my opinion X is …… Y is a good example of why ……."
Analytical	ANL	Interpretation of content through the analysis, synthesis, and evaluation of others' understanding	"The original question was … Joe said … Mary said … As for me …."
Informative	INF	Providing information from literature and relating it to course content/topic of discussion	"I read an article about X once and the author said …. You can find more information about this in …"

Table 3.3 continued

Online Conversations and Educationally Valuable Talk (EVT) Indicators (Uzuner, 2007)

Indicator	Acronym	Defined	Examples
Explanatory	EXPL	Chain of connected messages intended to explain/make clear OR statements serving to elaborate on the ideas suggested in previous posts	"I want to build on your comment that ……."
Interpretive	INTP	Interpretation of formal content through opinions that are supported by relevant examples, facts, or evidence.	"In my opinion X is …… Y is a good example of why ……."
Implicative	IMP	Assertions that call for action OR statements whereby participants formulate a proposal/decision about how to achieve a certain end based on the insights they gained from the course readings/discussions	"Teachers should /should not …." "X must not be forced …."

Table 3.3 Continued

Online Conversations and Educationally Less Valuable Talk (ELVT) Indicators (Uzuner, 2007)

Indicator	Acronym	Defined	Examples
Affective	AF	Short posts that ONLY contain a statement of personal feelings (likes & dislikes)	"I never liked Math either"
	AA	Short posts that ONLY contain appraisal (praising & thanking someone)	"Thank you for offering your insights into …."
	ASP	Questions or comments that add social presence to the discussion but do not contribute new information.	"I have been to your country once and I visited X, Y, Z when I was there"
Judgmental	JA	Short posts that ONLY contain brief statements of agreement without elaboration	"Yes, I agree with you …."
	JDA	Short posts that ONLY contain brief statements of disagreement without elaboration.	"I do not think so"
Experiential	EXP	Posts that only contain personal experiences, narratives, descriptions that are not followed by reflection	"I did the same thing when I was teaching X. "I did A, B, C. It was fun"
Reproduction	REP	Repeating/reproducing the ideas mentioned/proposed in the previous posts without elaboration	"You are right, X is …… " (followed by a sentence)
Miscellaneous	MIS	Opinions that seem to be off topic OR statements regarding technical problems/course logistics	"I am unable to open Jay's file…"

Note: Adapted from "Educationally Valuable Talk: A New Concept for Determining the Quality of Online Conversations," by S. Uzuner, 2007, *Journal of Online Learning and Teaching*, 3, p. 403-405. (CC BY-NC-SA 2.5) Copyright Uzuner 2007. Accessed March 18, 2013 via jolt.merlot.org/vol3no4/Uzuner.htm. Reprinted with permission of author.

While this rubric was very thorough in its approach, the practical use of it in an average instructional day for a teacher probably would not be feasible since it required a great deal of time for application.

Rubric 3. The third rubric used to analyze the students' online posts was developed by Lambert (2003) as part of an investigation into a six month long online collaborative art design project at the university level. After analyzing project data Lambert developed the rubric and found that in medium to high performing teams, 30%-40% of new postings were new topics and 60%-70% of postings were replies to new topics. There was also a balance between providing and requesting information and feedback; 5%-15% of feedback was analytical or reflective and 5%-10% of postings were involved in socialization or maintenance of group culture averaging of 1.4-5.0 messages were posted per week. In general, the pattern that developed over the codes for the qualities among all the teams consisted of the most posts occurring in the "provide or request information" code, followed by the "feedback", "reflective feedback", "raise problems", "solve problems", and "social" codes respectively. The reproduced rubric developed by Lambert (2003) is in Table 3.4.

Table 3.4

Evaluating Students' Online Discussions Rubric

Code	Primary Aim of Posting	Example
1	Provide or request information/ material	Tadaa! Here's some info on the new link (see attachment) What do you think about…?
2	General Feedback	I'll make those changes on the sitemap
3	Reflective/Analytical Feedback (eg. Feedback plus own ideas)	I'm kinda liking the first one, with the 3D attempt. I don't think…is as cool, cos the style is a bit childish…anyone else?
4	Raise Problems	Serious problems with the multi-session CD…
5	Raise/Provide Problem Solutions	Remembered a friend of mine with a mac, should be OK
6	Socialization, group culture	Nice one bruva! Good luck for the talk!

Note: From "Collaborative Design Projects: Evaluating Students' Online Discussions," by S. R. Lambert, 2003, *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education, Adelaide, Australia, 7-10 December 2003.* Copyright Lambert 2003. Accessed March 18, 2013 via http://ro.uow.edu.au/asdpapers/74. Reprinted with permission of author.

This rubric provided a method of evaluation of student online posts that was practical and potentially useful in an instructional environment encountered by most high school-level teachers. However, it was still very broad in its categorization of the interactions and nuances of the students' online postings.

Attitude Survey. Administering the Online Cooperative Learning Attitude Scale (OCLAS), as developed by Korkmaz (2012), before the webquest activities and upon their completion determined whether students have a positive or negative view of online cooperative learning. The original survey has a Cronbach's alpha of 0.904.

Survey questions measuring positive attitudes toward the use of online learning had Cronbach's alpha of 0.899. Survey questions measuring negative attitudes toward online learning had a Cronbach's alpha of 0.822. I grouped data according to a five-point Likert scale. See Appendix D. Using an independent *t* test compared the pre and post-survey answer means for each question for significant changes in the students' positive or negative views of online cooperative learning. I added the last question with the choice of yes or no to determine if students had access to the Internet at home. For the purpose of this study, I renamed the survey "Attitudes Toward Online Learning Survey" to make it clear to the students that it was strictly a survey, and not something different, by including the term "scale" in the title. Adjusting the Likert scale slightly by using easily understandable language choices familiar to students, I converted the scale choices from "never" to "strongly disagree," "seldom" to "disagree," "sometimes" to "undecided," "generally" to "agree," and "always" to "strongly agree." I converted each verbal choice to a number value after the survey administration to aid in the interpretation of the data. In order to do this, I converted the phrases in the following way: "Strongly Disagree" = 1, "Disagree" = 2, "Undecided" = 3, "Agree" = 4, and "Strongly Agree" = 5.

Unit Exam. After completing each webquest and traditional class work such as vocabulary and chapter review questions from the textbook, and notes, the students completed a unit exam. Collected data examined student exam performance in a pre and post- test format. Each test consisted of 30 multiple choice questions tied to the

traditional work, and two short essay questions related to the webquest topic. I collected data on student performance on exams and compared it to the quality and quantity of online posts. A Pearson correlation analyzed the data for comparison between the quality and quantity of online posts and the exam scores, multiple-choice scores, and short essay scores. An independent *t* test checked for any significant differences in the exam scores between the first and last webquests. A sample unit exam is available in Appendix E. Appendix F contains a copy of the rubric used to grade exam essays.

Implementation of Project

The entire investigation took place during the 2012-2013 school year. I obtained Human Subjects Approval at the beginning of December. Next, I sent home parental consent forms for signatures that the students returned to me directly. After collecting signed parent forms, I gave the student assent forms to the participants for approval. Overall, this process took approximately nine weeks and with completion by early February. At the beginning of the project, I emphasized expectations and reminders of appropriate behavior while using the school computers. During this time, I gave the students general guidance on how Edmodo functioned and given a chance to practice logins, making a posting to both the instructor and to others within their class and groups.

Before the start of each Webquest, students received vocabulary from their textbooks to define and list as an introduction to each topic. This routine was

implemented as a way of previewing information with the students to help them get started, and to maintain compliance with the Learning Focused Strategies that have been adopted by my school district. Each webquest covered approximately one half of the course material for each unit. The other half came from smaller assignments like learning vocabulary, completing end of chapter reading questions from the text, and teacher-provided lecture notes. Each webquest was provided to the students in paper form and was available online via Edmodo. I reviewed teacher-provided notes after the webquests in all cases and before the unit exams. The purpose of the exams was to discern student understanding and determine if there was a correlation between student performance on the tests and the quality and quantity of student online posts.

For each webquest, I divided the class into six groups. Four of the groups had four students, and two groups consisted of three students. The groups stayed together throughout the entire study. I randomly assigned students to their groups by using a random number generator in Microsoft Excel.

With the school's bell schedule, four out of eight classes at my high school met every other day on Tuesday through Friday for 90 minutes per class. Classes held on Tuesday and Thursday were odd numbered class periods and classes meeting on Wednesday and Friday were even numbered class periods. On Monday, classes with periods not occurring during lunch met for approximately 45 minutes. In addition, on Monday, classes that occurred during the lunch period met for 60 minutes. Therefore, the maximum number of times the Environmental Science class could meet was once on Mondays for 60 minutes, and Tuesday and Thursday for 90 minutes each day since

the class occurred during fifth period. The first webquest ran seven class periods for a total of 570 minutes of class time. It was determined that many students were able to complete the first webquest faster than the allotted time of seven class periods. Therefore, the final webquest lasted five class periods for a total of 420 minutes of class time. The intermediate webquest spanned five class periods for a total of 420 minutes of class time. In addition to using class time, I permitted the students to complete the webquest assignments outside of school. Students were also required to complete their discussions via Edmodo rather than verbally. Each team was permitted to post to their team or to me directly or the class as a whole. The student groups could not post directly to other groups in the class specifically. As the instructor, I was able to access all of the student posts. Parents were also had to access Edmodo if they requested a password for access.

I categorized and tabulated data according to the Cognitive Presence Rubric (CPR) from the first set of webquest student postings to examine the posting types for any patterns. Additionally, data from the first webquest were analyzed using the Online Conversations for Educationally Valuable Talk (EVT) and Educationally Less Valuable Talk (ELVT) rubric by Uzuner (2007) as well as Evaluating Students' Online Discussions (EOD) rubric by Lambert (2003). The data was reviewed to establish a baseline for comparisons with the final webquest to gauge whether or not the instructional interventions had any effects on student learning. A modified EVT/ELVT rubric was developed upon completion of the final webquest and was used to analyze both the quality and quantity of the student online posts.

The students received individual grades regarding their posts and webquest assignments via the student rubric provided in the webquest to provide them feedback on their performances. See Appendix B. I did not give feedback from the Cognitive Presence Rubric, the EVT/ELVT rubric, EOD rubric, and Modified EVT/ELVT rubric to the students to prevent any potential confusion. Data was solely for analytical purposes in this study.

During the intermediate webquest, instructor guidance was increased. The intent of this was to examine if the students took the initiative to use the collaborative features available online through Edmodo to complete the task with less outside interference, as in the third webquest. According to Gerber et al (2008), student performance and the amount of instructor activity are unrelated, but to the amount of student interaction with the content. Before the start of the intermediate webquest, I used one 90-minute class to provide instructional support to the students. The support prompts consisted of providing feedback and grades from the first webquest via the rubric found at the end of the webquest sample in Appendix B. I presented and discussed another support prompt, the Student Posting Rubric by Ho and Swan (2007), with the students. See Appendix G. Students were encouraged to ask questions strictly via Edmodo to each other. Students could ask questions verbally of me as needed during the intermediate or second phase of the study. This provided a method of support. During the first and final webquests, the students were encouraged to post all of their questions via Edmodo to each other and to me, but this was difficult to enforce due to the students being together in the same classroom.

During the final webquest, feedback from the intermediate webquest rubric and exam grades provided the only extra support to the students. Students could not ask for verbal help either. If they tried, I directed them to work with their group members.

For research question 3, administering the Attitudes Toward Online Learning Survey measured student attitudes towards online collaboration before using Edmodo. I administered a Post-use survey after the completion of final webquest presentations, and papers, and unit exam. Pre and Post-Survey data compared whether students as a class had a positive or negative experience using Edmodo. A t-test analyzed the data for any significant differences.

I examined research question 4 by analyzing group data from the quality and/or quantity of online posts relative to data from final exam scores. A Pearson correlation analysis checked for possible significant findings between the averages of the pre and post-test multiple-choice scores, essay scores, and whole exam scores.

The students had the opportunity to work in class, at home, and by smartphones if they were available. Reservations for access to the school's computer lab affected access to the mobile laptop cart, since the school's staff shares the equipment.

Preparation for the study and data-collection took place according to the timeline presented in Table 3.5.

Table 3.5

Timeline for Instruction and Data Collection

Time Period	Action
September-December 2012	Obtain IRB approval of human subjects protocol
December 2012–February 2013	Distribute and collect parent/student consent/assent forms; Orient students on how Edmodo is used
February 28-March 14, 2013	Conduct webquest 1; collect data
May 8–May 21 2013	Conduct webquest 2
May 23– June 4, 2013	Conduct webquest 3; collect data

Chapter 4

ANALYSIS

Background Information

Data collection for this study occurred during the spring of the 2012-2013 school year. One College Preparatory Environmental Science class at my high school was available for the purposes of this study. As part of the standard annual high school scheduling process, assigned students comprised this class randomly from their choices as well as the advice of both their guidance counselors and parents. The total number of students enrolled in the course during the study was 22 students at the start; two new students joined the class during the intervention phase of the study, leading to a maximum of 24 student participants. One student did not provide a permission form to participate, so that particular data was not included in the analysis. It brought the average total to 23 students (N=23). The grade levels of the students ranged from ninth to twelfth grades. Three seniors were only able to complete the first phase of the study and through the intervention phase before graduating early but did complete the post-survey.

I divided the instructional component of the study into divided into three phases. The initial phase consisted of conducting the first webquest unit followed by phase two, which involved instructional interventions being provided during a second

webquest unit, and concluded with the third phase in which instructional interventions were not provided during the webquest unit. Collection and analysis of data occurred during only phases one and three. Before participation in the study began, I randomly placed the students into small groups of three to four students each. The students stayed with their assigned groups throughout the entire project. The formation of six groups resulted. I used three rubrics to initially code for the quality and quantity of online student posts for each webquest with data aggregated by group. I developed a fourth rubric after the analysis of data from the first three rubrics provided insufficient clarity about the quality of the posts. Using statistical analyses, I determined if any significant differences were present between the content indicators (codes) described within each of the rubrics. Additionally, I conducted qualitative comparisons between the patterns of student online posts and those referenced in the literature described in the methodology section. A modified version of a survey developed and validated by Korkmaz (2012) called the Online Cooperative Learning Attitude Scale (OCLAS), re-titled Attitudes Toward Online Collaboration to fit the purposes study, was administered to gauge student views at the beginning and at the end of this investigation. Additionally, I examined the data for potential correlation of student performance on unit exams and both the quality and quantity of student online posts.

Quality and Quantity of Online Posts Comparison

I analyzed the information obtained during the study by utilizing three different rubrics initially. One rubric that I considered for use as developed by Ho and Swan (2007), proved too broad to fit the purpose of this study due to the sheer volume of posts produced by students. See Appendix G. For a sample of coding produced from each rubric and what the students were posting in this study, see the screen shots from webquest one and webquest three see Appendix C. I removed personally identifying information from the examples to maintain student confidentiality. For all statistical tests, an alpha level of $p < 0.05$ was selected. The students made 213 online posts during the first webquest (webquest 1). The students also made 219 online posts during the final webquest (webquest 3). Having established that the 'quantity' of student posts remained stable over the first and third webquests, the next task was to examine any qualitative differences among student posts across the two webquests.

The first rubric used to analyze the quality of student posts was the Cognitive Presence Indicator Rubric (CPR), and was created by Kanuka et al. (2007) (See Table 3.2). I analyzed student posts using the four indicators of cognitive presence or "phases of cognitive presence" according to Kanuka et al. (2007). About a fourth of the posts did not fit any of the criteria developed by Kanuka, and as a result were separated into their own category under "No Classification." Examples of these four indicators, and those that did not fit under them are in Table 4.1.

Table 4.1

Online post examples from Webquest 1 (W1) and Webquest 3 (W3) using Cognitive Presence Rubric (CPR)

Phases of Cognitive Presence Indicators	Examples from Webquest 1 (W1) and Webquest 3 (W3)
Triggering event	W1 – "Alright dude I think we have our topics for now, since we each have to write a page. I'm doing "is there evidence" and X is doing "is there a cure?" you guys have to think of your own topics. Idk (I don't know) just write about causes and effect or something."
	W3 – "Do you guys have any ideas on what invasive species you would like to Do the project on?"
Exploration	W1 – "Should we introduce what global warming is on the first essay…like talk about what it is?"
	W3 – "I guess I should do "create your own plan of action?"
Integration	W1 – "I am reviewing the essay and I have found some spots that I think could be changed. You guys can look and see if you agree or not when I have finished."
	W3 – "X can you add something about the Chinese mitten crab in DE. I think it would help a lot"
Resolution	W1 – "This is my portion of the essay. Thanks everyone for your hard work."
	W3 – "Finally finished." With attached file for project
No Classification	W1 – "Awesome!"
	W3 – "That's really good I think this is going to be our best webquest yet!!"

Note: Language conventions are direct quotes of student posts from the study. Removed identifying information maintained student confidentiality.

A summary of the quantitative analysis of the results is in Figure 4.1. When examining the general pattern of responses found in the study compared to the pattern found by Kanuka et al. (2007), the cognitive content of the student online posts appeared to follow a similar pattern. It was not possible to classify posts that are

social in nature with this rubric. The students had a tendency to make off-topic remarks at times.

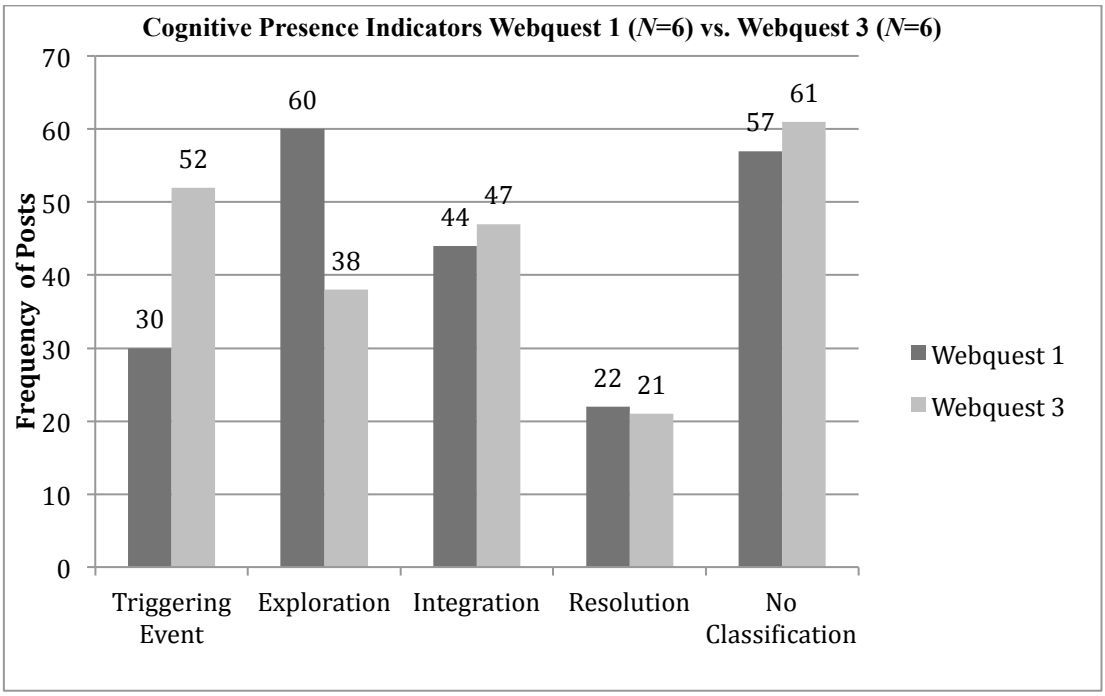


Figure 4.1. Comparison of webquest 1 vs. webquest 3 online posts.

A *t* test of the means of the quality indicators found between student posts in webquest 1 ($N = 6$) and webquest 3 ($N = 6$) showed no significant differences. See Table 4.2. A simple regression analysis of the frequency means of the posts was carried out and no significant differences were found $F(1,5)=1.34$, $p = .33$, $\eta^2 = 0.031$. The numbers above each bar are the frequencies of the posts matching each particular indicator. This indicates that the quality of online posts pertaining to 'cognitive presence' as captured by this rubric remained stable across the first and third webquests.

Table 4.2

Comparisons of Quality Indicators for Cognitive Presence Rubric

Indicator	Webquest 1 Mean (*SD*)	Webquest 3 Mean (*SD*)	Difference in the Means	t test *p*
Triggering Event	5.50 (4.56)	8.67 (5.13)	3.17	.14
Exploration	10.00 (6.32)	6.33 (5.31)	-3.67	.24
Integration	7.33 (5,72)	7.83 (8.82)	0.50	.87
Resolution	3.67 (2.94)	3.50 (1.48)	-0.17	.91
No Classification	9.50 (10.82)	10.17 (14.26)	0.67	.84

$p < 0.05$.

The next rubric, Online Conversations Educationally Valuable Talk (EVT) and Educationally Less Valuable Talk (ELVT) by Uzuner (2007), classifies different nuances of statements made during the student conversations (See Table 3.3). Eleven indicators described EVT. Eight indicators described together as ELVT. Before providing a quantitative analysis of the data, examples of the content of the posts are located in Table 4.3 and 4.4. Examples of nuanced distinctions in students' posts organized according to Uzuner's distinctions are shown. Some of the examples labeled as "possible" answers are additions intended to provide clarity since no data was present in the student posts.

Table 4.3

Online post examples from Webquest 1 (W1) and Webquest 3 (W3) using Educationally Valuable Talk (EVT) Indicators

Indicator/ Acronym	Examples
Exploratory EPL	W1 – None were posted for this indicator. Possibly "I am curious about…" W3 – "We are doing the invasive lionfish" - In reply to a confused group member
Invitational INVT	W1 – "Yes I am in this group. Guys, we should go to this …hyperlink." W3 – "Do you guys want to talk about a plant too?"
Argumentation ARG	W1 – "Slide x for the PowerPoint should be on simple facts about global warming to tie in the viewer..... " W3 – "Yeah except more wild than a farm pig and bigger"
Critical CRT	W1 – "Some of the changes you made really don't make sense and are wrong. I think we should stick with the original." W3 – "I looked through the packet and I didn't see anywhere that says you couldn't use the ones on the packet and the site about them was in the resource section but do you have any other ideas then?"
Heuristic HE	W1 – " Cool pic for pp" followed by hyperlink to a picture. W3 – None were posted for this indicator. Possibly "Hey have you seen this before?!"
Reflective REF	W1 – None were posted for this indicator Possibly "The history of this indicates… W3 – None were posted for this indicator. Possibly "You know I tried that, it doesn't work like you think it does."
Interpretive INTP	W1 – None were posted for this indicator. Possibly "My opinion is X, I found data to back it up." W3 – None were posted for this indicator. Possibly "I have the evidence to back it up."
Analytical ANL	W1 – None were posted for this indicator. Possibly "Look at these various sources. It all points to a new idea for that…" W3 – "Ok, in which states is the animal becoming a problem?
INF	W1 – "Hey look what I found. It might help. Hyperlink included with title of webpage." W3 – "I found a map. Hyperlink included," "my sources"
Explanatory EXPL	W1 – None were posted for this indicator. Possibly "That was a good idea. I want to add that …" W3 – "What is a feral pig?"
Implicative IMP	W1 – None were posted for this indicator. Possibly "Climate change is something that needs to be studied more thoroughly" W3 – None were posted for this indicator. Possibly " Inspections need to occur to protect ecosystems from invasive species. This is a no brainer!"

Note: Language conventions are direct quotes of student posts from the study.

This rubric was able to elucidate more details about the content of the online posts that the students were furnishing than was the cognitive presence rubric. An examination of the examples of student posts in the EVT portion of the rubric shows that during webquest 1, six indicators could not define the posts. The indicators were Exploratory (EPL), Reflective (REF), Interpretive (INTP), Analytical (ANL), Explanatory (EXPL), and Implicative (IMP). See Table 4.3. By definition, these indicators describe higher-order thinking, which may show a weakness in student learning that occurred during webquest 1. This deficiency in the student posts during webquest 1 may have been due to the students' lack of familiarity with how to do the webquest and the use of Edmodo. In other words, it was a new experience for the students. Webquest 3, in contrast, had posts that did not fit within four EVT indicators used to define student online posts. The indicators were Heuristic (HE), Reflective (REF), Interpretive (INTP), and Implicative (IMP). This indicates a small shift in the type of indicator in which the students' online posts fit upon completion of webquest 3. However, in both webquests, the three indicators-Reflective (REF), Interpretive (INTP), and Implicative (IMP) did not define student posts after the completion of both webquests. This data shows that while there was a slight decrease in the number of indicators used to describe the online posts, there was a lack of reflection, interpretation, or implicative statements from the students' online posts.

With respect to the ELVT portion of the rubric, some differences in the number of posts defined by the indicators are also apparent. Student online posts from webquest 1 did not fit within the definitions of four indicators. These indicators were

Affective (AF), Judgmental-agreement (JA), Judgmental-disagreement (JDA), and Reproduction (REP). Upon examination of webquest 3, only one indicator, Judgmental-disagreement (JDA), was not able to define any student posts. See Table 4.4. This data could be describing a shift in the manner in which students were interacting from webquest 1 to webquest 3 from one of little expression of likes and dislikes, judgments made in agreement and disagreement, and no repetition of ideas, to one in which their dialog became more expressive and argumentative. The reason for this could be that the students were beginning to gain experience using online collaboration via Edmodo, or it could be the nature of the topic covered by webquest three was conducive to encouraging student responses differently. It is important to remember that the ELVT indicators are just considered "less valuable" than the other indicators presented in the EVT rubric but do have some importance at a minor level. The indicators within in the ELVT portion of the rubric are considered to be 'less valuable' since they describe communications that do not build new knowledge within the context of online collaboration (Uzuner, 2007). As the data show, the ELVT portion of the rubric was beneficial to understanding the online posts made by the students.

Table 4.4

Online post examples from Webquest 1 (W1) and Webquest 3 (W3) Conversations and Educationally Less Valuable Talk (ELVT) Indicators

Indicator/ Acronym	Examples
Affective AF	W1 – None were posted for this indicator. Possibly " I like this" W3 – "Yea that sounds good"
Affective AA	W1 – "okay thanks" W3 – "Cool, I'll be sure to check it out. And great job."
Affective ASP	W1 – "I don't know about all that" W3 – "Hey guys. How's it going?"
Judgmental JA	W1 – None were posted for this indicator. Possibly " I don't agree." W3 – "Feral pigs sound fine."
Judgmental JDA	W1 – None were posted for this indicator. Possibly "I don't believe that is right." W3 – None were posted for this indicator. Possibly "You are not correct."
Experiential EXP	W1 – "Anybody know the assignment like me." W3 – "Africa" implying location in response to previous post
Reproduction REP	W1 – None were posted for this indicator. Possibly " W3 – "Feral pigs" statement was made twice in different posts by different students
Miscellaneous MIS	W1 – "Global warming is a government conspiracy" W3 – "Yo Yo Yo" random statement

Note: Language conventions are direct quotes of student posts from the study with no alterations.

In addition to examining and defining the student online posts, further analysis of student posts for webquest 1 and webquest 3 was conducted with regard to the quantity of posts that could be matched to the EVT and ELVT indicators. Interestingly, there were differences between webquest 1 and webquest 3 in the

number of types of indicators that could describe the online posts. The online posts fit five different indicators in the EVT classification of webquest 1 compared to seven indicators in this portion of the rubric in webquest 3. See Figure 4.2

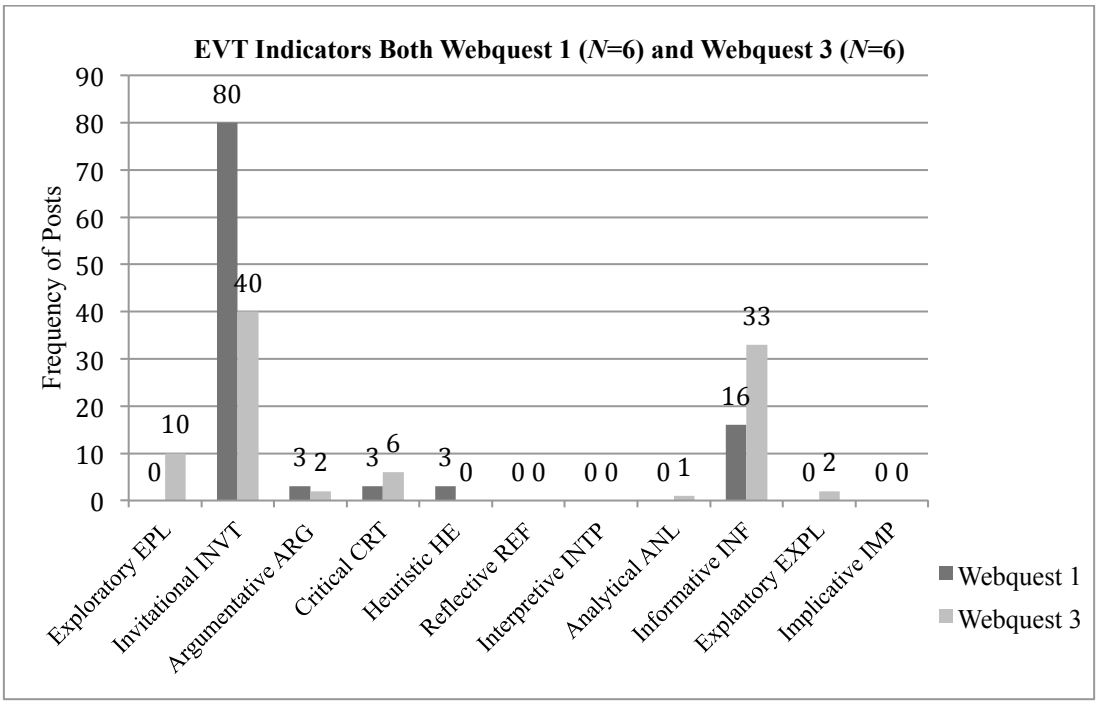


Figure 4.2. Comparison of webquest 1 to webquest 3 EVT indicator frequencies.

The five EVT indicators that matched student online posts for webquest 1 were Invitational (INVT), Argumentative (ARG), Critical (CRT), Heuristic (HE), and Informative (INF). The seven indicators that matched student online posts from webquest 3 were Exploratory (EPL), Invitational (INVT), Argumentative (ARG), Critical (CRT), Analytical (ANL), Informative (INF), and Explanatory (EXPL). As the students progressed through the study and completed webquest 3, these results show that students were potentially beginning to develop more complex thinking skills

by the end of the study. Posts falling in the additional indicators describing exploration (EPL), analysis (ANL), and explanation (EXPL) demonstrate this. Numbers above each indicator bar show the frequencies of the total number of posts classified according to the EVT indicators.

Data analysis using a *t* test revealed, however, only one significant difference for the Exploratory (EPL) indicator $t(10) = -3.37$, $p = 0.02$, 95% CI [-9.76, 11.42], $d = 0.70$ *found* between the means of webquest 1 ($N = 6$, $M = 0.00$, $SD = 0.00$) and webquest 3 ($N = 6$, $M = 1.67$, $SD = 1.21$) regarding the qualities and quantities of the students' online posts using the EVT indicators. See Table 4.5.

Table 4.5

Comparison of EVT Indicators Webquest 1 (*N*=6) vs. Webquest 3 (*N*=6)

EVT Indicators	Webquest 1 Mean (*SD*)	Webquest 3 Mean (*SD*)	Difference in the Means	t test *p*	Cohen's *d*
Exploratory EPL	0.00 (0.00)	1.67 (1.21)	1.67	.02*	0.70
Invitational INVT	13.33 (9.54)	6.67 (4.37)	-6.67	.06	
Argumentative ARG	0.50 (0.84)	0.33 (0.82)	-0.17	.36	
Critical CRT	0.50 (0.84)	1.00 (1.26)	0.50	.30	
Heuristic HE	0.50 (1.23)	0.00 (0.00)	-0.50	.36	
Reflective REF	0.00 (0.00)	0.00 (0.00)	0.00	.00	
Interpretive INTP	0.00 (0.00)	0.00 (0.00)	0.00	.00	
Analytical ANL	0.00 (0.00)	0.17 (0.41)	0.17	.36	
Informative INF	2.67 (3.33)	5.50 (2.66)	2.83	.18	
Explanatory EXPL	0.00 (0.00)	0.33 (0.52)	0.33	.17	
Implicative IMP	0.00 (0.00)	0.00 (0.00)	0.00	.00	

Note. Blank *d* values denote data that could not be computed due to no significant differences being present. *$p < 0.05$.

An examination of the ELVT portion of the rubric revealed that for webquest 1, the student online posts fit four indicators compared to seven different indicators

during webquest 3 (See Figure 4.3). The four indicators with matching student posts for webquest 1 were Affective-appraisal (AA), Affective-social presence (ASP), Experiential (EXP), and Miscellaneous (MIS).

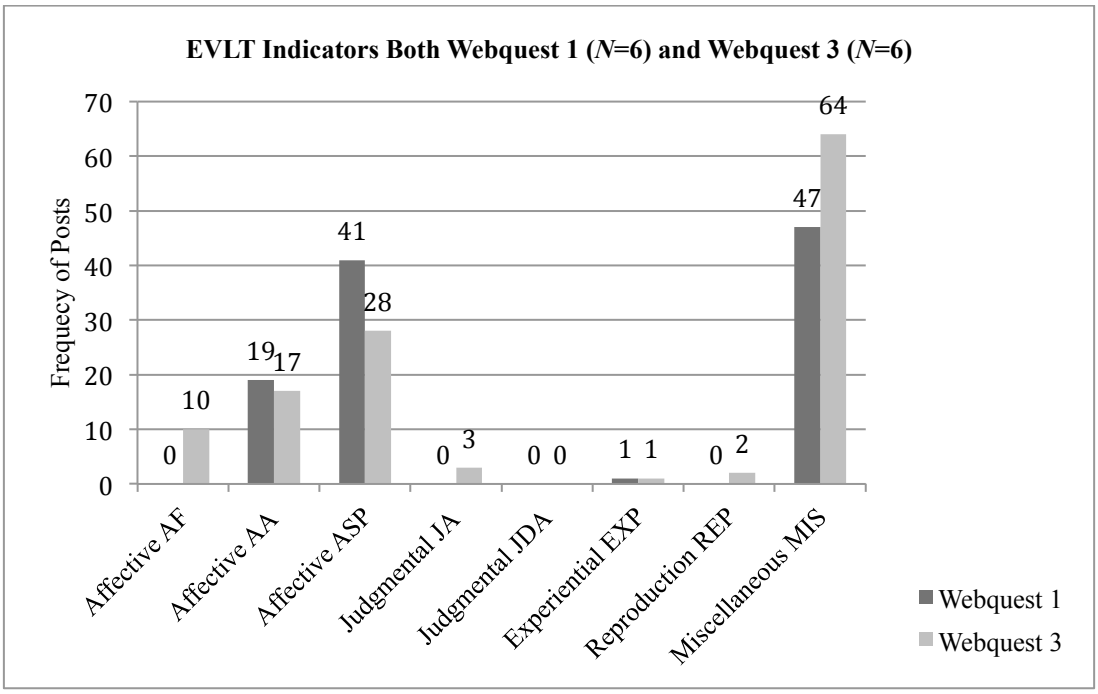


Figure 4.3. Comparison of webquest 1 to webquest 3 ELVT indicator frequencies.

The seven indicators with matching student posts for webquest 3 were Affective-social presence (ASP), Judgmental-agreement (JA), Experiential (EXP), Reproduction (REP), and Miscellaneous (MIS). Again, this increase in the diversity of matching indicators demonstrates that some type of change may have been occurring in the manner in which the students were communicating online. The changes could have been the result of the content in the third webquest being easier to comprehend, or that the students were becoming more comfortable with the use of online collaboration.

Additionally, the changes could have been the result of the instructional interventions provided during webquest 2. Numbers above each indicator bar show the frequencies of the total number of posts classified according to the ELVT portion of the rubric.

Data analysis using a *t* test of the ELVT portion of the rubric, showed that there were no significant differences between the means for the number of posts of webquest 1 and webquest 3. See Table 4.6. This illustrates that the number of posts matching a particular ELVT indicator remained steady.

Table 4.6

Comparison of ELVT Indicators Webquest 1 (*N*=6) vs. Webquest 3 (*N*=6)

ELVT Indicators	Webquest 1 Mean (*SD*)	Webquest 3 Mean (*SD*)	Difference in the Means	*t* test *p*
Affective AF	0.00 (0.00)	1.67 (3.20)	1.67	.26
AA	3.17 (3.54)	2.83 (3.37)	-0.33	.75
ASP	6.83 (7.03)	4.67 (4.72)	-2.17	.36
Judgmental JA	0.00 (0.00)	0.50 (0.84)	0.50	.20
Judgmental JDA	0.00 (0.00)	0.00 (0.00)	0.00	.00
Experiential EXP	0.17 (0.41)	0.17 (0.41)	0.00	1.00
Reproduction REP	0.00 (0.00)	0.33 (0.82)	0.33	.36
Miscellaneous MIS	7.83 (5.98)	10.67 (9.52)	2.83	.30

*$p < 0.05$.

However, more differences that are significant do appear to be present after examination of Figures 4.2 and 4.3. The most common types of posts match the following four indicators: Invitational, Informative, Affective Social Presence (ASP), and Miscellaneous. This may have been the result of the *t* test being insufficient for analysis in this case. Therefore, I performed a regression analysis followed by a

Tukey HSD Post Hoc analysis to examine the data further. The indicators that did not register data in both webquest 1 and webquest 3 were not included in this analysis to prevent registering a false increase in significant differences. I believed this to be a more conservative approach to analyzing the data. Those indicators not registering data were Reflective (REF), Interpretive (INTP), Implicative (IMP), and Judgmental (JDA). A significant difference between means of the frequencies was found using the regression analysis $F\,(1,15) = 26.90$, $p < 0.0001$, $\eta^2 = 0.67$. The Tukey HSD test analysis of significance within indicators results are presented in Table 4.7.

Table 4.7

Tukey HSD test significant differences for EVT/ELVT

Combination differences	Mean difference of combinations	Critical q(α,r,dfw)	Standardized error	95% Confidence interval for μ*i*-μ*j*	
EPL-INVT	8.33	5.80	0.76	3.96	12.71
INVT-ARG	-6.50	5.80	0.76	-10.87	-2.13
INVT-CRT	-7.17	5.80	0.76	-11.54	-2.79
INVT-HE	-6.17	5.80	0.76	-10.54	-1.79
INVT-ANL	-6.83	5.80	0.76	-11.21	-2.46
INVT-INF	-9.50	5.80	0.76	-13.87	-5.13
INVT-EXPL	-7.00	5.80	0.76	-11.37	-2.63
INVT-AF	-8.33	5.80	0.76	-12.71	-3.96
INVT-AA	-6.33	5.80	0.76	-10.71	-1.96
INVT-ASP	-4.50	5.80	0.76	-8.87	-0.13
INVT-JA	-7.17	5.80	0.76	-11.54	-2.79
INVT-EXP	-6.67	5.80	0.76	-11.04	-2.29
INVT-REP	-7.00	5.80	0.76	-11.37	-2.63
INVT-MIS	-9.50	5.80	0.76	-13.87	-5.13
INF-ASP	5.00	5.80	0.76	0.63	9.37
ASP-MIS	-5.00	5.80	0.76	-9.37	-0.63

$p < 0.05$.

The frequency of student posts classified under the Invitational indicator (INVT) had significant differences with fourteen other indicators within the EVT/ELVT rubric as shown in Table 4.7. Significant differences in the frequency of posts also occurred under the Affective (ASP) and Informative (INF) and Miscellaneous (MIS) indicators. Based upon the post hoc test, there was a difference in the numbers, of matching student online posts to the EVT/ELVT rubric indicators. No clear conclusion can be determined from this analysis, since some indicators showed an increase in matching posts while others showed a decrease in matches between webquest 1 and webquest 3.

The third tool I used to examine the quality of students' online posts was the Evaluating Students' Online Discussions (EOD) rubric by Lambert (2003). The purpose for using this rubric was to try and find a more thorough yet simple rubric that could be used in a classroom setting in a practical manner. This rubric contains six indicators: Provide or request information or material (RIM), Provide general feedback (GF), Provide reflective or analytical feedback (RAF), Raise problems (RP), Raise or provide problem solutions (RPPS), and Socilization or group culture (SGC). Refer to Table 3.4 for more details. Examples of student online posts that correspond to each of the indicators in this rubric can be found in Table 4.8. Examples from both webquests 1 and 3 were easily categorized utilizing this rubric, unlike the rubric by Uzuner (2007).

Table 4.8 – Online post examples from Webquest 1 (W1) Evaluating Students' Online Discussions Rubric

Code	Primary Aim of Posting	Example
1	Provide or request information/ material	W1 – "How are we going to do the PowerPoint team?" W3 – "Are you guys finished with the paper and PowerPoint?"
2	General Feedback	W1 – "Ok, I added the counterargument slide to the PowerPoint" W3 – "I'll see if I can incorporate that"
3	Reflective/Analytical Feedback (eg. Feedback plus own ideas)	W1 – "The PowerPoint also needs to include the facts about gb. X and Y students you can use R's papers on this part" W3 – "What we need to do is research on the invasive species Feral Pig. Like where it came from, how they got here, and what is currently being done to stop them. We also need to say what we would do to stop them. We should include this information in our essay and PowerPoint. I'm currently researching, and X is working on the PowerPoint."
4	Raise Problems	W1 – "And X student, did Y student really do that thing with the migration of the ducks?" W3 – "We need to describe their type of habitat and their source of food and how they benefit the environment. We need to do this in the essay and the PowerPoint."
5	Raise/Provide Problem Solutions	W1 – "Final draft for our group." W3 – "If you have any suggestions, post it. I'm game for really anything as long as it has enough information. And Mr. Olson has them, ask him for one."
6	Socialization, group culture	W1 – "X student, get off the games and finish the PowerPoint" W3 – "X great work brotha"

Note: Language conventions are direct quotes of student posts from the study with no alterations.

Student online posts were analyzed for the amount of matches to the EOD indicators for both webquest 1 and 3. A similar pattern emerged between the webquests (See Figure 4.4). The highest frequency of online posts matched the

indicator for ‘providing or requesting information.’ This was similar to the result that Lambert (2003) had at the universitiy level. The next indicator that had the most posts were those relating to ‘socialization and group culture.’ This is the opposite of Lambert’s result, which had the least number of posts at the university level. Online posts matching the definition for general feedback were the next most common. No example was provided by Lambert in this case. Following this, the next most common indicator matches were best described as providing ‘reflective or analytical feedback,’ which is approximately the same as Lambert’s findings. The fifth indicator that had the next most common matches were in the raising/providing problem solutions. The least number of posts matched the ‘raising problems’ indicator. Lambert did not provide further details regarding these last two indicators. Numbers above each indicator bar show the frequencies of the total number of posts as classified according to the EOD rubric.

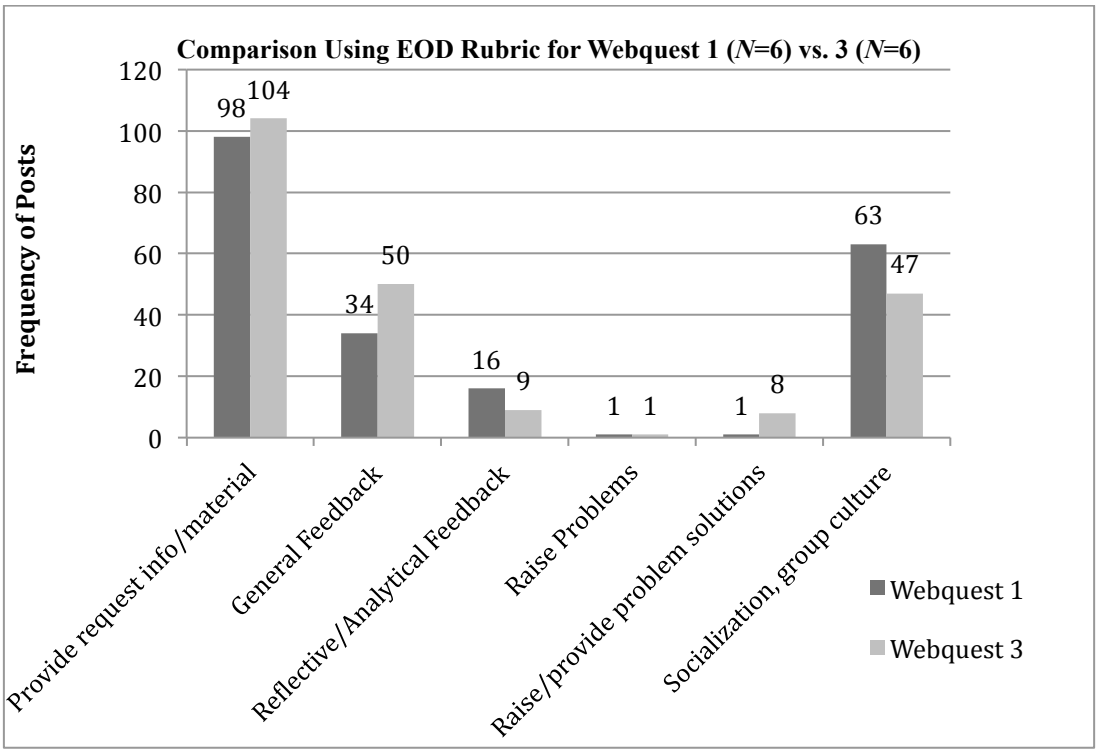


Figure 4.4.

No significant differences were found while comparing the means for the quantities of student online posts matching the EOD indicators for webquest 1 and webquest 3 while using a *t* test for analysis. The results can be found in Table 4.9.

Table 4.9

Comparison Between Webquest 1 vs. Webquest 3 for Evaluation of Online Discussions (EOD)

Indicator	Webquest 1 Mean (*SD*)		Webquest 3 Mean (*SD*)		Difference in the Means	*T* test *p*
Provide or request information/material (RIM)	16.33	(8.64)	17.33	(11.38)	1.00	.79
General Feedback (GF)	5.67	(4.08)	8.33	(5.32)	2.67	.11
Reflective/ Analytical Feedback (RAF)	2.67	(1.97)	1.50	(1.38)	-1.17	.11
Raise Problems (RP)	0.17	(0.41)	0.17	(0.41)	0.00	1.00
Raise/provide problem solutions (RPPS)	0.17	(0.41)	1.33	(2.34)	1.17	.30
Socialization, group culture (SGC)	10.50	(13.63)	7.83	(12.30)	-2.67	.20

$p < 0.05$.

Since the Analysis of the means of student online posts for quality and quantity using the EOD rubric did not yield any significant differences, I performed a regression analysis again in case the result was incorrect. The regression resulted in $F(1,6) = 44.37$, $p < 0.002$, $\eta^2 = 0.92$. The regression analysis shows a significant difference between webquest 1 and webquest 3 means for the indicators. Use of a Tukey Post Hoc test, however, showed no significant differences between the means of the indicators. See Table 4.10.

Table 4.10

Tukey HSD test significant differences for EOD

Combination differences	Mean difference of combinations	Critical q(α,r,dfw)	Standardized error	95% Confidence interval for μ*i*-μ*j*	
RIM-GF	-1.67	6.71	0.86	-7.42	4.08
RIM-RAF	2.17	6.71	0.86	-3.58	7.92
RIM-RP	1.00	6.71	0.86	-4.75	6.75
RIM-RPPS	-0.17	6.71	0.86	-5.92	5.58
RIM-SGC	3.67	6.71	0.86	-2.08	9.42
GF-RAF	3.83	6.71	0.86	-1.92	9.58
GF-RP	2.67	6.71	0.86	-3.08	8.42
GF-RPPS	1.50	6.71	0.86	-4.25	7.25
GF-SGC	5.33	6.71	0.86	-0.42	11.08
RAF-RP	-1.17	6.71	0.86	-6.92	4.58
RAF-RPPS	-2.33	6.71	0.86	-8.08	3.42
RAF-SGC	1.50	6.71	0.86	-4.25	7.25
RP-RPPS	-1.17	6.71	0.86	-6.92	4.58
RP-SGC	2.67	6.71	0.86	-3.08	8.42
RPPS-SGC	3.83	6.71	0.86	-1.92	9.58

However, this rubric does show a pattern in which the student online posts did not demonstrate a high degree of analysis or problem solving. The data showed that the students tended to provide general responses to each other and that they were very social.

Extending Uzuner's Rubric. While many of the posts could be coded using the previous three rubrics, there were some online posts that did not fit into existing categories even within Uzuner's (2007) rubric, which seemed to be the most comprehensive of the three rubrics used in this study. Consequently, I modified the EVT/ ELVT rubric out of a need to accommodate the range of content found within

the students' postings. This modification consisted of adding three indicators to Uzuner's rubric. The new indicators in the EVT grouping were Content Information Resources such as Weblinks (WBK) and Content Information Resources such as pictures and pasting of new information (PPI). The new indicator added to the ELVT grouping was Organizing (ORG) that described student duties and planning. See Table 4.11.

Table 4.11

Additions to EVT/ELVT Rubric

Added Educationally Valuable Talk (EVT) Indicators				
Indicator	Acronym	Category	Defined	Examples
Content Information Resources	WBK	Computer links	Hyperlinks to new sources related to topic	"Hey check out this website", actual hyperlink
Content Information Resources	PPI	Pictures, pasting of new information	Hyperlinks to pictures, pasting of information found on websites	Actual pictures inserted into posts, Direct quotes or information pasted into posts
Added Educationally Less Valuable Talk (EVT) Indicators				
Indicator	Acronym	Category	Defined	Examples
Organizing	ORG	Planning	Talk about duties to complete workload	"Hey I'll do the PowerPoint", "How about you do the essay"

The intent was to accommodate a number of posts that did not fit within the EVT/ELVT indicators originally captured by Uzuner (2007). A large majority of posts fell within the four main indicator categories of Invitational (INVT), Informative

(INF), Affective Social Presence (ASP), and Miscellaneous (MIS) while using the original EVT/ELVT rubric by Uzuner (2007). Upon reading all of the student online posts from both webquests, the analysis of data illustrates that more details could be revealed regarding the content of the posts the students were producing. Examples of student posts using these new indicators are in Table 4.12 below. Since these were the only new indicators, examples of the original indicators with student examples in Tables 4.3 and 4.4 were used in conjunction with these.

Table 4.12

Online post examples from Webquest 1 (W1) and Webquest 3 (W3) using additions of new indicators to EVT/ELVT rubric by Uzuner (2007)

Added Educationally Valuable Talk (EVT) Indicators	
Indicator/ Acronym	Examples
Content Information Resources WBK	W1 – "Here is the website that I got my information from…hyperlink"
	W3 – "Hyperlink to Wikipedia file"
Content Information Resources PPI	W1 – "Found something…hyperlink to website on increased exposure to allergens"
	W3 – "Basic Wiki article….hyperlink included."
Added Educationally Less Valuable Talk (EVT) Indicators	
Indicator	Examples
Organizing ORG	W1 – "I can get like a page of the essay done today"
	W3 – "Student X and I will be doing the PowerPoint, Y student with the essay"

As Figure 4.5 shows, during use of the modified EVT rubric, four indicators were predominantly common. Four fell under the EVT grouping and were:

Invitational (INVT), Informative (INF), Computer links (WBK), and Pictures and Pasting of information (PPI).

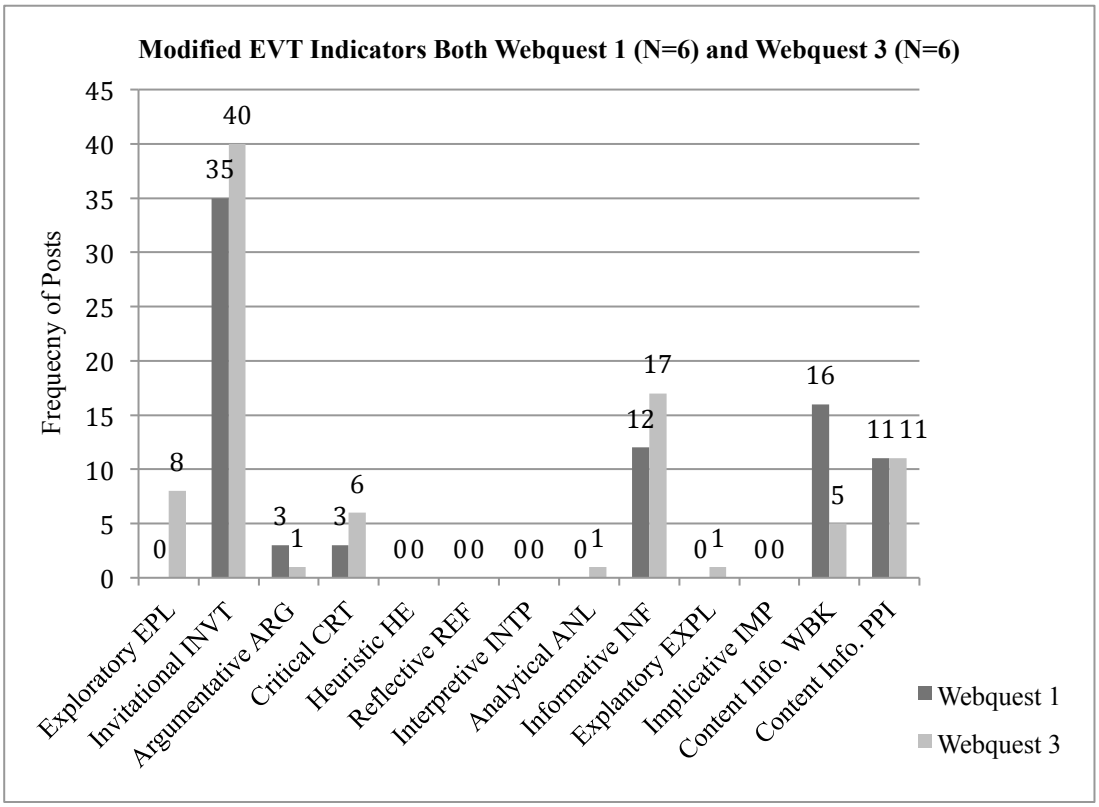


Figure 4.5.

It appeared that online posts made by the students could primarily be categorized by the Invitational (INVT) and Informative (INF) indicators after comparing the original EVT rubric results to the modified EVT rubric data. An examination of Figures 4.2 and 4.5 demonstrate this information. As noted before, numbers above each indicator bar show the frequencies of the total number of posts that as classified according to the modified EVT rubric.

Table 4.13

Comparison of Modified EVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6)

EVT Indicators	Webquest 1 Mean (*SD*)	Webquest 3 Mean (*SD*)	Difference in the Mean	*t* test *p*	Cohen's *d*
Exploratory EPL	0.00 (0.00)	1.33 (1.21)	1.33	0.04*	1.55
Invitational INVT	5.83 (3.49)	6.67 (4.08)	0.83	0.53	
Argumentative ARG	0.50 (0.84)	0.17 (0.41)	-0.33	0.18	
Critical CRT	0.50 (0.84)	1.00 (1.26)	0.50	0.30	
Heuristic HE	0.00 (0.00)	0.00 (0.00)	0.00	0.00	
Reflective REF	0.00 (0.00)	0.00 (0.00)	0.00	0.00	
Interpretive INTP	0.00 (0.00)	0.00 (0.00)	0.00	0.00	
Analytical ANL	0.00 (0.00)	0.17 (0.41)	0.17	0.36	
Informative INF	2.00 (2.19)	2.83 (1.17)	0.83	0.52	
Explanatory EXPL	0.00 (0.00)	0.17 (0.41)	0.17	0.36	
Implicative IMP	0.00 (0.00)	0.00 (0.00)	0.00	0.00	
Content Info. WBK	2.67 (1.97)	0.83 (1.17)	-1.83	0.06	
Content Info. PPI	1.83 (2.14)	1.83 (1.94)	0.00	1.00	

Note. Blank *d* values denote data that could not be computed due to no significant differences being present. * $p < 0.05$.

Using a *t* test for analysis of the differences between the means of the qualities and quantities of the students' online posts using the modified EVT showed that there was one significant difference, $t(10) = -2.80$, $p = 0.04$, 95% CI [-7.78, 9.11], $d = 1.55$ between the means for the Exploratory (EXP) indicator found in webquest 1 ($M = 0.00$, $SD = 0.00$) and webquest 3 ($M = 1.33$, $SD = 1.21$). See Table 4.13. Again, after analyzing the graphs of the data for the comparisons between webquest 1 and webquest 3, there appear to be some significant differences between the indicators as shown in Figure 4.5.

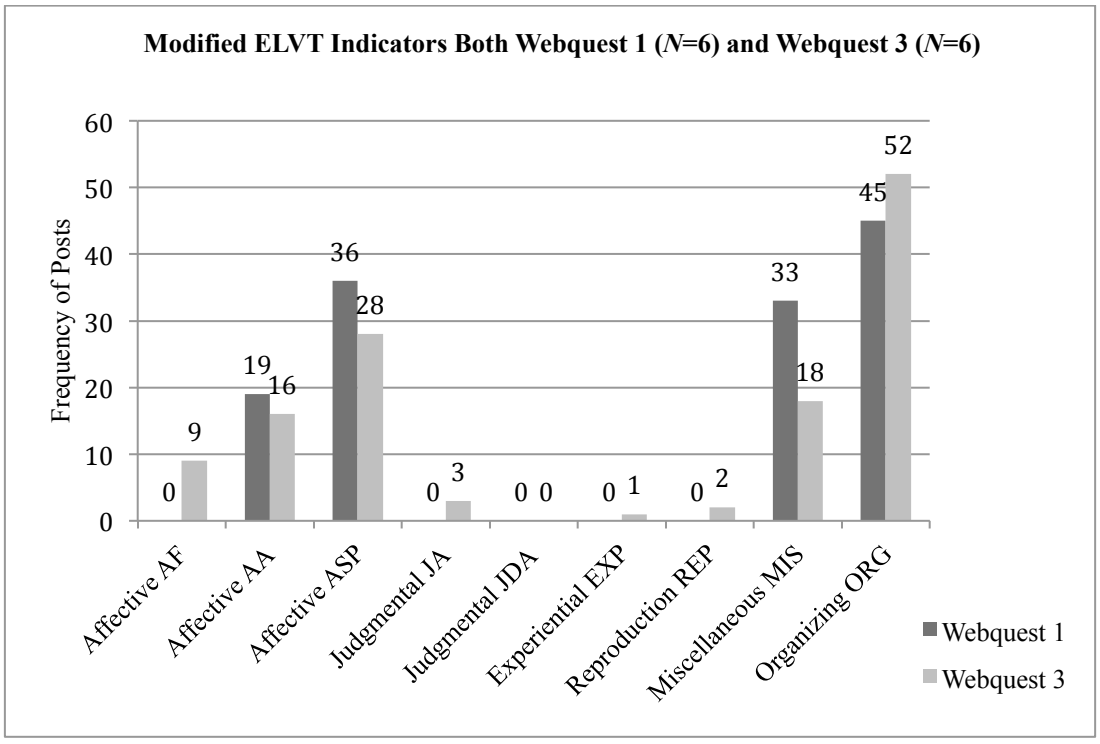


Figure 4.6.

As shown in Figure 4.6, the four indicators falling under the ELVT grouping that were the most common were: Affective (AA), Affective (ASP), Miscellaneous (MIS), and Organizational (ORG). The use of the modified ELVT rubric illustrates that many of the student online posts were primarily described by the Affective-appraisal (ASP) and Miscellaneous (MIS) indicators in the original unmodified ELVT rubric. Examination of Figures 4.3 and 4.6 will demonstrate this information. The numbers above the bars for each indicator label the frequencies of the student online posts.

Table 4.14

Comparison of Modified ELVT Indicators Both Webquest 1 (N=6) vs. Webquest 3 (N=6)

ELVT Indicators	Webquest 1 Mean (SD)		Webquest 3 Mean (SD)		Difference in the Means	t test p
Affective AF	0.00	(0.00)	1.50	(3.21)	1.50	.30
Affective AA	3.17	(3.54)	2.67	(3.01)	-0.50	.64
Affective ASP	6.00	(5.22)	4.67	(4.80)	-1.33	.59
Judgmental JA	0.00	(0.00)	0.50	(0.84)	0.50	.20
Judgmental JDA	0.00	(0.00)	0.00	(0.00)	0.00	.00
Experiential EXP	0.00	(0.00)	0.17	(0.41)	0.17	.36
Reproduction REP	0.00	(0.00)	0.33	(0.82)	0.33	.36
Miscellaneous MIS	5.50	(6.57)	3.00	(4.94)	-2.50	.16
Organizing ORG	7.50	(5.86)	8.67	(7.09)	1.17	.54

* $p < 0.05$.

Analysis of the means of the quantities and qualities of student online posts between webquest 1 and webquest 3 using the modified ELVT rubric can be found in Table 4.14. When I conducted t test on the means of the number of student online posts derived from the use of the modified ELVT rubric, there were no significant differences detected. However, after analyzing the graphs of the data for the comparisons between webquest 1 and webquest 3, there appear to be some significant differences between the indicators. This could be a result of a t test not being a robust enough statistical test for this set of data. As a result, I applied a regression analysis to the data followed by a Tukey HSD Post Hoc test to clarify where significant differences may have been occurring.

In order to carry out the regression analysis, five indicators were not included because they did not register data. I believed that this would prevent introducing a false significant difference error while using the Tukey HSD Post Hoc test. Again, my

approach was to be a conservative in analyzing the data. The indicators not included were: Heuristic (HE), Reflective (REF), Interpretive (INTP), Implicative (IMP), and Judgmental (JDA). See Table 4.15.

Table 4.15

Tukey HSD Test Significant Differences for Modified EVT/ELVT Rubric

Combination differences	Mean diff of combinations	Critical q(α,r,dfw)	Standardized error	95% Confidence interval for μ*i*-μ*j*	
EPL-WBK	3.17	5.79	0.44	0.65	5.69
EPL-ASP	2.67	5.79	0.44	0.15	5.19
EPL-MIS	3.83	5.79	0.44	1.31	6.35
INVT-WBK	2.67	5.79	0.44	0.15	5.19
INVT-MIS	3.33	5.79	0.44	0.81	5.85
CRT-MIS	3.00	5.79	0.44	0.48	5.52
ANL-MIS	2.67	5.79	0.44	0.15	5.19
INF-WBK	2.67	5.79	0.44	0.15	5.19
INF-MIS	3.33	5.79	0.44	0.81	5.85
EXPL-MIS	2.67	5.79	0.44	0.15	5.19
WBK-AF	-3.33	5.79	0.44	-5.85	-0.81
WBK-ORG	-3.00	5.79	0.44	-5.52	-0.48
AF-ASP	2.83	5.79	0.44	0.31	5.35
AF-MIS	4.00	5.79	0.44	1.48	6.52
JA-MIS	3.00	5.79	0.44	0.48	5.52
EXP-MIS	2.67	5.79	0.44	0.15	5.19
REP-MIS	2.83	5.79	0.44	0.31	5.35
MIS-ORG	-3.67	5.79	0.44	-6.19	-1.15

The results of the regression analysis showed that there were significant differences between the quantities of posts falling within the Miscellaneous (MIS) indicator at least eleven times with other indicators. Adding new indicators classified the content of the online posts into the miscellaneous category since the original EVT/ELVT rubric was not sensitive to this information. The regression analysis of the means of the indicators produced an $F(1,17) = 69.88$, $p < 0.05 \times 10^{-5}$, $\eta^2 = 0.82$ showing a significant difference between the means of the indicators as listed in the ELVT portion of the rubric. The use of the modified EVT/ELVT rubric also indicated a greater mix of indicators that appeared to be significantly different from the original EVT/ELVT rubric. This makes logical sense with the addition of three new indicators. The use of this rubric, in general, illustrates more detail about the quality and quantity of the student posts as intended.

In conclusion, there were no significant differences in the quantity, and only few indicators of significant quality differences in students' online posts between the first and third webquests.

Analysis of Usefulness of Rubrics

The second research question focused on the usefulness of the rubrics used in this study. As discussed earlier, the first three rubrics had a limited capacity to subsume the majority of student online posts. This led to the development of a revised rubric to describe any student posts that did not fit under current descriptors. While the first three rubrics were useful each in their own way, it appears that they were also

limited. This could be the result of their development at the collegiate level. A review of the literature did not reveal any readily usable rubrics developed at the secondary level. The participants chosen for this analysis consisted of high school-aged students who did not tend to communicate using very sophisticated means or have in-depth discussions with each other. One issue that was consistent among all of the rubrics found in the literature was that they tended to be very broad in how their indicators were described, as with the CPR rubric, or very specific like the EVT/ELVT rubric. Being too broad in defining indicators does not help a researcher or teacher on a practical level. An overly general rubric is difficult to use and increases the chance of measurement errors. On the opposite end of the spectrum, an overly specific rubric may be useful for a researcher, but not to a classroom teacher. The specificity of a detailed rubric to describe online collaboration would be too time-consuming for a teacher.

The EOD rubric used only six indicators to categorize the online posts, yet was concise in its indicator descriptions. The EOD rubric appeared to be an applicable tool for analyzing student online posts on a regular basis by teachers due to its simplicity. This rubric could be beneficial to a classroom teacher because it provides a basic framework that could be used to analyze online collaboration and help reveal whether or not students are communicating ideas to each other in a purposeful way that encourages problem solving and thinking.

An overall examination of all the rubrics tends to reveal students are not sharing their cognitive abilities in their online posts. On the other hand, the students

may actually need help in developing these abilities. The Cognitive Presence Rubric did not provide any analyzable information to this effect.

Inter-rater Reliability

I examined data for any discrepant interpretation errors from the use of the rubrics by checking for inter-rater reliability. A faculty member of a local community college applied all four rubrics to all 219 posts obtained during the third webquest. Comparisons between the researcher and the outside evaluator examined if any error effects were evident in the application of the rubrics. Evaluation utilized a Pearson correlation test. See Table 4.16 for a comparison of Pearson's r Correlation results between the researcher and outside evaluator.

Table 4.16

Comparison of Pearson Correlation between Researcher and Outside Evaluator.

Rubric	Pearson Correlation (*r*)
Cognitive Presence Rubric (CPR)	0.36
Educationally Valuable Talk/ Educationally Less Valuable Talk (EVT/ELVT) Combined	0.89
Educationally Valuable Talk (EVT) Only	0.92
Educationally Less Valuable Talk (ELVT) Only	0.95
Evidence of Discourse Rubric (EOD)	0.87
Modified Educationally Valuable Talk/ Educationally Less Valuable Talk (EVT/ELVT) Combined EVT/ELVT	0.83
Modified Educationally Valuable Talk (EVT) Only	0.86
Modified Educationally Less Valuable Talk (ELVT) Only	0.91

The Pearson correlation values ranged between 0.83 and 0.95, showing a strong positive relationship. Values above an $r = +0.70$ are considered to show a strong positive relationship (Quinnipiac.edu, 2013). The Cognitive Presence Rubric Pearson correlation obtained value was 0.36, meaning that there was a moderate positive relationship. Values ranging from $r = +0.30$ to $r = +0.39$ are considered to show a moderate positive relationship (Quinnipiac.edu, 2013). The inter-rater reliability for the Cognitive Presence Rubric was low in comparison to the other rubrics. For the third indicator in this rubric, a difference in inter-rater agreement was as high as 30%. Discussion with my colleague led to the determination that the indicators were too

broad in their nature, making it difficult to categorize student online posts. Therefore, we did not place too much credence or its use for evaluation of online posts.

Given the results of inter-rater reliability, the use of the Cognitive Presence Rubric did not seem to be reliable enough to describe the range and scope of students' online posts. Both the Evidence of Discourse Rubric and the Educational Valuable Talk and Educationally Less Valuable Talk rubrics, had higher inter-rater reliability, but did not cover the broad scope of students' posts. The modified rubric, which is adapted to accommodate my students' posts, enjoyed a reasonably high inter-rater reliability and covered a broader scope of criteria. For these reasons, it seems most fit for use as a tool to describe or analyze student online posts.

Analysis of Student Attitudes

In order to determine what the students' attitudes were regarding the use of an online collaboration platform, data were collected before the start of the first webquest and after the final webquest was completed. I obtained data using the Attitudes Toward Online Collaboration Survey (See Appendix D). Table 4.17 shows the corresponding statements for each survey item. Q1, Q2, etc. designated each survey item statement. I added question 18 was to the survey to help determine the degree to which students had readily available access to the Internet. The students could answer either yes or no to question 18, which asked "Do you have access to the Internet outside of school at home or by smartphone?"

Table 4.17

Attitudes Toward Online Collaboration Survey Corresponding Statements.

Positive Attitude Statements	
Q1	I enjoy solving problems regarding the group project using Online Cooperative Learning Application (OCLA) with my group members.
Q2	Being interactive with the other group members using OCLA increases my motivation for learning.
Q4	I enjoy experiencing cooperative learning using OCLA with my group members.
Q6	Online group activity increases our creativity.
Q8	I believe that the group can work on a document effectively with the online cooperative learning application.
Q10	OCLA improves my social skills.
Q12	I enjoy helping others in OCLA.
Q13	OCLA is very entertaining for me.
Q15	OCLA helps me feel better psychologically.
Q16	More ideas come up as a result of OCLA.
Q17	I think that I have had / will have more successful results since I work with a group in OCLA.
Negative Attitude Statements	
Q3	Trying to teach something to my group members in OCLA makes me tired.
Q5	OCLA does not make any sense to me.
Q7	I cannot develop my own ideas in OCLA.
Q9	I don't like that people are depending on me in OCLA.
Q11	I don't think that my interaction with my group members in OCLA will make any contribution to me.
Q14	OCLA is not suitable for me.

Table 4.18 shows the results of the comparisons made using the differences in the percentages of responses between the survey given at the beginning and the end of this project. Since the questions were answered via a Likert-type survey numbers were assigned to the choices to aid in analysis in the following manner: strongly disagree = 1, disagree = 2, undecided = 3, agree = 4, and strongly agree = 5. I obtained the percentages from the number of responses the students provided via each

survey item. A positive change in the response percentages indicated an increase of students selecting that particular choice. A negative change in the student responses indicated a decrease in that particular choice on the survey

For survey items Q1, Q2, Q4, Q12, and Q13 student selections aligned most with an increase in "agreement" on the survey. The students' choices most aligned with "strong agreement" were found in survey items Q6, Q8, Q15, Q16, and Q17. Overall, the students' responses demonstrated a positive experience using Edmodo during their webquests. The students' survey responses showed a "strong" disagreement with the statement Q10, "OCLA improves my social skills." Only 5% of the student responses aligned with the "strongly agrees" choice on the survey for this item.

For survey items Q3, Q11, and Q14 the student choices aligned most with an increase in "disagreement" on the survey. The students' choices most aligned with "strong disagreement" were found in survey items Q5, and Q7. The student responses were less negative about their use of Edmodo during this project. One statement that the students showed an increase in "agreement" was for item Q9, "I don't like that people are depending on me in OCLA." The student response to item Q9 was 19% in overall agreement and 10% of the responses in disagreement.

Table 4.18

Comparison of Positive and Negative Statement Responses (*N*=22)

Positive Attitude Questions

Question	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q1	0%	5%	-43%	24%	14%
Q2	-5%	-10%	0%	5%	10%
Q4	0%	0%	-19%	0%	19%
Q6	5%	0%	-5%	-29%	29%
Q8	-5%	0%	-14%	-5%	24%
Q10	10%	-10%	-5%	0%	5%
Q12	-5%	0%	-14%	5%	14%
Q13	-5%	-5%	-14%	24%	0%
Q15	5%	0%	-19%	-5%	19%
Q16	0%	-10%	-29%	0%	38%
Q17	-5%	-5%	-5%	-5%	19%

Negative Attitude Questions

Question	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q3	5%	38%	-29%	-14%	0%
Q5	29%	24%	-38%	-10%	-5%
Q7	29%	5%	-33%	0%	0%
Q9	5%	5%	-29%	14%	5%
Q11	5%	14%	-10%	-5%	-5%
Q14	38%	5%	-29%	-5%	-10%

Therefore, it appears that the students tended to view the use of online learning more positively over all. With the grouped survey questions according to positive statements about learning online, most of the questions did show a positive increase in the answers agreeing with the statements. Additionally, when analyzing the negative statements regarding OCLA, the majority of the responses showed a decrease in their agreement with negative statements, demonstrating that the students were viewing online learning somewhat more positively. The final question on the survey asked if

the students had access to the Internet outside of school at home or by smartphone. The 'yes' response during the pre-survey was 86% and 95% for the post-survey. See Appendix H for a comparison of the percentage of responses for each question item.

Exam Performance and Quantity of Response Comparison

In order to answer research question 4, I analyzed the data for a correlation between the means of group exam scores and the quantity and quality of student posts in webquest 1 and webquest 3. I averaged the exam scores for each group of students to maintain confidentiality. I used a Pearson correlation analysis because the degree to which individual students may have prepared for their exams by using their textbooks, notes, and vocabulary beyond the information covered during each webquest all may affect exam performance.

For webquest 1, a Pearson correlation of r (6) = 0.58, p = .21, was obtained when comparing the number of posts (M = 35.50, SD = 25.97) to the means of each group's total exam scores (M = 43.50, SD = 4.40). For webquest 3, a Pearson correlation of r (6) = .71, p = .09, was obtained when comparing the number of posts (M = 36.50, SD = 28.54) to the means of each group's total exam scores (M = 53.69, SD = 3.96). These values show a strong to very strong positive correlation of the number of posts to overall exam scores.

The total scores were broken down further into the multiple choice and essay question components from the exam sections. The Pearson correlation for webquest

1's multiple-choice question section means of the group scores (M = 12.4, SD =1.76) compared to the number of online posts (M = 35.50, SD = 25.97) was r (6) = 0.40, p = .42, and, for webquest 3 the multiple choice question section means of the group scores (M = 23, SD = 1.89) compared to the number of online posts (M = 36.50, SD = 28.54) was r (6) =0.65, p = .14. The correlation was slightly weaker for webquest 1 compared to webquest 3 on the multiple-choice question portion of the exam. However, both r-values demonstrate a strong positive correlation between the online posts and the mean scores for the multiple-choice components.

On the essay portion of the test, tied most closely to the webquest material, a Pearson correlation compared the number of posts and the group means of the essay scores. For webquest 1, the resultant Pearson correlation was r (6) = 0.60, p = .19, when comparing the number of posts (M = 35.50, SD = 25.97) to the means of each group's essay scores (M = 31.18, p = 3.05). For webquest 3, the resultant Pearson correlation was r (6) = 0.72, p = .08, when comparing the number of posts (M = 36.50, SD = 28.54) to the means of each group's essay scores (M = 30.60, SD = 2.26). The essay component of the exams in both webquest 1 and webquest 3 show a strong positive correlation with the number of posts made by the students. The results are in Table 4.19.

Table 4.19

Comparison of Pearson Correlation r-values for exam information

	Multiple Choice Score	Essay Score	Total Exam Score
Webquest 1	0.40	0.59	0.58
Webquest 3	0.65	0.72	0.71

This examination of the correlation values illustrates a potential connection between the number of online posts and performance on exams. Again, the sample size is very small in this study, so caution is important when interpreting this data.

Comparing the number of posts under each of the indicators in the rubrics examined any connections that may have been present between the quality of the online posts and exam performance. While analyzing the indicator data from the CPR rubric for webquest 1, all groups had posts that aligned to all of the indicators. Upon examining webquest 3 for comparisons using the CPR rubric, the highest performing group on the exam had posts potentially sortable into all four indicators. The lowest performing group on the exam had no posts that fit the indicator "Exploration".

Using the EVT rubric I compared the group with the largest number of posts to the group posting the least number of posts. I found that the top-performing group on the exams also had the greatest number of posts in the EVT category. The highest mean score for webquest 1 was a group exam score of 48 out of 66 possible points. The lowest mean exam score for webquest 1 was a group score of 37 out of 66 possible points. The highest performing group also had posts aligning to four EVT

indicators as compared to the lowest scoring group having posts in only two EVT indicators. The highest performing group also had posts aligning to five EVT indicators as compared to the lowest group having posts in only four EVT indicators using the modified EVT/ELVT rubric.

The highest mean score for webquest 3 was a group exam score of 58 out of 66 possible points. The lowest mean score for webquest 3 was a group exam score of 47 out of 66 possible points. The highest performing group had six posts aligning to EVT indicators as compared to the lowest scoring group having posts in only three EVT indicators. The highest performing group had posts aligning to seven EVT indicators, while the lowest performing group had posts aligning to four EVT indicators using the modified EVT/ELVT rubric.

In an examination of the EOD rubric for webquest 1, the highest performing group had posts present in four indicators, while the lowest performing group had posts present in five indicators. The difference was that the lowest performing group had made one post aligning to the indicator "Raise/provide problem solutions". In a data analysis of webquest 3 using the EOD rubric, the highest performing group on the exam had posts aligning with six indicators, while the lowest performing group had posts falling into only two indicators.

In summary, there exists a positive correlation between the quality and quantity of online posts and exam performance. Students who post more often and cover a wider range of indicators in their posts seem to do better on the unit exam. If the nature of student posts serve as a predictor for student performance, then it would

be possible for me to access student online posting information not only to monitor or scaffold their conversations, but also to identify ‘potential low performers’ and to design proper interventions that can both increase their engagement and eventually result in improving their exam scores.

Chapter 5

DISCUSSION AND CONCLUSIONS

Discussion

The intent of this investigation was to characterize and describe student engagement in an online collaboration platform (Edmodo) by analyzing both the quality and quantity of student online posts while assessing their performance and attitudes toward its use within an introductory high school Environmental Science class. The impetus for monitoring the effectiveness of using an online collaboration platform was an interest in enhancing the students' learning experience and performance. The technology offers a way to place the process of learning in the students' control. Most, if not all, students have used computer technology from an early age, which is different from past generations. The use of technology continues to evolve into new and novel approaches for delivering content and potentially enhancing the learning process for all who are involved.

This study became multifaceted in its nature. Trying to understand how students interact in an online environment is a complex problem. As a result, I focused my attention on the impact of using an online learning platform that is already in use for student learning.

The focus of this investigation centered on four main questions:

1. How do students engage in an online collaboration platform (Edmodo) as indicated by the quality and quantity of their online posts?
2. How useful are some available evaluative rubrics for characterizing student online posts?
3. What are students' attitudes toward learning science while utilizing an online collaboration platform?
4. Do the quality and/or quantity of students' online posts correlate with their performance on their final unit exams?

While attempting to determine how the use of Edmodo affected the quality and quantity of student online posts, three different rubrics were identified that would be used to analyze the data. After reviewing the literature, it became evident that most of the research being conducted to analyze student online posts was done at the collegiate level as in the EOD rubric by Lambert (2003) for example. Finding useful and valuable tools to aid me in my work and the learning of my students is critical in particular among a generation of students that is increasingly more social networking savvy. One of the difficulties in utilizing the rubrics found in the literature was the use of descriptors to describe language and interactions of people who are conversing in ways more suited to college-level students. Understanding the nuances of language is not a simple task. Students tend to post short sentences or paste information from their sources. An observation from this effort was that the interactions among the

students were brief. Analysis of the data showed only one significant difference between the qualities and quantities of student posts between webquests 1 and 3 when using t-test for analysis. Both the modified and unmodified forms of the EVT/ELVT rubric indicated this difference with the exploratory indicator. This was probably due to the small sample size used in this study and the limited power of a t-test. A regression analysis proved to be more robust for determining where significant changes might be occurring. The decision to utilize a regression analysis developed after reviewing the graphs generated by comparing the frequencies of posts that aligned to the various applications of the rubrics used in this analysis. Regression analysis and Tukey Post Hoc testing between webquest 1 and webquest 3 of the EVT/ELVT and EOD rubric student online posting data showed significant differences between the indicator qualities and quantities.

The rubrics were helpful in understanding what students were saying online and had varying degrees of effectiveness for use in evaluating students' online comments. The Cognitive Presence Rubric (CPR) is not recommended for evaluating students' online conversations in a high school classroom setting by teachers, since many of the posts the students made could not be classified consistently into its four indicators: triggering event, exploration, integration, and resolution. Of the total number of posts in webquest 1 vs. webquest 3 approximately 27% could not be classified by this rubric. While the Educationally Valuable Talk/Educationally Less Valuable Talk (EVT/ELVT) rubric is very detailed, it can be unwieldy to use for analysis 'everyday' scenarios that most secondary teachers experience due to its

inclusion of too many indicators. In addition, the original EVT/ELVT rubric could not account for students making online posts in areas such as hyperlinks, pasting of pictures, and social organizing within the group dynamic. Therefore, I added categories covering these missing details leading to the development of the modified EVT/ELVT rubric, to classify many posts into the new indicators. The Evaluating Students' Online Discussions (EOD) rubric appeared to provide a practical method to analyze students' online discussions by using fewer indicators to divide data into general categories. After careful analysis, a suggested modification would be to include an indicator to specify if the online posts are hyperlinks and/or pictures. Furthermore, grouping of organizing statements that the students post online fit into the 'socialization/group culture' indicator already found in the EOD rubric. The EOD rubric did provide clear indications that the students were spending most of their time making posts to provide or request information and to socialize. The rubric also indicated that the students were spending little time making raising problems, offering solutions and providing reflective and analytical statements. The EVT/ELVT rubric was in agreement with this as well.

A key finding of this investigation was that higher performing groups on the final unit exams made more online posts that aligned with a greater variety of indicators used to classify the quality of posts. While it is not possible to establish a causal connection, the data suggests that methods to encourage better online communication may improve student performance. Notably, observations of the students while engaged in the study revealed that one group, utilized both Edmodo and

Google Docs. They were completing their work in real-time as opposed to staying confined to online communication via Edmodo. While some of the data collected in this study (for example, student online posts) did not always reflect that the students were analyzing and thinking at a deeper level, it may be that expression of these actions occurred in a different medium and not via the online platform.

An interesting finding was that the number of different indicators or codes used to describe the verbal exchanges increased from webquest 1 to webquest 3. When comparing the first webquest to the final or third webquest, the number of indicators of different language usage increased from nine to fourteen as measured by the EVT/ELVT rubric. This may indicate that the students were beginning to improve their communication skills and in-depth analysis of the material within a relatively short period of two months. This was a positive outcome of the project. Conducting the study over a full school year allowing student on-line collaboration may produce greater evidence of language development as expressed in online communication.

Over the course of the project, the students did show positive interest in the use of Edmodo. Even though the study occurred at the end of the school year, the students were actually very enthusiastic about its use. The survey demonstrates this clearly. By May 31st, many students want to begin their summer break, and are usually not very motivated or engaged in academic tasks. The fact that they remained engaged in the webquest/unit (there was no drop in on-line posts) is noteworthy. In addition, one student with special needs commented that using Edmodo helped him to keep up with the other kids who worked at a faster pace. In the opinion of this student, it allowed

him to go back and review online discussions and provided him time to process information to improve his understanding. These things are very valuable pieces of information and may aid in the pursuit of targeted use of technology that could have a significant impact on both student learning and achievement.

A positive correlation between the quantity of student posts and multiple-choice scores, essay scores, and total exam scores is another important finding gained from this study. The amount of correlation with these scores increased when comparing webquest 1 to webquest 3. Webquest 3 had a greater correlation between the quantity of student posts and scores on multiple-choice items, and essay questions, and total exam scores than webquest 1. The stronger correlation may be due to the topic of 'invasive species' being an easier-to-comprehend topic than that of 'climate change'. It also could be that the students became more comfortable using online collaboration as a means to explore the topic.

As with any study with subjective endpoints that require interpretation, many variables could affect the results. It would have been more advantageous to have a larger sample of students to work with during the project. Some indicators used to evaluate the students' online posts were not evident in the webquests. Perhaps a larger sample would have changed this outcome or the use of different topics within the webquests themselves. The rubrics did help to illustrate details about student interactions while completing the webquests. The EVT/ELVT, modified EVT/ELVT, and EOD rubrics showed that students did not spend much time analyzing data or thinking critically about their research topics. Very few, if any online posts made, fell

into areas of critical thinking. While this aspect of the findings is disappointing, it provides insights for possible restructuring of the webquests and toward revisions of the instructions for online collaboration, which would encourage more arguments or discussions. These findings perhaps underscore the importance of teacher intervention in guiding student thinking and communication to a more sophisticated level.

Edmodo allowed for tracking students who were actually contributing to discussions in greater detail as compared to traditional verbal classroom discussions. More than one student in the class was concerned about how their group members were affecting his or her grades. From the instructor's standpoint, the online medium can be advantageous for administering fair grades for performance, thereby helping students stay honest about the work that they complete. Collaborative group work done in a traditional face-to-face manner does not offer this advantage. Another benefit of using the online collaboration software is that it allows students to communicate outside of class in a convenient way, especially if they do not live in close proximity to one another. This is a problem for students who live in rural areas and who may not have transportation. Additionally, further research could be conducted by expanding the use of Edmodo across more than one subject to see if any effects such as those found in this study are evident elsewhere.

Conclusions

The results of this study, which were limited to one academic subject and one class, showed several advantages for using an online collaboration site like Edmodo in the following ways:

1. The student online posts appeared to become more diverse as the study progressed suggesting an increase of more in-depth thinking, which ultimately shows an improvement in learning outcomes.
2. The Educationally Valuable Talk / Educationally Less Valuable Talk (EVT/ELVT) and the Evaluating Students' Online Discussions (EOD) Rubrics were effective for analysis of student online posts. The EOD rubric was the easiest and most practical for day-to-day instructional use.
3. The students stayed engaged in using the online learning platform and viewed its use positively despite the study occurring at the end of the school year.
4. Higher exam scores, even when broken down into multiple choice and an essay component, showed a positive correlation with groups that posted most often and those groups with the greatest variety of posts.

In addition to answering the main questions, which were the primary focus of the study, some other valuable insights became apparent. The use of an online platform provides an opportunity for students with special needs to control the pace at which they can interact with both the material and their peers. The online platform allows

for access from virtually everywhere via phones and computers, helping to eliminate the inability for kids to interact anywhere and anytime while trying to complete their schoolwork. The use of an online platform helps with tracking those students who are actually doing the work for the whole group.

The study also confirmed that simply using on-line collaboration technology does not automatically result in improved communication. For example, it was necessary to provide the students with an outline of how to start their webquest. This was important especially since they were covering an open-ended topic with which they had little familiarity. As with teaching material in a regular face-to-face class, students need to have guidance and boundaries set so that they know what goals they need to reach for success. Students also need to be reminded that what they write online can be seen by many people and, in this case, potentially by both parents and teachers. Providing feedback to the students via the grading rubric found at the end of the webquest and via graded exams appeared to be an effective method to motivate the students to do well. The supplementary rubric by Ho and Swan (2007) was helpful, but it is not clear if it aided the students in any specific way. After helping answer student questions and providing feedback during webquest 2, all student-to-student communication had to occur during the webquests via Edmodo. This proved to be a challenge, and the students admitted that it was not a 'natural feeling' to be restrained from talking to a group member when that person was sitting beside them. Only a few students posted online outside of class time. During webquest 3, only one student had done so. However, since the survey showed that students had good access to the

Internet, the students could complete more work outside of school by limiting the amount of class time for using school computers, thereby encouraging more online interaction to occur.

In addition to the specific findings and conclusions described earlier the following recommendations for fellow teachers wishing to optimize the use of online communication platforms to support student engagement in collaborative online environments such as that provided by Edmodo, are offered as follows:

1. Determine the purpose of using an online platform such as Edmodo before its implementation within your instructional units. Planning for how the students are to engage with the materials and with each other is important. Do not expect to deliver all instruction to the students via Edmodo. Students will want to ask questions verbally. If class time is used to complete a webquest with Edmodo in this manner, then discourage the students from talking to one another despite their desire to do so during the project. This is critical for tracking conversations for individual accountability (grading).
2. Share access to the online platform with the parents of your students. This will help deter poor behavior. Remind students that others may be watching them.
3. Try not to intervene as a teacher with students online. The students need to have an opportunity to discuss and formulate their ideas. They may need to

be refocused if they are getting away from the desired learning outcome.

4. Provide students with a basic starting outline of expectations and introductory information to help them get started. Provide a grading rubric to the students so they know what goals they need to meet in order to succeed.
7. Standardize how the students are to name electronic files for submission to the instructor or their classmates. This will prevent confusion or potential loss of work.

The use of online collaboration platforms such as Edmodo shows great promise for the future. I believe that the use of an online learning platform such as Edmodo could also provide a way to better monitor differences in gender interactions with the content, which was not possible to evaluate given the limited number of females in my study. I recommend that further research on the effects of implementing the use of Edmodo for a longer period to see if improvements in student learning and collaboration improve consistently. Additionally, investigations to determine the effects of other analytical frameworks (rubrics) not covered in this study might provide new insights about the use of the Edmodo on student learning.

Utilizing an online learning platform like Edmodo may open up more opportunities for students to succeed. The flexibility of the system combined with solid teaching methods should make it a useful and helpful tool for many years. The students managed to stay engaged in learning, even though data collection occurred

near the end of the school year. I believe that continuing to use Edmodo to support student engagement with course content will be beneficial to not only my students, but to other teachers and students in different subjects areas. I intend to continue to expand my use of Edmodo within the subjects that I teach by encouraging students to complete varied assignments such as group lab reports, and guide them into developing their own class's online learning community. With the ultimate purpose being to improve engagement of students in the learning process, I would like to partner with other teachers to determine if similar effects might be attainable in other subjects. The experience gained in implementing and evaluating this online collaborative tool will enable me explore its use in other courses, and support other teachers in my school/district by adapting it to their needs.

REFERENCES

Ainsworth, S. (1999). The functions of multiple representations. *Computers and Education*, 33(2-3), 131–151. doi:10.1016/S0360-1315(99)00029-9

Anderson, E. (2012). Climate change: An evaluation of the data webquest activity. CC-BY-NC-SA 3.0. Retrieved August 18, 2012 from http://questgarden.com/120/62/8/110303075616/index.htm

Assessment &Teaching of 21st Century Skills. (2012). What are 21st-century skills? Retrieved August 22, 2012 from http://atc21s.org/index.php/about/what-are-21st-century-skills/

Barbour, M. K., & Reeves, T. C. (2009). The reality of virtual schools: A review of the literature. *Computers & Education,* 52(2), 402 – 416. doi:10.1016/j.compedu.2008.09.009

Bencze, J.L. (2007). Promoting student-led science and technology projects in elementary teacher education: Entry into core pedagogical practices through technological design. *International Journal of Technology and Design Education*, 20(1), 43 – 62.

Blumenfeld, P., Fishman, B.J., Krajcik, J., Marx, R.W., & Soloway, E. (2000). Creating usable innovations in systemic reform: Scaling up technology-embedded project-based science in urban schools. *Educational Psychologist*, 35(3), 149 –164. doi:http://dx.doi.org/10.1207/S15326985EP3503_2

Chang, C., Tsai, C. (2005). The interplay between different forms of CAI and students' preferences of learning environment in the secondary science class. *Science Education*, 89(5), 707 – 724. doi:10.1002/sce.20072

Chiang, H., & Jacobs, K. (2009). Effect of computer-based instruction on students' self-perception and functional task performance. *Disability and Rehabilitation: Assistive Technology*, 4(2), 106 –118. doi:10.1080/17483100802613693

Churches, A. (2008). Bloom's taxonomy blooms digitally. Retrieved August 18, 2012 from http://www.techlearning.com/article/44988

Conlon, T. (2006). Formative assessment of classroom concept maps: The reasonable fallible analyzer. *Journal of Interactive Learning Research*, 17(1), 15 – 36.

Demirci, N. (2010). Web-based vs. paper-based homework to evaluate students' performance in introductory physics courses and students' perceptions: two years experience. *International Journal on E-Learning*, 9(1), 27 – 49.

Edmodo.com. (2012). http://www.edmodo.com. Accessed July 8, 2012.

Egenfield-Nielsen, S. (2006). Overview of research on the educational use of games. Digital kompetanse. Retrieved May 5, 2010 from http://www.itu.dk/~sen /papers/game-overview.pdf

Garrison, D.R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education,* 2, (2-3), 1–19. Doi: :http://dx.doi.org.proxy.nss.udel.edu/ 10.1016/S1096-7516(00)00016-6

Gefen, D., Geri, N., & Paravastu, N. (2007). Vive la Difference: The cross-culture differences within us. *International Journal of eCollaboration*, 3(3), 1–15. doi:10.4018/jec.2007070101

Gerber, M., Grundt, S., & Grote, G. (2008). Distributed collaboration activities in a blended learning scenario and the effects on learning performance. *Journal of Computer Assisted Learning,* 24, 232 – 244. doi:10.1111/j.1365 -2729.2007.00256.x

Gleitman, H. (1995). *Psychology* (4th ed.). New York, Norton.

Griffiths, M., & Hunt, N. (1995). Computer game playing in adolescence: Prevalence and demographic indicators. *Journal of Community & Applied Social Psychology*, 5(3), 189 –193. doi:10.1002/casp.2450050307

Hartley, R. (2010). The evolution and redefining of 'CAL': a reflection on the interplay of theory and practice. *Journal of Computer Assisted Learning*, 26, 4 –17. doi:10.1111/j.1365-2729.2009.00340.x

Ho, C.H., Swan, K. (2007). Evaluating online conversation in an asynchronous learning environment: An application of Grice's cooperative principle. *The Internet and Higher Education*, 10(1),13. doi:http://dx.doi.org.proxy .nss.udel.edu/10.1016/j.iheduc.2006.11.002

Information Communication Technologies. (2012). Techterms computer dictionary. Retrieved from http://www.techterms.com/definition/ict.

Isotani, S., Mizoguchi, R., Inaba, A., & Mitsuru, I. (2010). The foundations of a theory-aware authoring tool for CSCL design. *Computers and Education*, 54, 809 – 834. doi:10.1016/j.compedu.2009.09.010

Kanuka, H., Rourke, L., & Laflamme, E. (2007). The influence of instructional methods on the quality of online discussion. *British Journal of Educational Technology*, 38(2), 260 – 271. doi:10.1111/j.1467-8535.2006.00620.x

Kickmeier-Rust, M.D., & Albert, D. (2010). Micro-adaptivity: Protecting immersion in didactically adaptive digital educational games. *Journal of Computer Assisted Learning*, 26(2), 95 –105. doi:10.1111/j.1365-2729.2009.00332.x

Koenig, A.D. (2008). Exploring effective educational video game design: The interplay between narrative and game-schema construction. *Dissertations Abstracts International A: Humanities and Social Sciences*, 69(2–A), 579. (621741069; 2008-99151-141).

Korkmaz, Ö. (2012). A validity and reliability study of the online cooperative learning attitude scale (OCLAS). *Computers & Education,* 59(4), 1162 –1169. doi:10.1016/j.compedu.2012.05.021

Lam, M. (2009). Effectiveness of web-based courses on technical learning. *Journal of Education for Business*, 84(6), 323 – 331.

Lambert, S.R. (2003). Collaborative design projects: Evaluating students' online discussions. In G. Crisp, D. Thiele, I. Scholten, S. Barker, and J. Baron (Eds.), Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, Adelaide, Australia, 7–10 December, 2003. Retrieved August 23, 2012 from www.ascilite.org. Accessed via http://ro.uow.edu.au/asdpapers/74/

Langman, J., & Carmen, F. (2010). Classroom response system-mediated science learning with english language learners. *Language and Education*, 24(2), 81– 99.

Lee, C., & Chen, M. (2010). Taiwanese junior high school students' mathematics attitudes and perceptions towards virtual manipulatives. *British Journal of Educational Technology*, 41(2), E17–E21. doi:http://dx.doi.org/10.1111/j.1467-8535.2008.00877.x

Levy, Y. (2004). Comparing dropouts and persistence in e-learning courses. *Computers and Education*, 48(2), 185 – 204. doi:http://dx.doi.org.proxy.nss.udel.edu/10.1016/j.compedu.2004.12.004

Marino, M., & Dunn, M. (2010) The effect of technology-based altered readability levels on struggling readers science comprehension. *Journal of Computers in Mathematics and Science Teaching*, 29(1), 31– 49.

McCrory, R., Putnam, R., & Jansen, A. (2008). Interaction in online courses for teacher education: Subject matter and pedagogy. *Journal of Technology and Teacher Education*, 16(2), 155 –180.

Okan, Z. (2003). Edutainment: Is learning at risk? *British Journal of Educational* Technology, 34(3), 255 – 264. doi:http://dx.doi.org/10.1111/1467-8535.00325

Papert, S. (1998). Does easy do it? Children, games, and learning. Retrieved August 18, 2012 from http://papert.org/articles/Doeseasydoit.html

Paraskeva, F., Mysirlaki, S., & Aikaterini, P. (2010). Multiplayer online games as educational tools: Facing new challenges in learning. *Computers in Education*, 54, 498 – 505. doi:10.1016/j.compedu.2009.09.001

Pfaffman, J.A. (2004). Manipulating and measuring student engagement in computer-based instruction. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 65(1-A), 124 –124. (Electronic; Print). (AAI3120416; 2004-99013-074).

Quinnipiac.edu. (2013). Pearson's r Correlation-A Rule of Thumb. Retrieved September 22, 2013 from http://faculty.quinnipiac.edu/libarts/polsci/statistics.html.

Rohaan, E.J., Taconis, R., & Jochems, W.J.M., (2010). Reviewing the relations between teachers' knowledge and pupils' attitude in the field of primary technology education. *International Journal of Technology and Design Education*, 20(1), 15 – 26.

Scanlon, E., & Issoff, K. (2005). Activity theory and higher education: evaluating learning technologies. *Journal of Computer Assisted Learning*, 21, 430 – 39. doi:http://dx.doi.org/10.1111/j.1365-2729.2005.00153.x

So, H., Seah, L.H., & Toh-heng, H.L. (2010). Designing collaborative knowledge building environments accessible to all learners: Impacts and design challenges, *Computers in Education*, 54(2), 479 – 490. doi:http://dx.doi.org /10.1016/j.compedu.2009.08.031

Uzuner, S. (2007). Educationally valuable talk: a new concept for determining the quality of online conversations. *MERLOT Journal of Online Learning and Teaching*, 3(4), 400 – 410. Accessed March 18, 2013 from jolt.merlot.org/vol3no4/Uzuner.htm

Vanderwaetere, M., & Clarebout, G. (2011). Can instruction as such affect learning? The case for learner control. *Computers & Education*, 57, 2322 – 2332. doi:http://dx.doi.org.proxy.nss.udel.edu/10.1016/j.compedu.2011.05.020

Venkatesh, V., & Morris, M.G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage Behavior. *MIS Quarterly*, 24(1), 115 –139.

Vygotsky, L. (1978). *Mind in society*. London: Harvard University Press.

Waite, S.J., Wheeler, S., & Bromfield, C. (2007). Our flexible friend: the implications of individual differences for information technology teaching. *Computers and Education*, 48(1), 80 – 99. doi:http://dx.doi.org/10.1016 /j.compedu.2005.01.001

Wang, F., Kinzie, M.B., McGuire, P., & Pan, E. (2010). Applying technology to inquiry-based learning in early childhood education. *Early Childhood Education Journal*, 37(5), 381 – 389. doi:10.1007/s10643-009-0364-6

Wang, H., & Wang, Y. (2008). Gender differences in the perception and acceptance of online games. *British Journal of Educational Technology*, 39(5), 787 – 806. doi:10.1111/j.1467-8535.2007.00781.x

Warwick, P., Mercer, N., Kershner, R., & Staarman, J.K. (2010). In the mind and in the technology: The vicarious presence of teacher in pupil's learning of science in collaborative group activity at the interactive whiteboard. *Computers and Education*, 55(1), 350 – 362. doi:http://dx.doi.org/10.1016/j.compedu.2010.02.001

Webster's II New College Dictionary. (1999). Boston, MA: Houghton Mifflin Co.

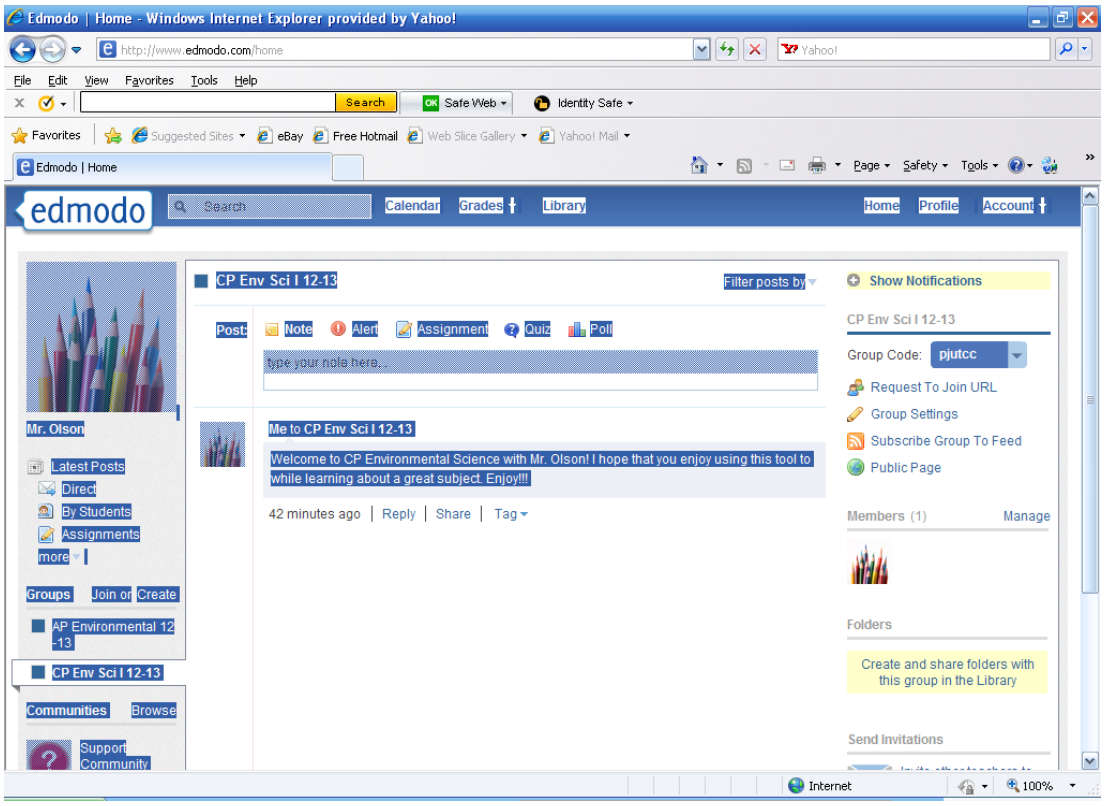
Webquest.org. (2012). What is a webquest? Retrieved August 23, 2012 from http://webquest.org/

www.doe.k12.de.us. (2013). Delaware Department of Education School Profiles. Retrieved September 19, 2013 from http://profiles.doe.k12.de.us /SchoolProfiles/District/Student.aspx?checkSchool=0&districtCode=17&district=Cape+Henlopen.

Yelland, N., & Margaret, L. (2001). Virtual kids of the 21st century: Understanding the children in schools today. *Information Technology in Childhood Education Annual*, 12, 175 –192.

Appendix A

EDMODO SCREENSHOT



This is a typical screenshot of Edmodo that students would see while working.

Appendix B

SAMPLE WEBQUEST

Climate Change: An Evaluation of the Data

This lesson has been adapted from Elspeth Anderson (2012), Crofton House School.

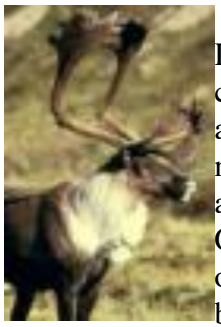
The estimated time for completion of this project is about 3 weeks.

Webquest Climate Change: An evaluation of the data

By Elspeth Anderson, Crofton House School

Purpose: For my students to develop an understanding of the available data on climate change and its interpretation. To have them develop the skills to locate data, evaluate the source, and compile and present information to others.

Introduction



Different voices both at home and abroad are continuing to raise concern about the changes being observed on the surface and in the atmosphere of our planet. The cause of the changes is being researched and in our lives our own personal education and actions are required.

Can we learn enough to speak for ourselves with authority and for the others, the organisms who live with us, such as the caribou, the polar bear and the forests? Using Edmodo, post your answers to the following questions in the assignment below. You will be graded individually based upon YOUR posts and not the group's

In February, 2007, the Intergovernmental Panel on Climate Change noted: "If we keep emitting greenhouse gases at current rates we will see bigger changes this century than we did in the previous century. The amount of warming will depend on choices human beings make."

What do we need to know, and what and how should we respond to the information?

Global Warming 101 Video

As with all important issues there are groups who have one point of view and groups who have an apposing point of view. We need to be aware of each voice and consider how each is using the data that is available.

How do we evaluate the data and the points of view?

A Con Video

Task

Overview of task:
This project will place emphasis on analytical/critical thinking, scientific writing, and presentation delivery.
There are many ways to analyze your topic, such as: comparison/contrast, problem/solution, pro/con argument, etc.

What is important is the report and the presentation must demonstrate your ability to develop analytical ideas for your audience (your classmates).

Details of task:
You are required to develop/complete the following components as a group:

1. A scientific report (3-5 pages in length). Double spaced, double sided printing.
2. A PowerPoint presentation to the class of 5-10 slides and lasting no more than 5 minutes. Your oral presentation should not be a reading of the information on the slides.

When you organize your written report as a group you must choose a topic, for example, an animal, place or an ecosystem and, then, using the list below say how it is affected by each of the following:

- the greenhouse effect -–include an explanation of the greenhouse effect,
- the effect of depletion of the ozone layer -–include an explanation of why the depletion,
- the effect of changes in permafrost, glaciers, and/or polar ice caps release of methane, rising sea level
- a discussion of varied solutions such as, carbon capture and carbon storage -– you may find others more appropriate to your topic

Process

Online resources

- view various short videos on climate change
- view a slideshow from the worldbank.org
- view facts and Canada's Action on Climate Change
- review facts on global warming
- review sites that contradict the global warming issue
- view data on permafrost and northern communities in Canada
- view facts on the greenhouse gases methane and connection with permafrost melting
- review sites on ozone depletion and its effects
- look at carbon capture and storage
- look at alternate energy sources and Kyoto protocol
- look at climate change photos

Processes 1:

Start your research report by looking at the data outline you the resources, or your own data

Skills required: Discussing with each other, writing and researching, fair collaboration

Critical thinking: recalling, analyzing, evaluating, synthesizing

To help you with the critical thinking portion consider any of the following modes of working:

- identify and discuss cause and effects
- compare and contrast
- identify conditions, trends, behavior, ways of thinking, etc. in order to clarify and alert an audience to a problem or solution
- explain relationships - how one thing contributes to another
- raise and address a significant questions about a subject
- interpret the importance of a set of events
- describe how something developed

The outline is ready ..... now to do your research.....

Processes 2:

Completion of the proofreading, revising, editing, and presentation of your work.

The following must completed:

1. Final research executed on the feedback of your draft.
2. Final revising/editing, which will include resource citing in MLA format and composition of a source/bibliography page
3. Final composition of your PPT and the presentation of the PPT to the class.
4. Check that you have not breached the copyright of any image you have used in your work.

Effective tips for PowerPoint presentation slides include:

1. Be succinct = being concise in your use of words, you are outlining the ideas not writing a text
2. Stick to no more than six lines on a slide
3. Stay focused -– one topic per slide
4. Be consistent in colors and design -– use animations only if they are necessary to convey your idea
5. Make sure the font size is large enough for easy reading by the audience member furthest away from the presentation and that the font and background colors have enough contrast from each other.

Evaluation

This is how your work will be evaluated.

	Developing researcher and collaborative student up to 0.5 of marks	**Qualified researcher and collaborative student up to 0.75 of marks**	**Exemplary researcher and collaborative student up to 1.0 of marks**	**Score**
Independent research; to develop credible research materials in class	Did not use time well, lacked consistent focus and effort	Used time to good effect, level of focus was good most of time	Used time in a focused and consistent manner to efficiently	/20
Collaboration in group tasks	Did not work with group to make group decisions or take on responsibility for the work	Worked well in the group, made some of the decisions and followed through on share of work	Worked exceptionally well in the group; did an equal share of the work needed to be done	/20
Written paper	Introduction, body paragraphs, conclusion all present. Development of thesis weak. Linking between paragraphs not clear. Little or no evidence of proofreading Citations not present or not in MLA format too long /too short	Introduction, body paragraphs, conclusion all present. Development of thesis good. Linking between paragraphs not always clear. Errors in proofreading Citations present in MLA format too long/ too short	Introduction, body paragraphs, conclusion all present. Development of thesis strong. Linking between paragraphs clear. Evidence of proofreading Citations in MLA format correct length	/25
PowerPoint presentation	Topic span too broad too many / too few slides narration from slides only too long/ too short	Topic span too broad correct number of slides narration independent of slides for most of presentation correct length of time	Topic span correct correct number of slides narration independent of slides correct length of time	/25
Peer evaluation – group work	poor participation in group work	good participation in group work	excellent participation in group work	/10

Conclusion

Check out the due dates for the following stages:

1. The draft of your written paper -– be cool!

2. The final submission of your paper -–job well done!

3. The date of your PowerPoint presentation to the class time to show your stuff!

Appendix C

SAMPLE WEBQUEST 1 AND WEQUEST 3 ONLINE POSTS

Sample Webquest 1 Online Posts

Rubric Code				Student Online Postings
CPR	**EVT/ ELVT**	**Mod EVT/ ELVT**	**EOD**	(Note: Grammatical errors are from the students. They are included to demonstrate the actual form of interactions that the students produced.)
__	MIS	MIS	6	Student P. to W3 CPES (CP Env Sci I 12-13) is anyone one? o Mar 10, 2013
3	INVT	ORG	3	Student P. to W3 CPES (CP Env Sci I 12-13) The PowerPoint also needs to include the facts about gb. S. and T. you can use B's papers on this part o Mar 10, 2013
__	MIS	MIS	2	Student P.to W3 CPES (CP Env Sci I 12-13) I saved some papers to the backpack.... o Mar 10, 2013
3	INVT	INVT	1	Student P. to W3 CPES (CP Env Sci I 12-13) Scientists learned long ago that the earth's climate has powerfully shaped the history of the human species — biologically, culturally and geographically. But only in the last few decades has research revealed that humans can be a powerful influence on the climate, as well...Hows this for a closing paragraph to essay?????? o Mar 10, 2013 o 1 Reaction
__	AA	AA	6	Student S - that sounds good ▪ Mar 10, 2013
2	INVT	WBK	1	Student P.. to W3 CPES (CP Env Sci I 12-13) http://topics.nytimes.com/top/news/science/to... Good link to a global warming page o Mar 10, 2013
2	MIS	ORG	1	Student P. to W3 CPES (CP Env Sci I 12-13) Did anyone finish the powerpoint? o Mar 10, 2013

Sample Webquest 3 Online Posts

Rubric Code				Student Online Postings
CPR	**EVT/ ELVT**	**Mod EVT/ ELVT**	**EOD**	(Note: Grammatical errors are from the students. They are included to demonstrate the actual interactions that the students produced. Layout is meant to reflect onsite views.)
1	MIS	ORG	2	Student A to 3W4 CPES (CP Env Sci I 12-13) Im starting on the essay now I'l do half o May 30, 2013 o 1 Reply
1	EPL	EPL	1	Student B said May 30, 2013: Chinese Mitten Crab then? Chinese Mitten Crab then?
1	INVT	ORG	1	Student A to 3W4 CPES (CP Env Sci I 12-13) Where is the packet? I think we should do something cool like penguins or ducks. o May 28, 2013 o 3 Replies
1	CRT	CRT	5	Student B. said May 28, 2013: If you have any suggestions, post it. I'm game for really anything as long as it has enough information. and Mr. Olsen has them, ask him for one. If you have any suggestions, post it. I'm game for really anything as long as it has enough information. and Mr. Olsen has them, ask him for one.
1	CRT	CRT	3	Student A said May 28, 2013: No Chinese mitten crab because they are in our bays killing blue crab. It hits home an it's on the packet. No Chinese mitten crab because they are in our bays killing blue crab. It hits home an it's on the packet.
1	CRT	CRT	3	Student B said May 29, 2013: I looked through the packet and i didn't see anywhere that says you couldn't use the ones on the packet and the site about them was in the resource section but do you have any other ideas then? I looked through the packet and i didn't see anywhere that says you couldn't use the ones on the packet and the site about them was in the resource section but do you have any other ideas then?
1	EPL	EPL	3	Student B to 3W4 CPES (CP Env Sci I 12-13) After looking at the options that's in the packet, I believe it would be best to do feral swine. There is much information about their location sitings, statistics, etc. The rest seem to be either potential threats or threats with little information. Opinions? o May 23, 2013 o 1 Reply
1	MIS	ORG	2	Student B said May 23, 2013: I'll go ahead and start on the powerpoint for it. I'll go ahead and start on the powerpoint for it.

Appendix D

ATTITUDES TOWARD ONLINE COLLABORATION SURVEY

Adapted from Korkmaz, Ö. (2012). A validity and reliability study of the online cooperative learning attitude scale (OCLAS). *Computers & Education, 59*(4), 1162-1169.

Directions: This part of the survey contains a number of statements about how you feel about using online collaboration through Edmodo. Your feeling about using Edmodo for learning is what is wanted. There are no right or wrong answers.

Circle the appropriate choice below each question on this sheet.

1. I enjoy solving problems regarding the group project using Online Cooperative Learning Application (OCLA) with my group members.

Strongly disagree Disagree Undecided Agree Strongly Agree

2. Being interactive with the other group members using OCLA increases my motivation for learning.

Strongly disagree Disagree Undecided Agree Strongly Agree

3. Trying to teach something to my group members in OCLA makes me tired.

Strongly disagree Disagree Undecided Agree Strongly Agree

4. I enjoy experiencing cooperative learning using OCLA with my group members.

Strongly disagree Disagree Undecided Agree Strongly Agree

5. OCLA does not make any sense to me.

Strongly disagree Disagree Undecided Agree Strongly Agree

6. Online group activity increases our creativity.

Strongly disagree Disagree Undecided Agree Strongly Agree

7. I cannot develop my own ideas in OCLA.

Strongly disagree Disagree Undecided Agree Strongly Agree

8. I believe that the group can work on a document effectively with the online cooperative learning application.

Strongly disagree Disagree Undecided Agree Strongly Agree

9. I don't like that people are depending on me in OCLA.

Strongly disagree Disagree Undecided Agree Strongly Agree

10. OCLA improves my social skills.

Strongly disagree Disagree Undecided Agree Strongly Agree

11. I don't think that my interaction with my group members in OCLA will make any contribution to me.

Strongly disagree Disagree Undecided Agree Strongly Agree

12. I enjoy helping others in OCLA.

Strongly disagree Disagree Undecided Agree Strongly Agree

13. OCLA is very entertaining for me.

Strongly disagree Disagree Undecided Agree Strongly Agree

14. OCLA is not suitable for me.

Strongly disagree Disagree Undecided Agree Strongly Agree

15. OCLA helps me feel better psychologically

Strongly disagree Disagree Undecided Agree Strongly Agree

16. More ideas come up as a result of OCLA.

Strongly disagree Disagree Undecided Agree Strongly Agree

17. I think that I have had / will have more successful results since I work with a group in OCLA.

Strongly disagree Disagree Undecided Agree Strongly Agree

18. Do you have access to the Internet outside of school at home or by smartphone?

Yes No

Appendix E

SAMPLE UNIT EXAM

Unit Test Air Pollution for the First Webquest

Multiple Choice

Identify the choice that best completes the statement or answers the question. Each question is worth 2 points each.

1. Which of the following practices would act to reduce vehicular exhaust in urban areas?
   I. Establish "No Idling" zones
   II. Require Enhanced Auto Inspections
   III. Retrofit gasoline pumps with sleeves to collect VOC's

a. I only
b. II only
c. II and III only
d. I and III only
e. I, II, and II

2. Large urban areas that have problems associated with high levels of particulate pollution also have
   I. Respiratory disease high above the national average
   II. Limited visibility – Haze
   III. Decreased water quality

a. I only
b. II only
c. I and II only
d. I and III only
e. I, II, and III

3. Early air pollution legislation in the United States sought to control all of the following EXCEPT

a. NO_X emissions
b. CO_2 emissions
c. open burning
d. sulfur content in fuel
e. emissions from industrial smokestacks

4. If a municipality wanted to take measures to decrease its air pollution, the largest impact would come from _____.

a. switching its city fleets of vehicles to natural gas from gasoline
b. a voluntary recycling program
c. limiting the new businesses start-ups in the area
d. constructing new landfills
e. requiring specific materials be used in the manufacture of new homes

5.The members of a municipality involved in the air pollution issues of the urban area are

i. The local government
ii. The public
iii. The local industries

a. I only
b. III only
c. I and III only
d. I and II only
e. I, II and III

6. Ground level ozone is classified as a pollutant because it reduces lung functionality AND
a. its concentrations are low but the particle size is high
b. it occurs in the atmosphere only
c. it is entirely anthropogenic in nature
d. it can degrade plant surfaces
e. it is an unstable molecule

7. The movement of large polluted air masses across the Pacific ocean into the northern United
States is an example of
a. the effects of the impact of the low air quality standards of ocean transport vehicles
b. a violation of the Montreal Protocol
c. the ill effects of increased UV radiation
d. a violation of the Clean Air Act
e. a reason that collaborative international air quality legislation would be useful

8. Which of the following is INCORRECT regarding NO_X?
a. It occurs as NO_2 and NO gases
b. They occur as products of combustion in the atmosphere
c. Motor vehicles and fossil fuel combustion are the primary anthropogenic sources
d. They play a role in the production of stratospheric ozone
e. They play a role in the production of photochemical smog

9. Which of the following is INCORRECT regarding CO?
a. It is a product of respiration
b. It is an odorless, colorless gas
c. It is a product of incomplete combustion
d. It is a common vehicle emission
e. It can be a dangerous indoor pollutant

10. Which of the following pollutants bonds with hemoglobin thereby interfering with O_2 transport in the blood stream?
a. CO_2
b. CO
c. O_3
d. NO
e. PM

11. Which of the following is an anthropogenic source of nitrogen oxides?
a. Motor vehicles
b. Forest fires
c. Nitrogen fixation
d. Lightning
e. Planting of legumes by farmers

12. Haze in the Amazon basin would most likely come from
a. slash and burn methodologies used to remove trees
b. microbial action in the river sediments
c. trade winds moving sea spray inland
d. cattle overgrazing the river basin
e. indigenous people's life styles

13. The smog that frequently exists in major metropolitan areas such as Los Angeles, CA is known as brown smog and consists primarily of what component?
a. fog
b. ozone
c. sulfate compounds
d. carbon particulate matter
e. smoke

14. Costs associated with atmospheric brown clouds such as those covering large areas in Asia include all of the following EXCEPT
a. fluctuating surface temperatures beneath the smog
b. light absorption causing reduced photosynthesis in plants
c. human respiratory problems
d. diminished allure of recreation areas
e. loss of tourism dollars

15. The air pollutant that is a metal and is released primarily from the combustion of coal is
a. lead
b. mercury
c. arsenic
d. sulfur
e. none of the above

16. Gasoline is a VOC. Which of the following is NOT a characteristic of gasoline that makes it a "VOC"?
a. gasoline evaporates at a typical atmospheric temperature
b. gasoline has a strong smell
c. gasoline is a hydrocarbon
d. gasoline is a hazardous compound
e. gasoline is an organic compound

17. Sulfates are considered secondary pollutants because
a. their emissions are difficult to regulate
b. they form more readily at night and in dry areas
c. they result from the transformation of primary pollutants
d. they originate from the burning of primarily coal
e. they are a component of grey smog

18. A thermal inversion, which can lead to serious pollution events, occurs when
a. warm air that normally rises, does so taking the pollutants with it
b. warm air that normally rises stays close to the surface holding pollutants close to the surface
c. cool air that normally rises, does so taking the pollutants with it
d. cool air stays close to the surface but pollutants rise into the atmosphere
e. cool air stays close to the surface and is blanketed by a layer of warm air that traps pollutants

19. Which of the following ranges correctly describes the pH of acid deposition?
a. $pH < 5.6$
b. $7 > pH > 5.6$
c. $7 < pH > 5.6$
d. $pH < 8.6$
e. $7 < pH < 8.6$

20. Which of the following is NOT a problem associated with acid deposition?
a. compromised aquatic systems
b. lowered pH of lakes
c. negative effects on human skin with contact
d. erosion of buildings and monuments made of marble
e. erosion of paint on painted surfaces

21.Catalytic converters in cars have been instrumental in removing which of the following pollutants from vehicle emissions?

I. NO_X
II. CO
III. SO_4^{2-}

a. I only
b. II only
c. I and II only
d. I and III only
e. I, II, and III

22. Aspects of sulfur allowances as provided for in the Acid Rain Program of the Clean Air Act include all of the following EXCEPT:

a. a cost overrun for the entire program
b. an overall reduction in sulfur emissions in the United States
c. companies can emit amounts of sulfur proportional to the amounts they emitted prior to 1990
d. companies can sell sulfur allowances that they do not use to other companies
e. companies that emit quantities of sulfur above which they have allowances for must pay a fine.

23. The class of anthropogenic compounds responsible for the breakdown of stratospheric ozone are known as

a. VOCs
b. CFCs
c. VFCs
d. CO_X
e. FCCs

24. Problems associated with the thinning ozone layer include all of the following EXCEPT

a. increased incidences of asthma
b. increased incidences of skin cancer
c. increased incidences of cataracts
d. reduction in photosynthetic activity in plants
e. suppressed immune system

25. The agreement that allowed for a reduction, and eventual elimination, of CFC production and use is

a. The Montreal Protocol
b. The Quebec Protocol
c. The Kyoto Protocol
d. The Clean Skies Initiative
e. The Clean Air Act

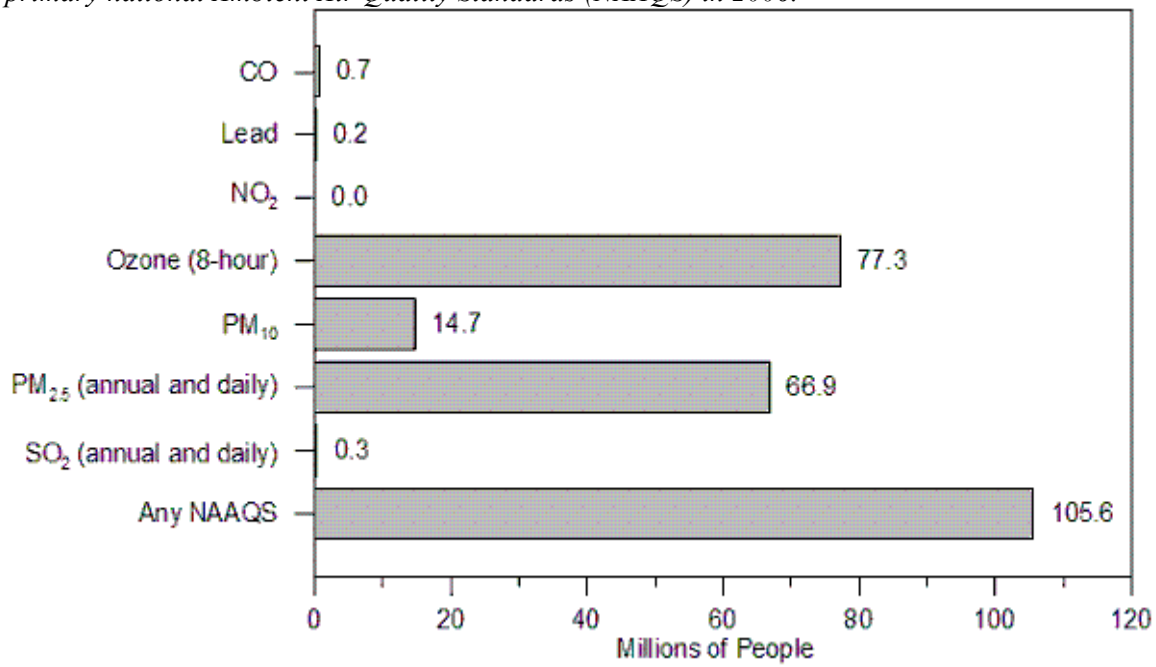
26. All of the following describe radon-222 EXCEPT
a. it is a radioactive gas resulting from the natural decay of uranium
b. it seeps into homes through cracks in the foundation or soil
c. the effects can be reduced by simply increasing ventilation
d. it binds with hemoglobin in the blood and can lead to death
e. it exists in the igneous rock granite all around the world

27. A phenomenon associated with the buildup of toxic compounds and pollutants in an airtight space is known as
a. sealed building syndrome
b. synthetic building syndrome
c. sick building syndrome
d. sick worker syndrome
e. insulated building sick worker syndrome

28. The beneficial ozone is ____ and the dangerous ozone is ____.
a. O_2, O_3
b. O_3, O_2
c. O_3, CFC
d. Tropospheric, stratospheric
e. Stratospheric, tropospheric

Figure 15-5

Number of people living in countries with air quality concentrations above the level of the primary national Ambient Air Quality Standards (NAAQS) in 2006.



29. Use Figure 15-5. The largest number of people affected by an air quality concentration above
the standard (NAAQS) level in 2006 were affected by
a. O_3
b. PM_{10}
c. CO
d. $PM_{2.5}$
e. SO_2

30. Which type of pollution control is most difficult?
a. choosing a fuel with fewer impurities
b. including catalytic converter on new automobiles
c. removing pollutants after they have been dispersed over a wide area
d. burning fuel at lower temperatures
e. reducing pollutants after combustion but before release into the atmosphere

Short Answer: Use complete sentences to answer the following questions. What cannot be read will be marked incorrect. Each question is worth 20 points.

1. What are some methods that could be used to reduce the amount of carbon dioxide that we release in the air? Please describe 3 methods.

2. What are the arguments being proposed regarding global climate change? Is it a problem or not? Please provide a well thought out answer based upon the studies that you have conducted so far in this class.

Appendix F

Exam Essay Grading Rubric

	Needs Work	Competent	Excellent	Possible Totals
Dimensions	**0 points**	**3 points**	**6 points**	
Content	No examples provided related to content asked by question.	Lists relevant information to question but does not explain clearly, some inaccuracies present.	Clear relevant and accurate examples provided as asked by question.	
	0 points	**3 points**	**6 points**	
Grammar/ Communication	No lists, Statements off topic, wild guesses	Understandable, Just lists, Information provided without explanation	Clear, to the point, Easy to understand, Grammar is good	
	0 points	**3 points**	**6 points**	
Thinking Skills	No extra explanations provided, no effort made	Shows evidence of going beyond question but provides no explanation for it. Lists examples without describing them with some inaccuracies present.	Goes beyond question request with other examples and/or explanations.	

Maximum point total possible = 18 points for each essay question.

Appendix G

STUDENT POSTING RUBRIC

Points	Quantity	Quality	Relevance	Manner
4	The amount of information is sufficient to Clearly establish the purpose of the posting.	The posting is a *new contribution* (e.g., novelty, originality), reflective of the student's opinions, ***AND*** is supported by *accurate* Evidence / examples.	The posting is on the same topic as both the conference, ***AND*** the previous posting.	The posting is logically organized and has no spelling, punctuation, or grammatical errors; meaning of the posting is clearly presented.
3	There is *slightly* too much or too little information; however, the purpose of the posting is still reasonably clear.	(a) The posting is a *new contribution* that reflects the student's opinions; however, evidence/examples are not provided to support claims; ***OR*** (b) The posting reflects the student's opinions and *accurate* evidence/ examples are provided.	The posting is on the same topic as the conference, but *not* the previous posting.	The posting is adequately organized; if any errors are found, they are so minor that the meaning is still reasonably clear.
2	There is too much or too Little information, such that the purpose of the posting is Occasionally obscured.	(a) The posting is representative of the student's opinions, yet evidence/examples are not provided to support claims; ***OR*** (b) The posting is largely a re-statement of prior postings ***BUT*** incorporates a *minor new contribution.*	The posting is on the same topic as any of the previous postings, but *not* the conference.	The technical aspect of the posting (e.g., organization, spelling, grammar) has several problems, such that the meaning is occasionally obscured.
1	There is so much or so little information that the purpose of the posting is not understood.	(a) The main idea in the posting is a re-statement of prior postings and *no new contribution* is present; ***OR*** (b) *Inaccurate* evidence/ examples are provided.	The posting is irrelevant to both the conference topic, ***AND*** previous postings.	The posting is poorly organized and/or it has serious errors in sentence structure or usage, thus the posting is hard to understand.

Note: Reprinted from "Evaluating online conversations in an asynchronous Learning environment: An application of Grice's cooperative principle," by C.H. Ho and S. Swan, 2007, *The Internet and Higher Education,* 10(1), 13. Copyright C.H. Ho and S. Swan 2007. Reprinted with permission from Elsevier.

Appendix H

COMPARISON OF PERCENTAGE RESPONSES FOR SURVEY

	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey
Question	Strongly Disagree	Strongly Disagree	Disagree	Disagree	Undecided	Undecided	Agree	Agree	Strongly Agree	Strongly Agree
Q1	0%	0%	14%	19%	52%	10%	29%	52%	5%	19%
Q2	5%	0%	19%	10%	19%	19%	48%	52%	10%	19%
Q3	0%	5%	38%	76%	38%	10%	24%	10%	0%	0%
Q4	5%	5%	5%	5%	33%	14%	48%	48%	10%	29%
Q5	10%	38%	29%	52%	48%	10%	10%	0%	5%	0%
Q6	0%	5%	10%	10%	14%	10%	62%	33%	14%	43%
Q7	10%	38%	33%	38%	48%	14%	10%	10%	0%	0%
Q8	5%	0%	10%	10%	29%	14%	52%	48%	5%	29%
Q9	0%	5%	48%	52%	38%	10%	14%	29%	0%	5%
Q10	0%	10%	24%	14%	29%	24%	38%	38%	10%	14%
Q11	5%	10%	43%	57%	33%	24%	14%	10%	5%	0%
Q12	5%	0%	10%	10%	19%	5%	57%	62%	10%	24%
Q13	5%	0%	19%	14%	38%	24%	19%	43%	19%	19%
Q14	5%	43%	29%	33%	48%	19%	10%	5%	10%	0%
Q15	5%	10%	10%	10%	57%	38%	29%	24%	0%	19%
Q16	5%	5%	14%	5%	33%	5%	43%	43%	5%	43%
Q17	10%	5%	10%	5%	29%	24%	43%	38%	10%	29%
Q18	86%	95%	14%	5%	0%	0%	0%	0%	0%	0%

Appendix I

HUMAN SUBJECTS DOCUMENTS

UNIVERSITY OF DELAWARE

RESEARCH OFFICE

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE:	December 3, 2012
TO:	Peter Olson
FROM:	University of Delaware IRB
STUDY TITLE:	[385149-1] An Investigation into the Impact of Online Collaboration on Student Engagement and Attitudes in a High School Environmental Science Course
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	December 3, 2012
EXPIRATION DATE:	December 2, 2013
REVIEW TYPE:	Expedited Review
REVIEW CATEGORY:	Expedited review category # 7

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Jody-Lynn Berg at (302) 831-1119 or jlberg@udel.edu. Please include your study title and reference number in all correspondence with this office.

Parent Permission Letter

AN INVESTIGATION INTO THE IMPACT OF ONLINE COLLABORATION ON STUDENT ENGAGEMENT AND ATTITUDES IN A HIGH SCHOOL ENVIRONMENTAL SCIENCE COURSE

Dear Parent or Guardian,

My name is Peter Olson. I am your child's environmental science teacher at Cape Henlopen High School and a doctoral student at the University of Delaware. I would like to ask your child to participate in a research study I plan to conduct on the effect of using an online collaboration platform called Edmodo on student engagement and attitudes towards its use in the learning process for my dissertation. Your child would be one of a minimum of at least 23 students enrolled in my College Preparatory Environmental Science I class who have been invited to participate in this study. The class was selected because it consists of an appropriately aged group new to the use of online collaboration. The study will enable me to get a clearer understanding of the effects of using online collaboration in a high school setting. Your child's choice and eligibility to take this class was not a result of this study in any manner.

Student Information to be Collected:

All students enrolled in my College Preparatory Environmental Science I class will be asked to use online collaboration to support their learning. I am asking your permission to use information obtained from your child that would enable me to study some outcomes of this kind of collaboration. First, I would like to collect data from your child's participation in online discussion groups during interactions with their peers from their environmental science class. I will collect data by observing your child's responses and amount of participation to two webquest assignments which will be completed via the use of a free online collaboration platform called Edmodo. Second, I would like to survey your child prior to participation in the online discussion groups and after regarding their attitudes toward the use of an online collaboration platform in the learning process. The surveys may take 15 minutes each to complete. Students may decline to answer any questions with no penalties of any kind. Additionally, data from summative unit exams on the webquest topics will be analyzed for any correlation to the online posts made by the students. All individual data will be kept confidential. Data will only be reported in aggregated form for analysis. Other assignments such as homework, and class work normally given during the course may be used for analysis. Data will be locked in a secure cabinet and office while in paper form. Electronic data will be stored on the University of Delaware School of Education server under password protection and encryption. Data will be held until August 31, 2016, at which time all files and documents will be destroyed.

Risks/Benefits

There will be no risks to participants in this study. Your child will not be identified by name in a report of the study. Participation is strictly voluntary for the sharing of data for research purposes. Non-participation in the sharing of data for research purposes will not affect your child's grades, assignments, or treatment by the instructor or peers in any way. Non-participation also will not forfeit the use of Edmodo as an educational instructional tool for class assignments. Analysis of data will occur after the completion of the course and will not impact the students' grades. The use of the Edmodo online collaboration platform is designed strictly for educational purposes and will not be used as a social network like Facebook or MySpace. Students will be required to use appropriate grammar instead of texting language. Edmodo does not allow private student-to-student messaging-the site will be used to discuss school-related content only. No put-downs or sarcasm toward another's ideas will be tolerated. All school rules and consequences related to harassment apply. There are also no guaranteed benefits from participating in this study. If you choose to decline participation, I will ensure that your child's assignment scores and survey information are not used in this study and remain only for normal grading as required by the school. If you grant your child permission to participate in this study, your child will receive a letter similar to this one, and can independently grant or decline permission to participate in this study. You can withdraw your child's participation any time during the course of the study. If this happens, I will ensure that your child's information is not used in this study and all collected data from your child will immediately be destroyed.

Please initial ----------

Contact Information:
If you would like more information about the study, please contact me or my university advisor:

Mr. Peter Olson
Removed for Confidentiality
Reasons, Contact information
May be found in the original letter

Dr. Zoubeida R. Dagher
Univ. of Delaware/School of Education
Willard Hall
Newark, DE 19716
Phone: 302-831-1667
Email: zoubeida@udel.edu

If you have questions about your child's rights as a research participant or have any concerns or complaints about the conduct of this project, please contact:
Chair, Human Subjects Review Board
210 Hullihen Hall
University of Delaware
Newark, DE 19716-1551
Phone: 302-831-2137

To indicate your decision regarding giving permission for your child to participate in this research study, please initial the previous page, check the appropriate box below, sign and date the form, and return this entire letter to me. If you would like to receive a summary of the findings for the project, please check the appropriate box below. You may keep the extra copy of this letter for your records.

Thank you,

Peter Olson
Location Information may be found in original letter

Permissions:

Please check one:

☐ I give permission for my child to participate in the study, "An Investigation into the Impact of Online Collaboration on Student Engagement and Attitudes in a High School Environmental Science Course" as explained above.

☐ I do not give permission for my child to participate in the study, "An Investigation into the Impact of Online Collaboration on Student Engagement and Attitudes in a High School Environmental Science Course" as explained above and understand my child may use Edmodo to complete assignments only.

Child's Name _____

Parent or Legal Guardian's Signature: _____ Date _____

Parent or Legal Guardian's Name (Please print):_____

☐ I would like to receive a summary report of the findings.

Please provide your address: _____
(Name)

_____
(Street) (City) (Zip Code)

Student Permission Letter

AN INVESTIGATION INTO THE IMPACT OF ONLINE COLLABORATION ON STUDENT ENGAGEMENT AND ATTITUDES IN A HIGH SCHOOL ENVIRONMENTAL SCIENCE COURSE

Dear Student,

My name is Mr. Olson. In addition to being your environmental science teacher, I am also a doctoral student at the University of Delaware. As part of my degree requirements, I am studying how my teaching affects student learning. All 23 students in your environmental science class are invited participate in this study. As a result, I am inviting you to participate in this study too. Since you are new to high school and probably unfamiliar with the use of online collaboration, your class was selected as a result of trying to better understand the effects of using an online collaboration platform on high school students.

Student Information to be Collected:

By agreeing to participate, you give me permission to use:

1) Data about the quality and quantity of posts you make online via Edmodo an online collaboration platform.
2) Information from surveys that you will complete about your attitudes towards learning via the use of Edmodo while learning about environmental science. Each survey may take 15 minutes to complete from your class time.
3) Data from your performance on unit exams for each webquest unit. Additional data may be used for analysis from your homework and class work as well.

With the exception of the attitudes survey, all other materials (homework, tests, and labs) are given to all students as assignments and will not take additional time away from normal class time and are considered regular class work and will be used to compute your marking period grades as usual. Your homework and lab grades may be included in the study data.

Risks/Benefits:

There will be no risks or benefits involved in participating in this study. You will not be identified in any oral or written report of the study. All collected data will be compiled to look at whole-class differences for research purposes only.

Your parents/legal guardians have already given permission for you to participate in this study, however, you may choose to be in this study, or you may choose not to participate. Your choice will not affect your grade, assignments, or treatment in this class in any way. If you choose not to participate, I will ensure that your scores and surveys are not used in this study for research but you will still be required to complete your webquest via Edmodo for assignment purposes. *You may choose to withdraw your permission to participate at any time. If you do so*, your records will not be used in this study and all of your data will be destroyed immediately. The use of the Edmodo online collaboration platform is designed strictly for educational purposes and will not be used as a social network like Facebook or MySpace. Students will be required to use appropriate grammar instead of texting language. Edmodo does not allow private student-to-student messaging-the site will be used to discuss school-related content only. No put-downs or sarcasm toward another's ideas will be tolerated. All school rules and consequences related to harassment apply. Collected data will be locked in a secure cabinet and office while in paper form. Electronic data will be stored on the University of Delaware School of Education server under password protection and encryption. Data that is used will be held until August 31, 2016, at which time all files and documents will be destroyed.

Please initial ----------

Contact Information:
If you would like more information about the study, please contact me or my university advisor:

Mr. Peter Olson
Removed for Confidentiality
Reasons, Contact Information
May be found in the original letter

Dr. Zoubeida R. Dagher
Univ. of Delaware/School of Education
Willard Hall
Newark, DE 19716
Phone: 302-831-1667
Email: zoubeida@udel.edu

If you have questions about your rights as a research participant, or have any concerns or complaints about the conduct of this project, please contact:
Chair, Human Subjects Review Board
210 Hullihen Hall
University of Delaware
Newark, DE 19716-1551
Phone: 302-831-2137

Please indicate your decision to participate in this research study, please check the appropriate box below, sign and date the form, and return this entire letter to me. If you would like to receive a summary of the findings for the project, please check the appropriate box below. You may keep the extra copy of this letter for your records.

Thank you,

Peter Olson
Location Information may be found in original letter

Permissions:

Please check one:

☐ I voluntarily agree to participate in the study, "An Investigation into the Impact of Online Collaboration on Student Engagement and Attitudes in a High School Environmental Science Course" as explained above.

☐ I do not wish to participate in the study, "An Investigation into the Impact of Online Collaboration on Student Engagement and Attitudes in a High School Environmental Science Course" as explained above and may use Edmodo to complete assignments only.

Child's Name (printed) _____

Child's Signature: _____ Date _____

☐ I would like to receive a summary report of the findings.

Please provide your address: _____
(Name)

_____
(Street) (City) (Zip Code)

Appendix J

PUBLICATION PERMISSIONS

Reprint Permission for:

Anderson, E. (2012). Climate change: An evaluation of the data webquest activity. CC-BY-NC-SA 3.0. Retrieved August 18, 2012 from http://questgarden.com/120/62/8/110303075616/index.htm

Reprint Permission for:

Ho, C.H., Swan, K. (2007). Evaluating online conversation in an asynchronous learning environment: An application of Grice's cooperative principle. *The Internet and Higher Education*, 10(1), 13.

ELSEVIER LICENSE
TERMS AND CONDITIONS

Feb 23, 2014

This is a License Agreement between Peter G Olson ("You") and Elsevier ("Elsevier") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Elsevier, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

Supplier	Elsevier Limited The Boulevard,Langford Lane Kidlington, Oxford, OX5 1GB,UK
Registered Company Number	1982084
Customer name	Peter G Olson
Customer address	University of Delaware/School of Education, Newark, DE 19716
License number	3334860708341
License date	Feb 23, 2014
Licensed content publisher	Elsevier
Licensed content publication	The Internet and Higher Education
Licensed content title	Evaluating online conversation in an asynchronous learning environment: An application of Grice's cooperative principle
Licensed content author	Chia-Huan Ho,Karen Swan
Licensed content date 2007	
Licensed content volume number	10
Licensed content issue number	1
Number of pages	12

Start Page	3
End Page	14
Type of Use	reuse in a thesis/dissertation
Intended publisher of new work	other
Portion	figures/tables/illustrations
Number of figures/tables/illustrations	1
Format	both print and electronic
Are you the author of this Elsevier article?	No
Will you be translating?	No

Title of your thesis/dissertation An Investigation into Student Engagement with an Online Platform (Edmodo) in a High School Environmental Science Course

Expected completion date	May 2014
Estimated size (number of pages)	134
Elsevier VAT number	GB 494 6272 12
Permissions price	0.00 USD
VAT/Local Sales Tax	0.00 USD / 0.00 GBP
Total	0.00 USD

Terms and Conditions

INTRODUCTION

1. The publisher for this copyrighted material is Elsevier. By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by Copyright Clearance Center, Inc. ("CCC"), at the time that you opened your Rightslink account and that are available at any time at http://myaccount.copyright.com).

GENERAL TERMS

2. Elsevier hereby grants you permission to reproduce the aforementioned material subject to the terms and conditions indicated.

3. Acknowledgement: If any part of the material to be used (for example, figures) has appeared in our publication with credit or acknowledgement to another source, permission must also be sought from that source. If such permission is not obtained then that material may not be included in your publication/copies. Suitable acknowledgement to the source must be made, either as a footnote or in a reference list at the end of your publication, as follows:

"Reprinted from Publication title, Vol /edition number, Author(s), Title of article / title of chapter, Pages No., Copyright (Year), with permission from Elsevier [OR APPLICABLE SOCIETY COPYRIGHT OWNER]." Also Lancet special credit - "Reprinted from The Lancet, Vol. number, Author(s), Title of article, Pages No., Copyright (Year), with permission from Elsevier."

4. Reproduction of this material is confined to the purpose and/or media for which permission is hereby given.

5. Altering/Modifying Material: Not Permitted. However figures and illustrations may be altered/adapted minimally to serve your work. Any other abbreviations, additions, deletions and/or any other alterations shall be made only with prior written authorization of Elsevier Ltd. (Please contact Elsevier at permissions@elsevier.com)

6. If the permission fee for the requested use of our material is waived in this instance, please be advised that your future requests for Elsevier materials may attract a fee.

7. Reservation of Rights: Publisher reserves all rights not specific ally granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.

8. License Contingent Upon Payment: While you may exercise the rights licensed immediately upon issuance of the license at the end of the licensing process for the transaction, provided that you have disclosed complete and accurate details of your proposed use, no license is finally effective unless and until full payment is received from you (either by publisher or by CCC) as provided in CCC's Billing and Payment terms and conditions. If full payment is not received on a timely basis, then any license preliminarily granted shall be deemed automatically revoked and shall be void as if never granted. Further, in the event that you breach any of these terms and conditions or any of CCC's Billing and Payment terms and conditions, the license is automatically revoked and shall be void as if never granted. Use of materials as described in a revoked license, as well as any use of the materials beyond the scope of an unrevoked license, may constitute copyright infringement and publisher reserves the right to take any and all action to protect its copyright in the materials.

9. Warranties: Publisher makes no representations or warranties with respect to the licensed material.

10. Indemnity: You hereby indemnify and agree to hold harmless publisher and CCC, and their respective officers, directors, employees and agents, from and against any

and all claims arising out of your use of the licensed material other than as specifically authorized pursuant to this license.
11. No Transfer of License: This license is personal to you and may not be sublicensed, assigned, or transferred by you to any other person without publisher's written permission.

12. No Amendment Except in Writing: This license may not be amended except in a writing signed by both parties (or, in the case of publisher, by CCC on publisher's behalf).

13. Objection to Contrary Terms: Publisher hereby objects to any terms contained in any purchase order, acknowledgment, check endorsement or other writing prepared by you, which terms are inconsistent with these terms and conditions or CCC's Billing and Payment terms and conditions. These terms and conditions, together with CCC's Billing and Payment terms and conditions (which are incorporated herein), comprise the entire agreement between you and publisher (and CCC) concerning this licensing transaction. In the event of any conflict between your obligations established by these terms and conditions and those established by CCC's Billing and Payment terms and conditions, these terms and conditions shall control.

14. Revocation: Elsevier or Copyright Clearance Center may deny the permissions described in this License at their sole discretion, for any reason or no reason, with a full refund payable to you. Notice of such denial will be made using the contact information provided by you. Failure tor eceive such notice will not alter or invalidate the denial. In no event will Elsevier or Copyright Clearance Center be responsible or liable for any costs, expenses or damage incurred by you as a result of a denial of your permission request, other than a refund of the amount(s) paid by you to Elsevier and/or Copyright Clearance Center for denied permissions.

LIMITED LICENSE

The following terms and conditions apply only to specific license types:

15. Translation: This permission is granted for non-exclusive world English rights only unless your license was granted for translation rights. If you licensed translation rights you may only translate this content into the languages you requested. A professional translator must perform all translations and reproduce the content word for word preserving the integrity of the article. If this license is tore-use 1 or 2 figures then permission is granted for non-exclusive world rights in all languages.

16. Posting licensed content on any Website: The following terms and conditions apply as follows: Licensing material from an Elsevier journal: All content posted to the web site must maintain the copyright information line on the bottom of each

18. For book authors the following clauses are applicable in addition to the above: Authors are permitted to place a brief summary of their work online only. You are not allowed to download and post the published electronic version of your chapter, nor may you scan the printed edition to create an electronic version. Posting to a repository: Authors are permitted to post a summary of their chapter only in their institution's repository.

20. Thesis/Dissertation: If your license is for use in a thesis/dissertation your thesis may be submitted to your institution in either print or electronic form. Should your thesis be published commercially, please reapply for permission. These requirements include permission for the Library and Archives of Canada to supply single copies, on demand, of the complete thesis and include permission for UMI to supply single copies, on demand, of the complete thesis. Should your thesis be published commercially, please reapply for permission.

Elsevier Open Access Terms and Conditions

Elsevier publishes Open Access articles in both its Open Access journals and via its Open Access articles option in subscription journals.

Authors publishing in an Open Access journal or who choose to make their article Open Access in an Elsevier subscription journal select one of the following Creative Commons user licenses, which define how a reader may reuse their work: Creative Commons Attribution License (CC BY), Creative Commons Attribution – Non Commercial – Share Alike (CC BY NCSA) and Creative Commons Attribution – Non Commercial – No Derivatives (CC BYNC ND)

Terms & Conditions applicable to all Elsevier Open Access articles:

Any reuse of the article must not represent the author as endorsing the adaptation of the article nor should the article be modified in such a way as to damage the author's honour or reputation.

The author(s) must be appropriately credited.

If any part of the material to be used (for example, figures) has appeared in our publication with credit or acknowledgement to another source it is the responsibility of the user to ensure their reuse complies with the terms and conditions determined by the rights holder.

Additional Terms & Conditions applicable to each Creative Commons user license:

CC BY: You may distribute and copy the article, create extracts, abstracts, and other revised versions, adaptations or derivative works of or from an article (such as a translation),to include in a collective work (such as an anthology), to text or data mine the article, including for commercial purposes without permission from Elsevier

CC BY NC SA: For non-commercial purposes you may distribute and copy the article, create extracts, abstracts and other revised versions, adaptations or derivative works of or from an article (such as a translation), to include in a collective work (such as an anthology), to text and data mine the article and license new adaptations or creations under identical terms without permission from Elsevier

CC BY NC ND: For non-commercial purposes you may distribute and copy the article and include it in a collective work (such as an anthology), provided you do not alter or modify the article, without permission from Elsevier

Any commercial reuse of Open Access articles published with a CC BY NC SA or CC BY NC ND license requires permission from Elsevier and will be subject to a fee.

Commercial reuse includes:
- Promotional purposes (advertising or marketing)
- Commercial exploitation (e.g. a product for sale or loan)
- Systematic distribution (for a fee or free of charge)

Please refer to Elsevier's Open Access Policy for further information.

21. Other Conditions:
v1.7
If you would like to pay for this license now, please remit this license along with your payment made payable to "COPYRIGHT CLEARANCE CENTER" otherwise you will be invoiced within 48 hours of the license date. Payment should be in the form of a check or money order referencing your account number and this invoice number RLNK501233511.
Once you receive your invoice for this order, you may pay your invoice by credit card. Please follow instructions provided at that time.
Make Payment To:
Copyright Clearance Center
Dept 001
P.O. Box 843006
Boston, MA 02284-3006
For suggestions or comments regarding this order, contact Rights Link Customer Support: customercare@copyright.com or +1-877-622-5543 (toll free in the US) or +1-978-646-2777.

Gratis licenses (referencing $0 in the Total field) are free. Please retain this printable license for your reference. No payment is required.
JOHN WILEY AND SONS LICENSE
TERMS AND CONDITIONS

Reprint Permission for:

Kanuka, H., Rourke, L., & Laflamme, E. (2007). The influence of instructional methods on the quality of online discussion. *British Journal of Educational Technology*, 38(2), 260-271.

Feb 09, 2014

This is a License Agreement between Peter G Olson ("You") and John Wiley and Sons ("John Wiley and Sons") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by John Wiley and Sons, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

License Number	3325041339020
License date	Feb 09, 2014
Licensed content publisher	John Wiley and Sons
Licensed content publication	British Journal of Educational Technology
Licensed content title	The influence of instructional methods on the quality of online discussion
Licensed copyright line	Copyright © 2006, John Wiley and Sons
Licensed content author	Heather Kanuka,Liam Rourke,Elaine Laflamme
Licensed content date	Jun 5, 2006
Start page	260
End page	271
Type of use	Dissertation/Thesis
Requestor type	University/Academic
Format	Print and electronic
Portion	Figure/table
Number of figures/tables	2

Original Wiley figure/table number(s)
I would like to include Table 1, pg 264 and Figure 2. pg 267, from the listed article into my doctoral dissertation paper. My paper will be published by the University of Delaware via University Microfilms, Inc. (UMI) doctoral dissertation program in its entirety.

Will you be translating?	No
Title of your thesis / dissertation	

An Investigation into Student Engagement with an Online Platform (Edmodo) in a High School Environmental Science Course

Expected completion date	May 2014
Expected size (number of pages)	134
Total	0.00 USD

Terms and Conditions
TERMS AND CONDITIONS

works may be made based on the Materials without the prior permission of the respective copyright owner. You may not alter, remove or suppress in any manner any copyright, trademark or other notices displayed by the Materials. You may not license, rent, sell, loan, lease, pledge, offer as security, transfer or assign the Materials, or any of the rights granted to you hereunder to any other person.

4. The Materials and all of the intellectual property rights therein shall at all times remain the exclusive property of John Wiley & Sons Inc or one of its related companies (WILEY) or their respective licensors, and your interest therein is only that of having possession of and the right to reproduce the Materials pursuant to Section 2 herein during the continuance of this Agreement. You agree that you own no right, title or interest in or to the Materials or any of the intellectual property rights therein. You shall have no rights hereunder other than the license as provided for above in Section 2. No right, license or interest to any trademark, trade name, service mark or other branding ("Marks") of WILEY or its licensors is granted hereunder, and you agree that you shall not assert any such right, license or interest with respect thereto.

5. NEITHER WILEY NOR ITS LICENSORS MAKES ANY WARRANTY OR REPRESENTATION OF ANY KIND TO YOU OR ANY THIRD PARTY, EXPRESS, IMPLIED OR STATUTORY, WITH RESPECT TO THE MATERIALS OR THE ACCURACY OF ANY INFORMATION CONTAINED IN THE MATERIALS, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, ACCURACY, SATISFACTORY QUALITY, FITNESS FOR A PARTICULAR PURPOSE, USABILITY, INTEGRATION OR NON-INFRINGEMENT AND ALL SUCH WARRANTIES ARE HEREBY EXCLUDED BY WILEY AND ITS LICENSORS AND WAIVED BY YOU.

6. WILEY shall have the right to terminate this Agreement immediately upon breach of this Agreement by you.

7. You shall indemnify, defend and hold harmless WILEY, its Licensors and their respective directors, officers, agents and employees, from and against any actual or threatened claims, demands, causes of action or proceedings arising from any breach of this Agreement by you.

8. IN NO EVENT SHALL WILEY OR ITS LICENSORS BE LIABLE TO YOU OR ANY OTHER PARTY OR ANY OTHER PERSON OR ENTITY FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, INDIRECT, EXEMPLARY OR PUNITIVE DAMAGES, HOWEVER CAUSED, ARISING OUT OF OR IN CONNECTION WITH THE DOWNLOADING, PROVISIONING, VIEWING OR USE OF THE MATERIALS REGARDLESS OF THE FORM OF ACTION, WHETHER FOR BREACH OF CONTRACT, BREACH OF WARRANTY, TORT,

NEGLIGENCE, INFRINGEMENT OR OTHERWISE (INCLUDING, WITHOUT LIMITATION, DAMAGES BASED ON LOSS OF PROFITS, DATA, FILES, USE, BUSINESS OPPORTUNITY OR CLAIMS OF THIRD PARTIES), AND WHETHER OR NOT THE PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THIS LIMITATION SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY PROVIDED HEREIN.

9. Should any provision of this Agreement be held by a court of competent jurisdiction to be illegal, invalid, or unenforceable, that provision shall be deemed amended to achieve as nearly as possible the same economic effect as the original provision, and the legality, validity and enforceability of the remaining provisions of this Agreement shall not be affected or impaired thereby.

10. The failure of either party to enforce any term or condition of this Agreement shall not constitute a waiver of either party's right to enforce each and every term and condition of this Agreement. No breach under this agreement shall be deemed waived or excused by either party unless such waiver or consent is in writing signed by the party granting such waiver or consent. The waiver by or consent of a party to a breach of any provision of this Agreement shall not operate or be construed as a waiver of or consent to any other or subsequent breach by such other party.

11. This Agreement may not be assigned (including by operation of law or otherwise) by you without WILEY's prior written consent.

12. Any fee required for this permission shall be non-refundable after thirty (30) days from receipt

13. These terms and conditions together with CCC's Billing and Payment terms and conditions (which are incorporated herein) form the entire agreement between you and WILEY concerning this licensing transaction and (in the absence of fraud) supersedes all prior agreements and representations of the parties, oral or written. This Agreement may not be amended except in writing signed by both parties. This Agreement shall be binding upon and inure to the benefit of the parties' successors, legal representatives, and authorized assigns.

14. In the event of any conflict between your obligations established by these terms and conditions and those established by CCC's Billing and Payment terms and conditions, these terms and conditions shall prevail.
15. WILEY expressly reserves all rights not specifically granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.

16. This Agreement will be void if the Type of Use, Format, Circulation, or Requestor Type was misrepresented during the licensing process.

17. This Agreement shall be governed by and construed in accordance with the laws of the State of New York, USA, without regards to such state's conflict of law rules. Any legal action, suit or proceeding arising out of or relating to these Terms and Conditions or the breach thereof shall be instituted in a court of competent jurisdiction in New York County in the State of New York in the United States of America and each party hereby consents and submits to the personal jurisdiction of such court, waives any objection to venue in such court and consents to service of process by registered or certified mail, return receipt requested, at the last known address of such party.

Wiley Open Access Terms and Conditions

Wiley publishes Open Access articles in both its Wiley Open Access Journals program [http://www.wileyopenaccess.com/view/index.html] and as Online Open articles in its subscription journals. The majority of Wiley Open Access Journals have adopted the Creative Commons Attribution License (CC BY) which permits the unrestricted use, distribution, reproduction, adaptation and commercial exploitation of the article in any medium. No permission is required to use the article in this way provided that the article is properly cited and other license terms are observed. A small number of Wiley Open Access journals have retained the Creative Commons Attribution Non Commercial License (CC BY-NC), which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

Online Open articles - Authors selecting Online Open are, unless particular exceptions apply, offered a choice of Creative Commons licenses. They may therefore select from the CC BY, the CC BY-NC and the Attribution-NoDerivatives (CC BY-NC-ND). The CC BY-NC-ND is more restrictive than the CC BY-NC as it does not permit adaptations or modifications without rights holder consent.

Wiley Open Access articles are protected by copyright and are posted to repositories and websites in accordance with the terms of the applicable Creative Commons license referenced on the article. At the time of deposit, Wiley Open Access articles include all changes made during peer review, copyediting, and publishing. Repositories and websites that host the article are responsible for incorporating any publisher-supplied amendments or retractions issued subsequently.
Wiley Open Access articles are also available without charge on Wiley's publishing platform, Wiley Online Library or any successor sites.

Gratis licenses (referencing $0 in the Total field) are free. Please retain this printable license for your reference. No payment is required.

Re: Need help with permissions ~134586

2 messages

customercare@copyright.com <customercare@copyright.com> Tue, Mar 4, 2014 at 9:31 AM
Reply-To: customercare@copyright.com
To: me <email address removed for confidentiality, can be found in original>

Hi,

I am currently trying to complete my doctoral dissertation and need some clarification on the use of some of your resources.

I am interested in including some tables and charts but my university is requiring that permission be granted before the final paper will be accepted for archival purposes. I attend the University of Delaware, and the school uses University Microfilms Inc. (UMI) to publish the paper for archiving with the library.

I would like to have permission to use the tables and figures as listed in the following licenses now and for the future:

3325041339020

I wish to reproduce Table 1, pg 264 and Figure 2 pg 267 into my dissertation paper.
I am not clear if it is ok to use these items based on the license agreement within my paper. Am I missing something? This particular license is with John Willey and Sons.

3334860708341

I would like to reproduce the Table found in Appendix A pg 13. This license has a clause #20 that states that I may use the table but must reapply for permission if the dissertation is being replicated commercially. I am assuming that this license permits me to use the table without any issues. Is my assumption correct?

How can I get permission to use these if these licenses do not permit the use of these items?

Thank you,
Peter Olson
Doctoral Student
University of Delaware
Newark, DE

customercare@copyright.com <customercare@copyright.com> Tue, Mar 4, 2014 at 3:32 PM
Reply-To: customercare@copyright.com
To: me <email address removed for confidentiality, can be found in original>

Dear Peter Olson,

Thank you for contacting Copyright Clearance Center.

The license #3325041339020 is valid only for the reuse of the table and figure in your dissertation. I you would like to use the table and figure in another paper, you would need to acquire a new license specific for it.

The clause #20 for license #3334860708341 means that you've acquired a permission to reproduce the table in your dissertation submitted to, and/or published by the academic institution. However, if your dissertation would be published (again) as a separate commercial book, than you need to reapply for a new permission to reuse the table in it.

If you have any further questions, please contact a Customer Service Representative at 877-622-5543, Monday-Friday 8:00 A.M. to 6:00 P.M. Eastern Time, or email customercare@copyright.com.

Best regards,
Marek Sfugier

Customer Service Representative
Copyright Clearance Center
222 Rosewood Drive
Danvers, MA 01923
+1.855.239.3415 Toll Free
+1.978.646.8600 Fax
www.copyright.com

Reprint permission for:

Uzuner, S. (2007). Educationally valuable talk: a new concept for determining the quality of online conversations. *MERLOT Journal of Online Learning and Teaching*. 3(4), 400-410. Accessed March 18, 2013 via jolt.merlot.org/vol3no4/Uzuner.htm

Peter Olson <email address removed for confidentiality, can be found in original> Mon, Mar 3, 2014 at 5:21 PM

To: sedef.smith@lamar.edu

Hello,

I am in the process of completing my doctoral dissertation at the University of Delaware, Newark, Delaware, USA. The title of my work is An Investigation into Student Engagement with an Online Collaboration Platform (Edmodo) in a High School Environment.

I would like permission to include Tables 1 and 2 from your work:
Uzuner, S. (2007). Educationally Valuable Talk: A New Concept for Determining the Quality of Online Conversations. Journal of Online Learning and Teaching 3(4), 2007.

The Tables can be found on pages 403-405 of the publication. I used the tables as a method of coding for comparisons with other rubrics for my own paper. My university requires that I get permission before including tables such as these before publication into the school archives. The university uses a company called UMI for this purpose. I have no intentions of making any income from this.

The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages, and to the prospective publication of my dissertation by ProQuest through its UMI Dissertation Publishing business. Proquest may produce and sell copies of my dissertation on demand and may make my dissertation available for free internet download at my request. These right will in no way restrict republication of the material in any form by you or by others authorized by you. Your permission will also confirm that you own the copyright to the above described material.

I found your rubric to be very informative and helpful. If these arrangements meet with your approval, please reply back to me via email as confirmation. Thank you!

Sincerely,
Peter Olson
Doctoral Student
University of Delaware
Newark, Delaware, USA, 19716

Sedef U. Smith <sedef.smith@lamar.edu> Mon, Mar 3, 2014 at 6:09 PM
To: Peter Olson <pgolson@udel.edu>

Hi Peter;

Permission granted. Good luck with your dissertation.

Sedef
[Quoted text hidden]
--
Sedef Uzuner Smith, Ph.D.
Assistant Professor, English as a Second Language
Lamar University
Counseling and Special Populations
College of Education & Human Development
P.O Box 10034
Beaumont, TX 77710
409-880-7723

http://wiki.creativecommons.org/License_Versions - Detailed_attribution_comparison_chart
http://wiki.creativecommons.org/Best_practices_for_attribution - This_is_a_good_attribution_for_material_you_modified_slightly
http://wiki.creativecommons.org/License_Versions - Modifications_and_adaptations_must_be_marked_as_such
https://creativecommons.org/compatiblelicenses
http://wiki.creativecommons.org/FAQ - If_I_derive_or_adapt_material_offered_under_a_Creative_Commons_license.2C_which_CC_license.28s.29_can_I_use.3F
http://wiki.creativecommons.org/Frequently_Asked_Questions - Does_my_use_violate_the_NonCommercial_clause_of_the_licenses.3F
http://wiki.creativecommons.org/License_Versions - Application_of_effective_technological_measures_by_users_of_CC-licensed_works_prohibited
http://wiki.creativecommons.org/Frequently_Asked_Questions - Do_Creative_Commons_licenses_affect_exceptions_and_limitations_to_copyright.2C_such_as_fair_dealing_and_fair_use.3F
http://wiki.creativecommons.org/Considerations_for_licensors_and_licensees
Learn more about CC licensing, or use the license for your own material.

Reprint Permission for:

Lambert, S.R. (2003). Collaborative design projects: Evaluating students' online discussions. In G. Crisp, D. Thiele, I. Scholten, S. Barker, and J. Baron (Eds.), Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, Adelaide, Australia, 7-10 December, 2003. Retrieved August 23, 2012 from www.ascilite.org. Accessed via http://ro.uow.edu.au/asdpapers/74/

From: Peter Olson [email address removed for confidentiality, can be found in original]
Sent: Monday, 10 February 2014 8:54 AM
To: Researchpubs
Subject: Copyright Permission

To who it may concern,
I am completing my doctoral dissertation at the University of Delaware, Newark, Delaware, USA. The title of my work is An Investigation into Student Engagement with an Online Collaboration Platform (Edmodo) in a High School Environment.

I would like permission to include Table 2 from:
Lambert, S.R. (2003). Collborative Design Projects: Evaluating Students' Online Discussions, Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, Adelaide, Australia, 7-10 December, 2003.
The Table can be found on page 298 of the publication. I used the table as a method of coding for comparisons with other rubrics for my own paper.

The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages, and to the prospective publication of my dissertation by ProQuest through its UMI Dissertation Publishing business. Proquest may produce and sell copies of my dissertation on demand and may make my dissertation available for free internet download at my request. These right will in no way restrict republication of the material in any form by you or by others authorized by you. Your permission will also confirm that you own the copyright to the above described material.

If these arrangements meet with your approval, reply back to me via email as confirmation.
Sincerely,
Peter Olson
Doctoral Student
University of Delaware
Newark, Delaware, USA, 19716

Peter Olson <email address removed for confidentiality, can be found in original> Mon, Feb 10, 2014 at 11:16 PM
To: Sarah Lambert <slambert@uow.edu.au>

Hi Sarah,

I am interested in including Table 2, pg 298. which describes your coding scheme. Within the text and directly underneath the table, I will include the following wording or something very similar such as:

"Note: From "Collaborative Design Projects:Evaluating Students' Online Discussions," by S.R. Lambert, 2003, *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, Adelaide, Australia, 7-10 December 2003*. Copyright Lambert 2003. Reprinted with permission."

I am required to follow the American Psychological Association (APA) format for citations, etc, for my paper. At this stage, I am just trying to finish the paper and get my final approvals to graduate and place the paper into the library archives. I will also place a copy of your approval within an appendix as a part of the final dissertation paper as instructed by the University of Delaware.

I hope that you find this satisfactory. I really appreciate your help and assistance!

Sincerely,
Peter Olson
Doctoral Student
University of Delaware
Newark, Delaware, USA 19716
[Quoted text hidden]

Sarah Lambert <slambert@uow.edu.au> Mon, Feb 10, 2014 at 11:20 PM
To: Peter Olson <email address removed for confidentiality, can be found in original>
Cc: Matthew Zingel <mzingel@uow.edu.au>

Thanks Peter.
Yes that will work if you could also add "Accessed via http://ro.uow.edu.au/asdpapers/74/" and the date to your reference. Which I'm pretty sure APA will allow you to do.
So in summary I give permission for you to reprint given an APA or similar formatted acknowledgement in each published instance, which includes the following:
"Note: From "Collaborative Design Projects:Evaluating Students' Online Discussions," by S.R. Lambert, 2003, *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, Adelaide, Australia, 7-10 December 2003*. Copyright Lambert 2003. Accessed via http://ro.uow.edu.au/asdpapers/74/ and the date to your text. Reprinted with permission."
I have cc'ed our Research Publications officer on this who forwarded on your initial inquiry.
Regards and good luck with your PhD submission,
Sarah

Sarah Lambert
Manager
Open Education
Teaching, Learning and Curriculum
DVC(E) Portfolio, Bld 39C

Reprint permission for:

Korkmaz, Ö. (2012). A validity and reliability study of the online cooperative learning attitude scale (OCLAS). *Computers & Education, 59*(4), 1162-1169.

ELSEVIER LICENSE
TERMS AND CONDITIONS

Feb 09, 2014

This is a License Agreement between Peter G Olson ("You") and Elsevier ("Elsevier") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Elsevier, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

Supplier	Elsevier Limited The Boulevard,Langford Lane Kidlington,Oxford,OX5 1GB,UK
Registered Company Number	1982084
Customer name	Peter G Olson
Customer address	Removed for Confidentiality
License number	3254340347332
License date	Oct 22, 2013
Licensed content publisher	Elsevier
Licensed content publication	Computers & Education
Licensed content title	A validity and reliability study of the Online Cooperative Learning Attitude Scale (OCLAS)
Licensed content author	Özgen Korkmaz
Licensed content date	December 2012
Licensed content volume number	59
Licensed content issue number	4
Number of pages	8
Start Page	1162
End Page	1169
Type of Use	reuse in a thesis/dissertation
Portion	excerpt
Number of excerpts	2
Format	both print and electronic
Are you the author of this Elsevier article?	No
Will you be translating?	No
Title of your thesis/dissertation	An Investigation into Student

	Engagement with an Online Collaboration Platform (Edmodo) in a High School Environmental Science Course
Expected completion date	Dec 2013
Estimated size (number of pages)	131
Elsevier VAT number	GB 494 6272 12
Permissions price	0.00 USD
VAT/Local Sales Tax	0.00 USD / 0.00 GBP
Total	0.00 USD
Terms and Conditions	

INTRODUCTION

1. The publisher for this copyrighted material is Elsevier. By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by Copyright Clearance Center, Inc. ("CCC"), at the time that you opened your Rightslink account and that are available at any time at http://myaccount.copyright.com).

GENERAL TERMS

2. Elsevier hereby grants you permission to reproduce the aforementioned material subject to the terms and conditions indicated.

3. Acknowledgement: If any part of the material to be used (for example, figures) has appeared in our publication with credit or acknowledgement to another source, permission must also be sought from that source. If such permission is not obtained then that material may not be included in your publication/copies. Suitable acknowledgement to the source must be made, either as a footnote or in a reference list at the end of your publication, as follows:

"Reprinted from Publication title, Vol /edition number, Author(s), Title of article / title of chapter, Pages No., Copyright (Year), with permission from Elsevier [OR APPLICABLE SOCIETY COPYRIGHT OWNER]." Also Lancet special credit - "Reprinted from The Lancet, Vol. number, Author(s), Title of article, Pages No., Copyright (Year), with permission from Elsevier."

4. Reproduction of this material is confined to the purpose and/or media for which permission is hereby given.

5. Altering/Modifying Material: Not Permitted. However figures and illustrations may be altered/adapted minimally to serve your work. Any other abbreviations, additions, deletions and/or any other alterations shall be made only with prior written authorization of Elsevier Ltd. (Please contact Elsevier at permissions@elsevier.com)

6. If the permission fee for the requested use of our material is waived in this instance, please be advised that your future requests for Elsevier materials may attract a fee.

7. Reservation of Rights: Publisher reserves all rights not specifically granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.

8. License Contingent Upon Payment: While you may exercise the rights licensed immediately upon issuance of the license at the end of the licensing process for the transaction, provided that you have disclosed complete and accurate details of your proposed use, no license is finally effective unless and until full payment is received from you (either by publisher or by CCC) as provided in CCC's Billing and Payment terms and conditions. If full payment is not received on a timely basis, then any license preliminarily granted shall be deemed automatically revoked and shall be void as if never granted. Further, in the event that you breach any of these terms and conditions or any of CCC's Billing and Payment terms and conditions, the license is automatically revoked and shall be void as if never granted. Use of materials as described in a revoked license, as well as any use of the materials beyond the scope of an unrevoked license, may constitute copyright infringement and publisher

reserves the right to take any and all action to protect its copyright in the materials.
9. Warranties: Publisher makes no representations or warranties with respect to the licensed material.
10. Indemnity: You hereby indemnify and agree to hold harmless publisher and CCC, and their respective officers, directors, employees and agents, from and against any and all claims arising out of your use of the licensed material other than as specifically authorized pursuant to this license.
11. No Transfer of License: This license is personal to you and may not be sublicensed, assigned, or transferred by you to any other person without publisher's written permission.
12. No Amendment Except in Writing: This license may not be amended except in a writing signed by both parties (or, in the case of publisher, by CCC on publisher's behalf).
13. Objection to Contrary Terms: Publisher hereby objects to any terms contained in any purchase order, acknowledgment, check endorsement or other writing prepared by you, which terms are inconsistent with these terms and conditions or CCC's Billing and Payment terms and conditions. These terms and conditions, together with CCC's Billing and Payment terms and conditions (which are incorporated herein), comprise the entire agreement between you and publisher (and CCC) concerning this licensing transaction. In the event of any conflict between your obligations established by these terms and conditions and those established by CCC's Billing and Payment terms and conditions, these terms and conditions shall control.
14. Revocation: Elsevier or Copyright Clearance Center may deny the permissions described in this License at their sole discretion, for any reason or no reason, with a full refund payable to you. Notice of such denial will be made using the contact information provided by you. Failure to receive such notice will not alter or invalidate the denial. In no event will Elsevier or Copyright Clearance Center be responsible or liable for any costs, expenses or damage incurred by you as a result of a denial of your permission request, other than a refund of the amount(s) paid by you to Elsevier and/or Copyright Clearance Center for denied permissions.

LIMITED LICENSE

The following terms and conditions apply only to specific license types:
15. **Translation**: This permission is granted for non-exclusive world **English** rights only unless your license was granted for translation rights. If you licensed translation rights you may only translate this content into the languages you requested. A professional translator must perform all translations and reproduce the content word for word preserving the integrity of the article. If this license is to re-use 1 or 2 figures then permission is granted for non-exclusive world rights in all languages.
16. **Website**: The following terms and conditions apply to electronic reserve and author websites:
Electronic reserve: If licensed material is to be posted to website, the web site is to be password-protected and made available only to bona fide students registered on a relevant course if:
This license was made in connection with a course,
This permission is granted for 1 year only. You may obtain a license for future website posting,
All content posted to the web site must maintain the copyright information line on the bottom of each image,
A hyper-text must be included to the Homepage of the journal from which you are licensing at http://www.sciencedirect.com/science/journal/xxxxx or the Elsevier homepage for books at http://www.elsevier.com , and
Central Storage: This license does not include permission for a scanned version of the material to be stored in a central repository such as that provided by Heron/XanEdu.
17. **Author website** for journals with the following additional clauses:
All content posted to the web site must maintain the copyright information line on the bottom of each image, and the permission granted is limited to the personal version of your paper. You are not allowed to download and post the published electronic version of your article (whether PDF or HTML, proof or final version), nor may you scan the printed edition to create an electronic version. A hyper-text must be included to the Homepage of the journal from which you are licensing at http://www.sciencedirect.com/science/journal/xxxxx . As part of our normal production process, you will receive an e-mail notice when your article appears on Elsevier's online service ScienceDirect

(www.sciencedirect.com). That e-mail will include the article's Digital Object Identifier (DOI). This number provides the electronic link to the published article and should be included in the posting of your personal version. We ask that you wait until you receive this e-mail and have the DOI to do any posting.
Central Storage: This license does not include permission for a scanned version of the material to be stored in a central repository such as that provided by Heron/XanEdu.
18. **Author website** for books with the following additional clauses:
Authors are permitted to place a brief summary of their work online only.
A hyper-text must be included to the Elsevier homepage at http://www.elsevier.com . All content posted to the web site must maintain the copyright information line on the bottom of each image. You are not allowed to download and post the published electronic version of your chapter, nor may you scan the printed edition to create an electronic version.
Central Storage: This license does not include permission for a scanned version of the material to be stored in a central repository such as that provided by Heron/XanEdu.
19. **Website** (regular and for author): A hyper-text must be included to the Homepage of the journal from which you are licensing at http://www.sciencedirect.com/science/journal/xxxxx. or for books to the Elsevier homepage at http://www.elsevier.com
20. **Thesis/Dissertation**: If your license is for use in a thesis/dissertation your thesis may be submitted to your institution in either print or electronic form. Should your thesis be published commercially, please reapply for permission. These requirements include permission for the Library and Archives of Canada to supply single copies, on demand, of the complete thesis and include permission for UMI to supply single copies, on demand, of the complete thesis. Should your thesis be published commercially, please reapply for permission.
21. **Other Conditions**:

v1.6

If you would like to pay for this license now, please remit this license along with your payment made payable to "COPYRIGHT CLEARANCE CENTER" otherwise you will be invoiced within 48 hours of the license date. Payment should be in the form of a check or money order referencing your account number and this invoice number RLNK501141301.
Once you receive your invoice for this order, you may pay your invoice by credit card. Please follow instructions provided at that time.

Make Payment To:
Copyright Clearance Center
Dept 001
P.O. Box 843006
Boston, MA 02284-3006

For suggestions or comments regarding this order, contact RightsLink Customer Support:
customercare@copyright.com or +1-877-622-5543 (toll free in the US) or +1-978-646-2777.

Gratis licenses (referencing $0 in the Total field) are free. Please retain this printable license for your reference. No payment is required.