AN ABSTRACT OF THE THESIS OF

Kim Greene for the degree of Master of Science in Forest Resources presented on March 17, 2015.

Title: Playing with Pedagogy: A Case Study of Contextual Teaching and Learning for the Natural Resources Classroom.

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Joanne F. Tynon

This thesis investigates Contextual Teaching and Learning (CTL) as a method of instruction for natural resources education. The research follows the adoption of CTL in the K-12 classrooms of six teachers focusing on natural resources education at two rural schools in Western Oregon. CTL is being investigated because it connects academic material to real world scenarios. CTL approaches result in increased student retention of academic materials, and increased engagement in learning.

Data was collected through teaching observations with and without a CTL approach to determine differences in teaching styles. Interviews were conducted with each teacher to determine his or her experience with the new method of instruction. All teachers were then surveyed about their perceived effectiveness of CTL approaches in the classroom and future intentions to use CTL approaches.

Results discuss the experiences of teachers when using CTL. Participants acknowledged that CTL approaches are indeed effective, but that they should be paired with more traditional, lecture based styles in order to best reach all learners. Participants placed value on whether or not a teaching method engages their students. This case study
adds to the body of research concerning teaching methods in natural resources education and CTL implementation.
Master of Science thesis of Kim Greene presented on March 17, 2015

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Kim Greene, Author
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Chapter One: Introduction

Environmental literacy can no longer be ignored in Oregon’s schools. The state of Oregon declared an emergency on environmental education in the 2009 legislative session with House Bill 2544, known as the No Oregon Child Left Inside Act. The Bill resulted in the formation of the Oregon Environmental Literacy Plan (OELP) in 2013. The plan’s goals are to:

(a) Prepare students to understand and address the major environmental challenges facing this state and country, including the relationship of the environment to national security, energy sources, climate change, health risks, and natural disasters.

(b) Contribute to students establishing a healthy lifestyle by making outdoor experiences part of the regular school curriculum and creating programs that promote healthy lifestyles through outdoor recreation and sound nutrition.

(c) Create opportunities for enhanced and ongoing professional development of teachers by improving teachers’ knowledge of environmental issues, skill in teaching environmental issues in the classroom, and skill in teaching environmental issues in settings outside of the classroom. (HB 2544, 2009)

The ultimate goal of the OELP is to increase the environmental literacy of Oregon students by the time they complete 12th grade. The OELP defines environmental
literacy as “an individual’s understanding, skills and motivation to make responsible decisions that consider his or her relationships to natural systems, communities and future generations” (Oregon Environmental Literacy Task Force, 2013, p. 40).

An increased level of environmental literacy can have great impacts on many environmental and social problems. Increasing engagement with the outdoors has been linked to a reduction in juvenile delinquency (West & Crompton, 2001; Witt & Caldwell, 2010) and ADD and ADHD (Faber Taylor & Kuo, 2008; Faber Taylor, Kuo, & Sullivan, 2001; Strife & Downey, 2009), decreases in childhood obesity and other preventable diseases (Coyle, 2005; Louv, 2005; Strife & Downey, 2009; Ward Thompson, Aspinall, & Montarzino, 2008; Witt & Caldwell, 2010), as well as increased levels of optimism and self-confidence in youth (Kellert, 2005; Louv, 2005; Strife & Downey, 2009; Ward Thompson et al., 2008; Witt & Caldwell, 2010). High environmental literacy can increase responsible environmental behaviors (Coyle, 2005; Hsu & Roth, 1998; Kellert, 2005; Pe’er, Goldman & Yavetz, 2007; Wells & Lekies, 2006) and levels of respect and thoughtfulness for surroundings (Coyle, 2005; Kellert, 2005).

When many of today’s youth reach the workforce, they will be faced with the challenge of solving multiple environmental problems, such as decreasing CO2 emissions, mitigating global climate change, and finding new energy sources. It is our job to prepare our youth to become responsible, environmentally literate citizens (OELTF, 2013).

OELP created an opportunity for Oregon’s K-12 schools to prioritize environmental literacy in the classroom. However, environmental literacy outcomes
are subject to an array of pedagogies, standards, and best practices for environmental education. Many researchers suggest that students should be active and engaged with in-field scenarios and nature experiences (Bögeholz, 2006; Bogner, 1998; Golob, 2011; Palmberg & Kuru, 2000). Others believe that place-based education should be used for environmental education as it connects the student to his or her community and local issues (Gruenewald, 2003; Niesenbaum & Gorka, 2001; Sobel, 2004). Still others find that pro-environmental behaviors are more common in those who have been influenced by parents or other adults outside of school settings, or from after school programs or nature play experiences that are not based in the classroom (Louv, 2005; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; Witt & Caldwell, 2010).

While researchers debate effective environmental education protocols (Battersby, 1999; Palmer, 1998), the North American Association for Environmental Education (NAAEE) set voluntary guidelines for excellence in environmental education (NAAEE, 1999). The principles for instruction suggested by the NAAEE include: making the learner an active participant by student-guided instruction; emphasizing communication skills and independent thinking through collaboration and problem solving activities; providing opportunities to explore the local environment; and fairly and accurately providing differing viewpoints surrounding the environment (NAAEE, 1999). These guidelines helped Oregon’s Environmental Literacy Program develop its own goals and strands for teachers.

Contextual teaching and learning (CTL) is a method of instruction that helps students generate meaning in schoolwork by connecting in-class activities to real
world scenarios (Johnson, 2002; SCANS, 1992). The connections between the real world and classroom topics create meaning for students. Teaching in context aids in student retention of academic materials. Teachers using CTL encourage students to be engaged in their learning and to work with groups to solve academic problems that interest them (Berns & Erickson, 2001; David, 2008). CTL is a method recognized and supported by psychology, neuroscience, and biology (Johnson, 2002).

**Purpose of Study**

The purpose of this study is to determine the perceived effectiveness of CTL approaches for environmental educators. That is, how do teachers perceive the usefulness of CTL approaches for natural resources education at two rural schools in Oregon? I investigated whether teachers believe using CTL approaches produces positive classroom attributes, or results in increased student learning.

I chose CTL as a model to examine because it fits with the best practices for instruction suggested by the OELP. Additionally, I chose to investigate CTL because, while it is acknowledged that CTL practices work, teachers are hesitant to implement CTL practices in their classrooms (Kirschner, Sweller, & Clark, 2006; Mikkelsen, L., personal communication, April, 2011).

The results of this study can provide a useful set of examples for teachers of environmental education, contribute to the promotion of an instructional method that has shown increased knowledge retention, change the way environmental education is taught, and promote endorsement of CTL practices by the Oregon Environmental Literacy Task Force. Teaching with CTL approaches could result in a youth
population not only more aware of their natural surroundings, it could also result in well-rounded students prepared to become future decision makers for global scale challenges.

**Thesis Overview**

In the following chapters I present my research. In chapter two, I review literature related to my research, especially research on environmental education and CTL approaches. In chapter three I outline my research plan, including both my methods for data collection, and my procedures for analysis. In chapter four I present my analysis and findings. Finally, in chapter five I discuss my conclusions and recommendations.
Chapter Two: Literature Review

I begin this chapter with an overview of the historical background of environmental education. Next, I introduce contextual teaching and learning (CTL) approaches and the supporting theory. I then detail each of the CTL approaches and the related research. Subsequently, I review past environmental education research and discuss trends in findings. I finish this chapter with my rationale for investigating CTL as a method of instruction for environmental education.

Historical Background

According to Palmer (1998), the term ‘environmental education’ was first used in the mid-1960s; however, the field was in existence long before then. The founding of environmental education has often been attributed to Sir Patrick Geddes (Palmer, 1998; Sterling, 1992). Geddes, a botany professor from Scotland in the 1890s, emphasized the importance of “instructional methods, which brought learners into direct contact with their environment” (Palmer, 1998, p. 4). Since then, environmental education has gone through many iterations, reformations, and re-inventions (Palmer, 1998).

Perhaps the most influential documents citing the need for, and suggested practices of environmental education for the international community are The Belgrade Charter, and The Tbilisi Declaration (Adkins, Carol-Simmons, & Bora, 2002; NAAEE, 1999; Palmer, 1998). The Belgrade Charter was developed at an international workshop held by the United Nations Educational, Scientific and
Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP) in 1975. The Belgrade Charter set objectives to see environmental education ensue at an international level (Palmer, 1998). The Tbilisi Declaration came out of a 1977 follow-up conference held by UNESCO to define recommendations for the application of environmental education. The Tbilisi Declaration identified three major goals of environmental education:

(i) To foster clear awareness of, and concern about, economic, social, political and ecological inter-dependence in urban and rural areas.

(ii) To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.

(iii) To create new patterns of behaviour among individuals, groups, and society as a whole towards the environment. (UNESCO, 1977)

In 1992, at the United Nations Conference on Environment and Development, also known as Earth Summit, 172 nations adopted Agenda 21, a doctrine designed to help shift the world towards a sustainable future (McKeown & Hopkins, 2003; Palmer, 1998). Agenda 21 calls for a reorientation of education, as it is “critical for promoting sustainable development” and establishing need for a “global effort to achieve environmental and developmental awareness in all levels of society” (Sitarz, 1994, pp. 293-294). The document directly calls for the expansion of environmental education programs for children (Sitarz, 1994, p. 268). The United Nations (UN) held a follow up conference to Earth Summit in 2012. Known as Rio+20, this conference
again designated a need to educate future generations for sustainable development (UN, 2012, p. 44). It is clear that the global community realizes the necessity for a population of environmentally literate citizens; however, the evolution to such a society has not yet been realized.

In the U.S. we have been aware of our deficiencies in primary and secondary education for decades (NCEE, 1983). With the enactment of No Child Left Behind in 2002, schools became responsible for meeting additional, more rigorous standards. Schools in both urban and rural communities are still failing to meet the standards we hold for American education today (Hayes, 2004).

When we consider the historical context of our nation’s development it seems perplexing that environmental literacy is not at the top of our agenda. The U.S. was the first nation to deliberately set aside national parks and wilderness areas for preservation, and our national pride evolved from an appreciation of the many amazing and unique natural phenomena our country enjoys (Nash, 2001). Why is it that we are not an international leader in environmental education and sustainable development?

With the advent of ever-improving technology, our youth are being raised in a different society. Varying researchers suggest that today’s youth spend more time indoors in front of televisions and computer screens, than they do playing outdoors (Louv, 2005; Merrill & Hessen Schei, 2010; Pergams & Zaradic, 2006). Their knowledge of the environment is at risk of becoming an abstraction (Louv, 2005, p. 2).
We need to rekindle the human-nature relationship, and we need to begin at an early age. Studies show that those who are exposed to nature in childhood are more likely to visit green spaces as adults and to hold positive environmental attitudes and behaviors compared to individuals who are introduced to nature as adults (Ward Thompson et al., 2008; Wells & Lekies, 2006). Finding the best way to incorporate environmental literacy in schools is an important task that could change our future.

**Contextual Teaching and Learning**

Contextual teaching and learning (CTL) is a model for teaching “based on the premise that meaning emerges from the relationship between content and its context” (Johnson, 2002, p. 3). Context gives meaning to the content. The goal of CTL is to engage students in significant activities that foster connections between the subject matter and their context within real-life situations, which helps generate significance or meaning in schoolwork. This meaning is key to the success of CTL (Johnson, 2002).

Johnson (2002) notes that CTL approaches are made up of eight components that, when combined, create the CTL model which aids students in finding a purpose to their academic work. These components are:

- making meaningful connections,
- doing significant work,
- self-regulated learning,
- collaborating,
- critical and creative thinking,
• nurturing the individual,
• reaching high standards, and
• using authentic assessment.

These components fulfill the inherent desire of humans to search for meaning in the world, and the brain’s need to connect and identify patterns (Johnson, 2002).

When using CTL approaches the teacher’s role becomes that of a facilitator guiding group collaboration and problem solving (Berns & Erickson, 2001). In the CTL classroom students spend more time actively engaged with the material and the classroom becomes a learning community where students experience real life situations (Johnson, 2002). Reese (2002) states that a diversity of learner types can become engaged when they relate class material to scenarios outside of the classroom, which suggests that students of varying learning styles can be reached through CTL.

Students generally gain more control over their learning when a CTL approach is utilized (Johnson, 2002). When students can control and direct their learning they become more engaged in the learning process and the material. This engagement results in a genuine interest in the academic material, resulting in ownership in the learning process, and more emotions related to their learning. These emotions release chemicals in the brain that enhance the pace and likelihood of connections between neurons, and these neural connections are the physical changes resulting from learning (Greenfield, 1997). The combination of engagement and control of their learning results in students’ increased self-esteem (Kinsley & McPherson, 1995). Baker, Hope, and Karanderjeff (2009) note that, “[S]uccess in
learning motivates students to learn, which leads to further success, which leads to confidence in the ability to learn” (p. 12).

**Theory Supporting CTL**

Neurological research has shown that learning creates a physical change in the brain (Draganski et al., 2004) and these changes are greatly enhanced when emotions are introduced (Zull, 2004). This information is influential for educational research. In order to enhance learning, students need to have the ability to work on activities that are interesting to them, where they feel pride when progressing on assignments or class work (Zull, 2004). Emotion-deriving activities are present in CTL approaches. Self-regulated learning, nurturing the individual, doing significant work, and reaching high standards are examples of CTL components that reach students on an emotional level. The chemicals released in the brain when emotions are involved both strengthen and ensure synapse responses, resulting in deeper learning (Johnson, 2002; Zull, 2004).

One of the most well-known education theorists, John Dewey, supported classroom learning that emphasized experience above the more traditional concept of knowledge transfer from teacher to pupil via lecture (Breault & Breault, 2005). Dewey believed that experience is a necessity in learning. “Because students engage in life through the use of imagination and develop deeper understandings through lived experiences, Dewey sought to cultivate students’ imagination and experiences in the classroom. For students, the Deweyan classroom opened up a world of possibilities” (pp. 128-129).
In addition to introducing emotion to influence deeper learning, Zull (2004) suggests a need for teaching that engages multiple regions of the brain. Using an experiential learning model activates more brain regions than passive learning environments. When neurons are engaged in multiple regions, synapse responses occur in each of those regions of the brain being engaged. This results in increased, deeper learning (Zull, 2004). Kolb’s (1984) model of experiential learning (Figure 1) shows the four-step process that utilizes multiple regions of the brain. First, the learner has an experience where new information is accumulated through the senses. Next, the learner goes through a period of reflection on the learning experience and the new data. The third step, abstraction, involves creating a theory about the information gathered through some sort of creative process. Finally, the learner uses motor skills to experiment and test the theory. This process of experiential learning occurs over and over to create a cycle of learning.

Figure 1. Kolb’s Model of Experiential Learning.
Brain research and the experiential education model are directly linked to the structure and procedures involved in the CTL model. Experiences and emotion are used to create a meaningful learning experience that is long lasting. CTL is designed to make the learning experience individualized and important for each student, and to foster learning as a lifelong activity associated with positive feelings of success (Johnson, 2002).

**The Five CTL Approaches**

In the following sections I outline each of the five approaches suggested by Berns and Erickson (2001) as best practices for adhering to the CTL model and discuss research that has examined these CTL approaches in various classroom settings. Each of these five approaches utilizes the eight components of the CTL model as described above. While these approaches can stand alone, they also at times work well in conjunction with one another.

**Collaborative Learning**

Collaborative learning, also known as cooperative learning, is a method that promotes group learning rather than individual or competitive learning. Collaborative learning uses small student groups, between two and four students, to work through both small tasks and large assignments (Johnson & Johnson, 1999). Collaborative learning is most effective when it starts off slowly, where students spend two to three minutes answering one question, and where it is adopted for the long term (Holubec,
Collaborative learning increases achievement, interpersonal relationships, and psychological health (Johnson & Johnson, 1999).

To be successful, teachers should be prepared to consistently seat students next to their group members, and to introduce collaborative learning to the class with a list of appropriate behaviors for group work developed by the class to be posted in the room. Holubec (1992) believes that an important part of group work is the mood of the group members. Students should start with greeting each other and end with thanking one another, setting a positive tone for the activity. Teachers should spend time watching, listening, and praising groups during group work time.

There are five essential elements for cooperative learning to be effective (Holubec, 1992; Johnson & Johnson, 1999):

- **Students must experience positive interdependence** within groups. This can be done by providing the group with one set of materials, assigning complementary roles to students, providing joint rewards, or dividing resources among group members.
- **Individual accountability** is important to ensure all group members are actively participating. This can be achieved by testing each student individually, selecting one student’s work to represent the whole group, or by having each student summarize what they have learned to their group members.
- **Face-to-face promotive interaction** includes positive contribution and interaction by all group members. Johnson and Johnson (1999) believe that “certain cognitive activities and interpersonal dynamics only occur when” (p.
71) students promote one another’s learning. These are actions such as praising, supporting, encouraging, and assisting in each other’s success, or explaining how to solve problems to other group members. This kind of support and encouragement incites emotions, which creates stronger synapse responses (Zull, 2004).

- **Social skills** are necessary for cooperative learning to succeed. Students have the opportunity to learn, use, and develop social skills that are not necessary for individual or competitive learning scenarios. Teachers should be prepared to teach their students about “leadership, decision-making, trust-building, communication, and conflict management skills” (Johnson & Johnson, 1999, p. 71).

- Finally, **group processing** is a necessary step for group learning to be effective. Groups should be given the opportunity examine their group’s effectiveness and cite helpful and unhelpful behaviors within the group in order to solve their problems and become a more cohesive unit.

**Research on Collaborative Learning**

Collaborative learning has been investigated in multiple subject areas and grade levels (Slavin, 1991). Collaborative learning can increase perceptions of comfort with unfamiliar materials (Seifert, Fenster, Dilts, & Temple, 2009). Students believe they have higher retention rates for the skills learned in a scenario compared to other methods (Seifert et al., 2009). A synthesis of research has found that cooperative learning is beneficial for all types of students (Slavin, 1991). When the group is held accountable for individual learning, the practice of each student
explaining concepts to one another solidifies the learning to result in knowledge retention (Slavin, 1991).

**Problem-Based Learning**

Problem-based learning engages students in investigations and problem solving. Students learn to gather, synthesize, and present data to others (Moffitt, 2001). Problem-based learning starts with a teacher-derived, complex, and academic-based question that acts as a case of investigation for students. Although these cases may not always have a solution they should be prefaced with learning outcomes to be attained along the way (Wang, Thompson, & Schuler, 1998).

Students address the case in small groups of roughly five to seven students. These small groups drive the inquiry process (Hung, Jonassen, & Liu, 2008). Outside of the initial question, students identify their own path. They can use various resources and methods to obtain information and test their ideas. The role of the teacher is to facilitate the group process and ask open-ended questions of the students to further the investigation process (Wang et. al., 1998). Through their student-driven work they should learn the content knowledge and problem solving skills, along with skills for working in a group. The group depends on one another for their mutual successes in learning the material (Hung et. al., 2008).

**Research on Problem-Based Learning**

Problem-based learning is a popular instructional model used in the medical field (Kaufman, 1985), but some research has been done on high school classes as
well (Mergendoller, Maxwell, & Bellisimo, 2006). There is a lack of consensus on whether or not problem-based learning is more effective than traditional teaching methods. Problem-based learning was found to generate student interest and motivation among medical students preparing for patient interactions (Vernon & Blake, 1993). Others have found it to be less effective than traditional methods for general knowledge gain (Albanese & Mitchel, 1993). Yet, Mergendoller et al. (2006) found problem-based learning to result in higher knowledge gain for high school economics students. These contrasting findings suggest that the effectiveness of problem-based learning is dependent upon the way it is introduced and structured in the classroom.

**Project-Based Learning**

Project-based learning uses a complex task to answer burning questions. Students are engaged in “realistic, thought-provoking problems” (David, 2008, p. 80) where they determine a driving question, design a project, and experiment to develop a product that addresses the original question. Project-based learning promotes teamwork and gives students responsibilities, which is more akin to real-life activities. Students become motivated in project-based learning because they ask a question that is interesting or concerning to them, and then they have an opportunity to answer the question and create a meaningful product. In the process of answering the question they discover key principals and concepts, while being presented with choices that control the project (Blumenfeld et al., 1991). This is much different from
lecture-based teaching models, where the control and structure of learning is primarily in the hands of the teacher (Blumenfeld et al., 1991).

Project-based learning requires student engagement and extended effort over time in order to learn subject concepts. The length of time required for a project can make it difficult for some students to maintain engagement, so it is important for the teacher to help set goals with the students, provide feedback opportunities, encourage the continuation of work, and aid in the development of social norms for group work (Blumenfeld et al., 1991).

Thomas (2000) distinguishes project-based learning with a few criteria necessary for this method to be considered a CTL approach. The goal is to keep the project as the central teaching strategy of the curriculum. There must be a student-developed question that drives the research process. The teacher can help to restructure the question with the group, but it is essential that the students have a legitimate interest in the subject. The project “must involve transformation and construction of knowledge on the part of the students” (Thomas, 2000, p. 3) through an investigative process. Projects must have student autonomy, and they must be realistic in nature, incorporating real-life activities or issues.

Research on Project-Based Learning
Research has found that project-based learning can be difficult to plan and enact and that can severely decrease its effectiveness. Thomas (2000) found that students can have a difficult time with self-directed learning for complex situations. Yet, the overall consensus finds larger gains in general academic achievement
through project-based learning when compared to traditional instruction methods such as lectures or bookwork (2000). The most extensive research on project-based learning was done with expeditionary learning schools (2000). These are adventure-based programs that lead learners on outdoor expeditions in the wilderness, which incorporate significant projects into the curriculum (Udall & Rugen, 1996). These expeditionary learning programs have shown enormous successes and increased achievement in all subject areas (Ross et al., 2001), yet it is unknown whether this is due to the project-based learning aspect, or some other structure of the expeditionary learning model.

**Service Learning**
Service learning incorporates community outreach into classroom learning. This approach is acclaimed for producing an experience that students value while connecting them with meaningful activities. Learning is enforced through active engagement. Students are provided with an opportunity for personal development, which teaches them about contributing to their community through civic responsibility (Waterman, 1997). The teacher helps to foster learning by deliberately connecting the service activity and classroom learning (Kinsley & McPherson, 1995).

Waterman (1997) distinguishes service learning as having specific attributes. To be considered service learning, students must be active participants in a community needed service in order to learn and develop. The service must be integrated into the students’ academic curriculum to provide structure for reflection, and the service activity should provide an opportunity for students to use newly
acquired skills and knowledge in real-life situations. Finally, service learning should enhance classroom lessons by extending the learning into their home community.

Students learn from service learning by doing significant work in their community and making a meaningful connection between real world issues and academic material (Johnson, 2002). The success of service learning is directly related to the skill, knowledge, and creativity of the teacher. Teachers design some service learning projects, while students develop others (Wade, 1997). Either way, the service must be a civic need in the students’ community and have a direct relationship with curricular goals. The teacher is needed to teach necessary skills, help encourage students, and provide a structured opportunity for reflection.

**Research on Service Learning**

When considering academic learning, service learning has been found to increase grades and standardized test scores at the K-12 level (Billig, 2000). Unlike the other CTL approaches, service learning has taken off at a national level. More than half of all public schools in the U.S. use service learning, and the public support is generally positive (Billig, 2000). Although mostly popular in the K-12 curriculum, service learning has also been used at the university level. Niesenbaum and Gorka (2001) found service learning to be an effective component for a study abroad program that pushed students past the role of tourist to being actively engaged in the community.
Work-Based Learning

Work-based learning starts with a student group focusing on similar career goals, typically in vocational high schools and at the college level. Academic content is integrated with activities of the determined workplace, and learning typically takes place outside of the classroom, in the work setting. Work-based learning is beneficial to students because it prepares them for the workforce and helps build resumes; it benefits businesses by providing students with the skill set they will need in the workforce, resulting in less time spent training new employees (Smith, 2001).

Students use the workplace context to gain meaning in academic content, linking the theory of learning to the practices of the workforce (Raelin, 1997).

Again, we see student-centered learning, where students can guide the learning to fulfill their needs for future employment. Learners are engaged because they are focused on learning the process and skills for various activities rather than learning in a traditional setting without context for the knowledge (Nixon, Smith, Stafford, & Camm, 2006). Oftentimes, employers determine these skills. Students, meanwhile, have the opportunity to associate with employers and professionals in the experiential environment. In some cases students can work towards an accreditation that will benefit them in their future employment (Nixon et al., 2006). Work-based learning not only introduces students to their field of interest, but it can also point out the necessary pieces of knowledge they must continue to gather from school in order to be successful on the job.
Research on Work-Based Learning

K-12 students are not the most likely candidates for work-based learning approaches. So, it is no surprise that there is very little research on work-based learning for K-12 classrooms. At the university level, work-based learning has been criticized for its informal nature and variability depending on placements or partnerships (Benett, 1993; Reeders, 2000). Yet, students enjoy work-based learning and seem to benefit from the process (Reeders, 2000). Employers are also supportive of work-based learning, as it increases the skill of the potential workforce, and decreases the cost of training new employees (Nixon et al., 2006).

Environmental Education Research

Environmental education classes appear to focus mainly on the degradation caused by humans, and they provide few opportunities for problem solving. This results in students who are urged to be environmental advocates, but they are not given the tools to effect change. They are not encouraged to be critical thinkers, to think through towards potential solutions (Shaw, 2003). Along with fostering critical thinking among students, it is important for environmental education programs to work towards influencing environmental knowledge, attitudes, and beliefs (Gunderson, Barns, Hendricks, & McAvoy, 2000; Payne, 2006).

Much environmental education research focuses on curriculum and program assessments in order to improve the way we teach about natural resources. Program assessments include techniques such as pre-post tests, concept mapping, and questionnaires. Pre-post test assessments of students are a common tool used for
measuring knowledge and attitude change. Bogner (1999) used this technique for a program about endangered birds. The pre-post assessment was also used to measure environmental knowledge and attitudes among high school students before and after a ten-day environmental science course (Bradley, Waliczek, & Zajicek, 1999). Manzanal, Rodríguez Barreiro, and Casal Jiménez (1999) used a pre-post assessment to compare ecology students who collected samples and participated in fieldwork, with their counterparts who only participated in classroom instruction. Techniques such as concept mapping (Andrews, Tressler, & Mintez, 2008), intergenerational influence assessments (Ballantyne, Fien, & Packer, 2000), participatory action research (Mordock & Kransy, 2001), and questionnaires, interviews, drawings, and photographs (Palmberg & Kuru, 2000) have also been used to assess changes in knowledge, attitudes, or beliefs. The general goal of environmental education research has been to look for changes in environmental knowledge, attitudes, or beliefs among students in order to change current or future behaviors relating to the environment (Pooley & O’Conner, 2000).

Success in environmental education programs has been linked to fieldwork and fieldtrips (Alagona & Simon, 2010; Dillon et al., 2006; Manzanal, et al., 1999). Environmental education programs that immerse students in outdoor learning have been found to be effective at increasing and altering students’ knowledge, attitudes, and beliefs about nature including, but not limited to, a greater understanding of the interconnectedness of nature (Bögeholz, 2006; Manzanal et al., 1999; Sandell & Öhman, 2012; Smith, 2007; West & Crompton, 2001).
Environmental education researchers have found that the learning environment and feelings and attitudes about the environment in which the learning occurs can influence how or if a student learns the material (Payne, 2006). Broadening the learning environment to the community at large through place-based education has been found to be effective in teaching about environmental issues at the local level resulting in students more intent on becoming responsible, active citizens (Sobel, 2004).

**Investigating the CTL Approach**

I chose to investigate the CTL model because it fits with the best practices suggested by the Oregon Environmental Literacy Plan (OELP), and provides a framework for teachers to include experiential learning that is guided by student interests. Payne (2006) notes the importance of assessing pedagogical theory, which is more transferrable to teachers at any school than individual programs that have been examined by past environmental education researchers. The CTL model for teaching has been shown to be effective in other fields (Baker et al., 2009), and there is empirical evidence through brain research that CTL methods work and, further, research shows that students using CTL approaches are more engaged in the learning process. I believe using the CTL model for natural resources education results in students fostering a greater connection to the natural world. I believe this because CTL approaches foster greater autonomy and have a greater likelihood of engaging students’ emotions. I believe teachers have tremendous insight into the learning
processes of their students; therefore, I feel they are the appropriate individuals to investigate in this study.

**Summary**

In this section I examined the relevant literature and research on environmental education and CTL approaches. While my literature review was not exhaustive, I did attempt to be comprehensive in regards to relevant literature. In the following chapter I outline my study methodology.
Chapter Three: Methodology

Chapter three outlines my research methodology. I start with the design of my research, and detail my study sites and sample population. Next, I describe how I collected my data and the procedures I used for analyzing the data corpus. I then briefly discuss my limitations.

Research Design

This study is an assessment of the Contextual Teaching and Learning (CTL) model for natural resources education. My research uses an exploratory case study at two rural Oregon ‘natural resource’ schools to investigate teachers’ evaluations of whether CTL approaches are valuable and effective for the natural resources education classroom, and to discover insights into the process of implementing CTL approaches in the natural resources classroom. This assessment differs from much previous environmental education research by examining the pedagogical theory rather than individual program assessments as suggested by Payne (2006), and intends to examine what, if any, “theory-practice gaps” (p. 29) might be present with the adoption of CTL. While much research supports CTL in the classroom, I found no research highlighting its use or practice for schools that focus on a natural resources curriculum.

For the purpose of this study, effectiveness is defined as producing positive classroom attributes, and/or resulting in increased student learning of the natural
world, while adhering to learning outcomes regulated by teachers. I chose teachers as the participants for this study, as opposed to learners, because they are best able to observe, understand, and evaluate changes in the classroom and among the learning process of their students. I chose to use an exploratory case study design for my research, as case studies are useful for examining a setting or situation with multiple methods and sources of data (Berg & Lune, 2012). Case studies are used for insights into specific cases or scenarios that could be followed up with additional research given findings of interest or success (Berg & Lune, 2012; Yin 1993). A flexible research design allows for the data collection and analysis process to remain adaptive, which allows the researcher to pursue patterns among variables as they emerge during the study (Robson, 2002). Additionally, case studies have been identified as a particularly cogent method for research in education, as they provide the ability to look at the phenomenon in depth and in context (Merriam, 1998; Tipins, Koballa, & Payne, 2002; Yin, 1993). The case study format allowed me access to the classroom where I could observe the CTL model in practice, and access to the teachers, who provided insight into their experiences implementing the model.

My case consists of six teachers at two schools who agreed to implement a CTL approach in their classroom. My research aims to understand the experiences of these teachers as they adopted CTL in the classroom. I collected two observations from each participant, one while using a typical pedagogical approach, and one while using a CTL approach. Following the observations I conducted an interview with each participant to understand their experiences and evaluations of CTL. Finally, I administered a questionnaire to each participant to collect any remaining thoughts or
opinions. Findings from this study can be used as a starting point for further empirical research on the use of CTL in natural resources education.

The CTL model consists of five distinct teaching strategies: collaborative learning, problem-based learning, project-based learning, service learning, and work-based learning. My research focuses on all but work-based learning, as none of my participants chose to use this approach in his or her classroom.

**Study Sites**

The Oregon Natural Resources Education Program (ONREP) is a state resource that provides professional development opportunities for Oregon educators. One program available from ONREP is the Stewardship Schools Program (SSP). It is funded through an array of state and national agencies. The SSP mission is to “prepare educators to engage and inspire students in relevant, meaningful, and inspiring classroom and outdoor learning experiences that contribute to student academic achievement” (Stewardship Schools, 2011, Mission section, para. 1). Schools apply to work with SSP and the chosen schools are provided with resources and strategies for implementing up-to-date natural resources education practices. The SSP partnership with schools lasts an average of three years and rewards teachers with 15-30 hours of professional development.

Through the SSP, I obtained a list of schools that have adopted natural resources into all parts of their curriculum and are working towards innovative classroom strategies. Using the SSP program coordinator as a gatekeeper, I contacted
superintendents at four SSP schools about involvement in this research. Two districts agreed to participate and they represent my study sites (Figure 2).

![Figure 2. Location of Study Sites](image)

Elkton School District is a newly formed charter school in a rural community of Douglas County in the Oregon coastal range, 50 miles southwest of Eugene on the Umpqua River. The district has two schools, an elementary school and a high school. The district serves 148 students and emphasizes natural resources education in all curriculum areas (Elkton School District, 2007). The district has a forest known as the land lab on the south side of the elementary school along the Umpqua riverbank. This forest enables teachers to utilize the local setting for class activities without having to take field trips away from school grounds. The district also has a garden where students and teachers can experiment with the life cycle of various plants throughout the school year.
Vernonia School District is a public school district nestled in the Nehalem Valley of Columbia County in the Oregon coastal range, 45 miles northwest of Portland. It serves roughly 600 students. Previously the community had two elementary schools, one middle school, and one high school. The schools and town were severely affected by major flooding in both 1996 and 2007. One outcome of these events was a new sustainability focused K-12 school, which opened in September 2012. The community as a whole is focusing on sustainability for their future. The town encourages green businesses to move to the area and the school curriculum focuses on natural resources (Doussard, 2011).

**Sampling**

The coordinator of the SSP, who worked closely with teachers at both schools, provided a list of teachers she recommended as potential participants. Therefore, I used a convenience sample to recruit participants from schools in these two districts. I sent these teachers invitations to participate in my research (see Appendix A, Recruitment Letter). I conducted three rounds of invitation emails, contacting a total of 44 teachers, for my recruitment process. Of these 44 teachers six participants responded and agreed to participate in my study, resulting in a 14% participation rate.

Once recruited, I gave each participant a consent form (Appendix B) approved by the OSU Institutional Review Board (IRB) describing the project and what I expected of them. Participants were required to sign their consent forms before I could begin data collection. My final sample consisted of three teachers from the Elkton School District and three teachers from the Vernonia School District. All
participants are referred to in this study with pseudonyms in order to preserve anonymity as required by the IRB.

**Methodology**

I began my research by observing each participant while s/he was teaching a lesson using what the participant considered a typical teaching approach for his or her classroom. I refer to this throughout the thesis as the initial teaching observation.

I created an Implementation Guide (Appendix C) for the teachers in my study. The purpose of the Guide was to introduce the CTL model, including the essential components of each approach. The Guide is based on materials from an array of education professionals (see Appendix C). I asked three outside educators, unrelated to this study, to review my Implementation Guide for clarity and usability. These educators had not been introduced to CTL, and were therefore able to assess whether the Implementation Guide provided enough information to carry out a lesson using CTL.

Once I was satisfied with my Implementation Guide, I gave each teacher in my study a copy and asked each to choose one of the CTL approaches to adopt for a given unit in their classroom. I then observed one lesson period for each participant where the unit was taught using a CTL approach.

I digitally audio-recorded both the pre-CTL and the CTL lesson observations for verification and review. As required by the IRB, I notified parents/guardians of students in participant classrooms that I would be making these observations by sending a letter home with students outlining my intentions (Appendix D).
After my observations were complete, I interviewed each participant. In the interview I asked about the teacher’s experience with the CTL model and his or her assessment of the implementation process and outcomes of using the approach (see Appendix E for interview questions). I digitally audio-recorded and transcribed these interviews for my own verification and data analysis.

Last, I asked participants to complete a mail-back, reflective questionnaire (Appendix F). I designed the questionnaire to help participants evaluate their experiences with the CTL model and to function as a summation of their study participation.

Data Analysis

My data set included two lesson observations, an interview, and a completed questionnaire for each participant, for a total of 12 lesson observations, six interviews, and six completed questionnaires. I reviewed the observations, and analyzed data from the interviews using standard qualitative analysis methods (Saldaña, 2009). Finally, I synthesized questionnaire responses to formulate an understanding of teachers’ lived experiences using CTL in the classroom.

I started my analyses with a descriptive assessment of each observation, including the topic and teaching style of the lesson, the general classroom atmosphere, and other relevant components, similarities, or differences in the individual observations. I then compared the percent of time spent on various classroom experiences (i.e., lecturing, group work) between traditional and CTL approach observations.
After transcribing the narrative data, I analyzed the interviews using NVivo 9™ as well as manual coding techniques recommended by Berg and Lune (2012). I performed a content analysis of the interview data, where I examined major themes and constructs that emerged in the interviews (Berg & Lune, 2012). In my content analysis I relied heavily on attribute, descriptive, emotion, and evaluation coding methods (Saldaña, 2009).

I coded the questionnaires and entered the quantitative data into MS Excel for analysis. I used descriptive statistics to determine the means of responses and compared the responses among the participants. I used content analysis to examine the text from questionnaires.

**Limitations**

Several limitations must be noted for this study. Most notably I had a small number of participants. Most teachers showed little interest in participation given the requirements, their current workloads, and other professional demands. Additionally, the only incentive was their learning and possibility of professional growth. Having a small sample means that saturation had to come from depth and length of interaction with participants, rather than through sample size.

I am unable to generalize my findings beyond my study sample to a broader population. This is because case study research is, by default, only about the particular case, and my purposive convenient sample is not representative of a larger known population. Therefore, it is not my intention to make generalizations of or for
educators at large, but rather to gain a deep understanding of my participants’ experiences.

I did not check for reliability by having another individual code my data due to lack of funding; this also limits the strength of my findings by introducing the potential for researcher bias. However, my research meets the needs for internal validity standards, as it uses multiple sources of data, over a long term with participants (Merriam, 1998).

**Summary**

In this chapter I discussed my methodology. I detailed my rationale for choosing the case study design and how I conducted my case study research. I defined the study sites and described how I recruited my study participants. I explained my data analysis methods and study limitations. In the next chapters I discuss my findings and what they mean for the larger field of natural resources education.
Chapter Four: Analysis

This chapter covers my data analysis and findings. I begin with a description of each lesson I observed. I then discuss my analysis of differences between first and second observations. Following, I focus on the analysis of participant interviews. I then discuss the results synthesized from the questionnaires. This chapter concludes with a brief summary of my findings.

Observations

In this section I provide a descriptive analysis of the various lessons I observed with each participant and the CTL approach each participant used. A participant summary is shown in Table 1, where each participant is detailed. Column one identifies each participant by pseudonym. The second and third columns indicate the grade levels they teach, ranging from 3rd grade to high school, and each participant’s subject of expertise. I provide a reference for the lesson matter covered during each observation, and the CTL approach each participant chose in Table 2.

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Grade</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adam</td>
<td>High School</td>
<td>Agriculture</td>
</tr>
<tr>
<td>Brian</td>
<td>4th/5th</td>
<td>Science</td>
</tr>
<tr>
<td>Charles</td>
<td>7th/8th</td>
<td>Science</td>
</tr>
<tr>
<td>Denise</td>
<td>High School</td>
<td>Anthropology</td>
</tr>
<tr>
<td>Emily</td>
<td>6th</td>
<td>Science</td>
</tr>
<tr>
<td>Fiona</td>
<td>3rd</td>
<td>Science</td>
</tr>
</tbody>
</table>
Adam During my first observation with Adam he used a hands-on activity to help high school students identify external beef anatomy. In a previous lecture, students received handouts detailing various parts of a cow. The class moved outside and watched Adam unload a cow from a trailer. Adam then led a short discussion on the importance of knowing the anatomy of a cow and how to approach a large animal. Students then placed sticky notes on the cow to show where each external beef part was located. Logistically, this lesson had at least two challenges: the difficulty of handling a large animal around a group of students, and sticky notes that did not adhere well to the hide of the cow.

For his CTL approach, Adam chose to use collaborative learning in a greenhouse setting. He split his class into several groups and gave them tasks to accomplish in the greenhouse. These tasks included trimming buds and stems, cutting back plants, and attaching hangers for hanging baskets to be sold later in the year. This lesson was mainly group work time but I noticed some students working by
themselves. Adam checked in with groups frequently and provided assistance when needed. The radio was on for a majority of the lesson, and the transitions to and from the classroom led to students forgetting their tasks.

**Brian**

My first observation with Brian started with a quiz on the water cycle. Brian administered the quiz using an electronic format where 4th and 5th grade students responded on handheld remotes. All responses were compiled on a large screen, giving students instant feedback to their answers and allowing them to compare their answers to those of the rest of the class. After the quiz Brian lectured on renewable and non-renewable resources. The students then participated in an activity that mimicked renewable resources. Chocolate chips were used to represent a resource, and groups worked together to harvest resources. The resources were only renewed if they were not over-harvested. Brian then followed up the activity with a discussion on what the students learned.

In my second observation Brian used a problem-based learning lesson where students worked with a partner to create a report on a specific whale. Partners were given a scientific document about a specific whale and then asked to create: two individual written reports, a group presentation, and a to-scale model of the whale. During the lesson I observed, students finished their whale models and gave final presentations to the class. For this particular problem-based lesson, Brian used elements of collaborative learning, resulting in increased accountability and inter-dependence for the students.
**Charles**  
The first lesson I observed with Charles was a lab day where 7th and 8th grade students got hands-on experience, to review Newton’s laws. Students visited four stations and, using a worksheet, they participated in a hands-on activity that demonstrated one or more of the laws. These activities led to further discussions of force, friction, inertia, gravity, and momentum. At the end of the lesson students were required to turn in their completed worksheets.

My second observation with Charles was a problem-based lab activity on the topic of acceleration. Students were split into groups of five, where each student had a role in the activity, either as a pusher, a rider, or a timer. A student was pushed in a chair through a hallway and, at specified distances; timers would record their time. Back in the classroom the times and distances were charted to detail the acceleration of riders and pushers. A significant amount of the lesson was spent transitioning from the classroom to the activity space, and back again.

**Denise**  
Observation one with Denise was a high school Anthropology lesson on ‘early man’ where Denise switched between lecture and group discussions of readings that students were to have read prior to class. The class sat at desks in a circle where students and Denise could see one another and interact in the discussion. Topics included the transition between hunter-gatherers and farming, as well as the ability for early humans to manipulate their environment.

During my second observation with Denise I observed student presentations from a problem-based learning unit. Each student chose a topic to follow while answering the question “how did we become human?” Students were given a few
weeks to work on PowerPoint presentations and gave both a practice and final presentation. The presentations resulted in a story depicting the evolution of humans. Topics presented during my observation included the brain, head lice, and clothing.

**Emily**
During my first observation, Emily gave a lecture on atmospheric layers to her 6th grade students. She used a PowerPoint presentation and had the students illustrate the atmospheric layers using colored pencils and two pieces of paper taped together to show scale more accurately. This technique resulted in two-dimensional models of the atmosphere. The lesson consisted of mostly lecture, but Emily engaged students by asking questions and providing examples.

Emily utilized project-based learning during my second observation. The class was preparing to create a terraced garden outside of their classroom. While weeding the area, students noticed numerous Pacific tree frogs, which would be displaced once construction of the garden began. Emily set up 24 hula-hoops throughout the future garden space to delineate sample sites. The students surveyed their sample areas, taking specific note of any Pacific tree frogs they found. After this activity Emily led the students around the school grounds to practice their observational skills. Students produced detailed drawings of what they found at various observation sites; these drawings later became entries in their science journals.

**Fiona**
During my first observation with Fiona, her 3rd grade students were learning about the water cycle. I observed a lesson partway into the unit. The lesson began with a song that included hand movements about the water cycle, which students had
learned the day before, followed by a short, animated, YouTube video about the water cycle. Next, Fiona lectured on the different places water is stored (e.g., oceans, rivers, soil). The remainder of the class period was spent doing a water cycle activity where students, acting as a drop of water, travel through the water cycle. The roll of a die determined the future of each water droplet. Later, for a writing lesson, each student detailed his or her individual experiences of the water cycle in a story.

During my second observation, Fiona chose to use service learning for her CTL approach. During a unit on invasive plant species, the students walked to a neighboring wetland area where a forest ranger talked to them about invasive plant species and the importance of wetland habitat. Next, the third graders worked in groups with high school student leaders to remove invasive species and replant native species in the wetland. On the way back to the school the students picked up litter from the community hiking/biking path.

**Observation Comparisons**
To determine if differences existed between the first and second observations, I reviewed each observation and recorded the time each teacher spent engaging in various classroom experiences for all observations. I then compared the various experiences across all participants. Experiences recorded during first observations included: activity, discussion, individual work, instructions, lecture, quiz, review, and transitions, for a total of four hours 45 minutes, and 44 seconds (Table 3).
Table 3. Allocation of Classroom Experiences During First Observations

<table>
<thead>
<tr>
<th>Classroom Experiences</th>
<th>Adam</th>
<th>Brian</th>
<th>Charles</th>
<th>Denise</th>
<th>Emily</th>
<th>Fiona</th>
<th>Total Time Means (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>18:50</td>
<td>5:53</td>
<td>29:03</td>
<td></td>
<td></td>
<td>23:43</td>
<td>1:17:29 27.1%</td>
</tr>
<tr>
<td>Discussion</td>
<td>5:44</td>
<td>8:45</td>
<td>14:45</td>
<td>20:01</td>
<td>0:55</td>
<td>1:50</td>
<td>52:00 18.2%</td>
</tr>
<tr>
<td>Individual Work</td>
<td>3:57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3:57 1.4%</td>
</tr>
<tr>
<td>Instructions</td>
<td>5:20</td>
<td>3:45</td>
<td>6:36</td>
<td>1:07</td>
<td>2:41</td>
<td>15:53</td>
<td>35:22 12.4%</td>
</tr>
<tr>
<td>Lecture</td>
<td></td>
<td>2:47</td>
<td>3:57</td>
<td>18:31</td>
<td>29:49</td>
<td>8:14</td>
<td>1:03:18 22.2%</td>
</tr>
<tr>
<td>Quiz</td>
<td></td>
<td>9:17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9:17 3.3%</td>
</tr>
<tr>
<td>Review</td>
<td>0:45</td>
<td>4:45</td>
<td>0:50</td>
<td>1:55</td>
<td>2:22</td>
<td></td>
<td>10:37 3.7%</td>
</tr>
<tr>
<td>Transitions</td>
<td>13:54</td>
<td>5:15</td>
<td>3:54</td>
<td>4:56</td>
<td>5:45</td>
<td></td>
<td>33:44 11.8%</td>
</tr>
<tr>
<td>Total times</td>
<td>48:30</td>
<td>40:27</td>
<td>58:15</td>
<td>40:29</td>
<td>40:16</td>
<td>57:47</td>
<td>4:45:44 100%</td>
</tr>
</tbody>
</table>

On average, teachers spent more time engaged in activities than any other classroom experience (mean=27.1%) (Table 3). During activities students were actively engaged with materials relating to the subject matter. Students were often out of their seats, or working in groups. Four out of six participants spent time using activities during the first round of my observations.

Lectures were common among participants during first round observations (mean=22.2%); five out of the six participants used lecture. For students, lectures consisted primarily of passive listening and/or note taking, unless they asked or answered questions. Adam was the exception; he did not lecture during my first observation. However, his external beef anatomy lesson, while very hands-on, followed a lecture he presented previous to my observation.
All of the participants spent time in discussion with their students \((mean=\text{18.2}\%)\). Discussions involved teachers and students answering and asking questions, and talking through the subject matter. Discussions differ from lectures since students are more involved in the experience and can help drive the focus of the conversation. Additionally, all participants spent time giving instructions to their students \((mean=\text{12.4}\%)\). I differentiated this category because the instructions did not pertain to the subject matter. In this context, instructions simply involved explaining the tasks students needed to do to complete an assignment, or to set guidelines for the experiences to follow. Five participants spent time in transitions \((mean=\text{11.8}\%)\); this experience typically consisted of traveling across campus, or setting up for activities. Five of the six participants spent time reviewing subject matter from previous lessons \((mean=\text{3.7}\%)\). Only one participant conducted a quiz, which happened to be rather interactive. Only one participant had students work individually, which consisted of students working on an assignment quietly in their seats.

During the second round of observations, when participants were using a CTL approach, I recorded six hours and 31 minutes of class time. Experiences included: activity, discussion, group work, individual work, instructions, lecture, review, student presentations, and transitions (Table 4).
When using CTL in the classroom, participants spent more time on activities than any other classroom experience \((mean=26.1\%)\); however, only three participants used them (see Table 4). All participants used transitions, which accounted for the second highest used experience \((mean=19.2\%)\). All participants used discussion in their classrooms during the second round of observations \((mean=16.3\%)\). Additionally, all participants spent time giving their students instructions \((mean=15.5\%)\).

Three participants used group work in their CTL observations \((mean=8.7\%)\), which was not evident during my initial observations. However, a large bulk of this was because Adam’s second lesson followed the collaborative learning approach, which uses group work as the basis for knowledge gain. Group work consists of students working in partners or small groups to complete an assignment or work.

<table>
<thead>
<tr>
<th>Classroom Experiences</th>
<th>Adam</th>
<th>Brian</th>
<th>Charles</th>
<th>Denise</th>
<th>Emily</th>
<th>Fiona</th>
<th>Total Time Means (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td></td>
<td></td>
<td>7:19</td>
<td>25:05</td>
<td>1:09:43</td>
<td>1:42:07</td>
<td><strong>26.1%</strong></td>
</tr>
<tr>
<td>Group Work</td>
<td>28:15</td>
<td>3:44</td>
<td>2:03</td>
<td></td>
<td></td>
<td></td>
<td><strong>16.3%</strong></td>
</tr>
<tr>
<td>Individual Work</td>
<td></td>
<td></td>
<td>7:13</td>
<td></td>
<td></td>
<td></td>
<td><strong>1.8%</strong></td>
</tr>
<tr>
<td>Instructions</td>
<td>6:45</td>
<td>6:49</td>
<td>15:29</td>
<td>1:36</td>
<td>15:40</td>
<td>14:28</td>
<td>1:00:47</td>
</tr>
<tr>
<td>Lecture</td>
<td>3:16</td>
<td>8:27</td>
<td></td>
<td></td>
<td>9:36</td>
<td>21:19</td>
<td><strong>15.5%</strong></td>
</tr>
<tr>
<td>Review</td>
<td>2:37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2:37</td>
</tr>
<tr>
<td>Student Presentations</td>
<td></td>
<td>4:08</td>
<td>19:44</td>
<td></td>
<td></td>
<td></td>
<td><strong>6.1%</strong></td>
</tr>
<tr>
<td>Transitions</td>
<td>5:36</td>
<td>8:25</td>
<td>8:05</td>
<td>2:05</td>
<td>22:03</td>
<td>29:02</td>
<td>1:15:16</td>
</tr>
<tr>
<td>Total times</td>
<td>47:42</td>
<td>38:39</td>
<td>44:55</td>
<td>44:00</td>
<td>1:16:37</td>
<td>2:19:07</td>
<td><strong>6:31:00</strong></td>
</tr>
</tbody>
</table>

When using CTL in the classroom, participants spent more time on activities than any other classroom experience \((mean=26.1\%)\); however, only three participants used them (see Table 4). All participants used transitions, which accounted for the second highest used experience \((mean=19.2\%)\). All participants used discussion in their classrooms during the second round of observations \((mean=16.3\%)\). Additionally, all participants spent time giving their students instructions \((mean=15.5\%)\). Three participants used group work in their CTL observations \((mean=8.7\%)\), which was not evident during my initial observations. However, a large bulk of this was because Adam’s second lesson followed the collaborative learning approach, which uses group work as the basis for knowledge gain. Group work consists of students working in partners or small groups to complete an assignment or work.
through a task. During group work, students are held accountable for the work of their team members.

During second round observations two participants had students give presentations \( (mean=6.1\%) \). Students had previously worked on projects that required a presentation for the assessment of their learning. Presentations involved one or two students in the front of the classroom delivering information to their peers and teacher. This classroom experience did not take place during the first round observations.

Three participants used lecture as a component to their CTL lesson \( (mean=5.5\%) \). Brian was the one participant who used individual work time \( (mean=1.8\%) \). Students had individual agendas to accomplish for a partner project concerning cetaceans. There was very little time spent on review during CTL observations. Only one participant used this classroom experience \( (mean=0.7\%) \).

There are differences to note between the first and second round observations, including the absence of entire categories (Table 5). For example, group work and student presentations took place during the CTL observations, but did not occur during the initial round. Bias may be present with the occurrence of student presentations, as participants may have scheduled my visit to see the culmination of a project. Group work was not present initially, but was used by three participants under the CTL model. In addition, quizzes took place during the first round, but did not occur during second observations (Table 5).
Note. $\eta = \text{number of participants recorded using classroom experience.}$

While each observation was unique to the participant, there were some time allocation changes among the whole. Most noteworthy was the reduction of lecture time from 22.2% of the initial observations down to 5.5% when using the CTL model (Table 5). This is congruent with the goals of CTL to increase active participation for learners and decrease passive auditory consumption. Additionally, transitions took up
more CTL observation time (19.2%), than during the initial observation time (11.8%).
During initial observations five participants used review during their lessons. When
using CTL only one participant engaged in review with his students.

The average time of CTL observations was 20 minutes longer than initial
observations. Both Emily’s and Fiona’s CTL observations took longer than a typical
class period. While activities decreased in percent during CTL observations, teachers
spent more actual time with their students engaged in activities when using CTL
(Table 5).

**Interviews**

In this section I describe and synthesize the themes I found in my participant
interviews. I start by describing the findings from each of the questions I asked
participants. I then synthesize and discuss major themes that I found from the
interview data.

**Interviews by Question**

Each participant chose the CTL approach they would be using in their
classroom. Participants selected four of the five CTL approaches, with no one
choosing to use work-based learning. Half of the participants chose problem-based
learning for their classroom. I asked participants why they chose the approach they
did, and they revealed that comfort with the approach and convenience to implement
the approach were significant factors, as well as the approach being a good fit for
their classroom. Brian chose problem-based learning because “it was just the best fit
for that…to engage kids to work together, to work out problems, and to synthesize
and put it down into their own words.” Adam suggested a level of comfort with collaborative learning since he typically uses a similar style, while Emily wanted something more long term for her students, seeing the opportunity to extend the project based learning throughout multiple subject areas.

I chose to do project based because [it’s] a little bit more long term…but also for the fact that I could take the data that we get in our project this year and even continue it next year with a new group of students…. Now we’re going outside and they can see it actually happening outside in the backyard of our classroom. (Interview with Emily)

I asked participants how using a CTL teaching approach differed from ways they had taught their respective units in the past. Responses varied, as each of the lessons and teaching methods varied for the participants. While utilizing problem-based learning, Denise noted that she did not need to micromanage her students. She found that problem-based learning urged students to become critical thinkers and follow the path they found most interesting. Adam found that the preparation for collaborative learning took longer than with other methods. Emily said she felt more supported by her school to go outside, which resulted in students having “more of a connection” between the various ecology units. Both Emily and Fiona noted that the biggest difference was the act of going outside and having students do meaningful hands-on activities with natural elements. Having critical thinkers, making deeper
connections, and doing significant work are all components of what CTL should look like in a classroom (Johnson, 2002).

When I asked participants about the difficulties or challenges they faced when using a CTL approach, I found that the issues were related to planning, logistics, and anxiety over classroom changes. Adam and Brian both found that conscientiously grouping students was an added challenge to their lesson planning. They both wanted their classroom to consist of small groups or partners who were going to work well together. This takes familiarity with one’s students and additional time to thoughtfully pair them together, which can be a burden to an already full workload. Charles found his greatest challenge to be the logistics of needing additional travel time to conduct the lab on the other end of the campus. Emily also found that she spent more time planning, and obtaining the resources for taking students out of the classroom.

Additionally, Emily cited the necessity of “front loading” with students, to familiarize the students with what to expect before taking them outside. Denise and Emily both discussed their anxiety with changing their classroom techniques. Denise described her greatest challenge with the method as “trusting the process… I had to kind of let go of some of those things that I thought were really necessary.” Emily called this hesitation “giving up your control of how you want your perfect lesson to be…your kids are out there doing their own things.” While both Emily and Denise noted this difficulty, they also both found their methods to work well in the end.

I specifically asked about planning or preparation differences with CTL approaches, which was the most common challenge identified by my participants. Again, participants found that logistics and planning were more time consuming.
when using the CTL model. Denise was the only participant who found that planning took less time. She let students work through their problems and ask questions, rather than spending time preparing for a lecture. Adam acknowledged that the preparation process of grouping students took longer. Brian found that he needed to have enough work to engage two students at once, and have more materials on hand. He also found that “you have to be able to anticipate more questions than in direct instruction,” which requires more effort and preparation as a teacher. Charles addressed the need to give his students more background before the activity, which takes more class time to prepare students than a traditional lecture without an activity component. Emily found that planning and preparation took a bit more time and effort, since there is a need to problem solve for anything that can go wrong, especially when leaving the classroom. She said “with the lesson planning you have to think of all of the different problems that could happen and then…you have to have more supplies ready.” Fiona had part of her service learning lesson planned for her by the school district, so she found planning to be much less time consuming. However, she noted the need to prepare students on the subject matter and to be dressed appropriately to go outside.

To assess differences required by teachers when using a CTL approach, I asked participants to recall the biggest changes to their classroom instruction. In response, Brian addressed the physical changes that took place in his classroom. “We rearranged the desks, having kids move around from place to place and not be in a space where they consider home. I was trying to get them to understand the room can be fluid and does not have to be static.” Charles found the need to give more background to his students, but suggested that this was due to the need of the specific
group of students he had at the time. Denise, Emily, and Fiona all referenced the change in their role from instructor to being more hands-off. Denise and Emily described this as the lesson being student driven, where they supported one another, and exuded elements of collaboration rather than competition. Fiona noted that her role involved more behavior management, and encouraging student involvement, rather than instruction. Fiona also noted that the service learning lesson took much longer than a traditional lesson, which is not always possible when adhering to the rigid structure of a typical school day schedule.

I asked participants how their students reacted to the change in teaching approaches and whether they noticed any significant changes among their students. Both Adam and Brian saw some students rejecting the lesson because they disliked who they were partnered with, but Adam found that overall students were more productive because of their intentional pairings. Brian found that students who normally do not do very well were quite successful with this lesson. “Some students who normally don’t do much or don’t do well did really well on this project. It gave them a chance to engage by doing the art along with the research and the writing.” Yet, he also found that the lesson was more challenging for students who typically prefer to work independently. Fiona noted really positive reactions from her students, but she also noticed a dichotomy among learning styles. She detailed two students who had strong reactions to the lesson. One, who is normally difficult to engage in the classroom, found the lesson to be exciting and enjoyable. Another, who is normally an active class participant, did not want to be involved in the activity. Charles found that “students really like doing the lab, but they find it hard to do the
work to understand the why.” He also noted that the students who had the hands-on experience in the lab were better able to grasp the concepts back in the classroom, but not everyone was able to have that experience because class time was limited. Denise suggested that, like her, her students had some initial anxiety to her hands-off approach, but that the overall outcome was a unit of students who were more responsible and collaborative, and less competitive. Emily found that her students really enjoyed the lesson, outside of the poor weather they experienced. She found the outcome to be students who were more excited about science lessons. When I asked her what her students were excited about she described their ownership and contribution to a meaningful project.

I asked participants to describe the differences and similarities between the CTL method they experienced and traditional teaching methods, however they defined them. Brian highlighted some key differences between the two methods:

The biggest difference is you’re putting the learning in the students’ hands, instead of me being up in the front of the class and making a good model, where I just input all of my knowledge in the kids’ brains and they soak it up like a sponge.... [T]he similarities are that you still give them direction as a whole group for a short period, but the difference is where they have collaboration time, quiet time, noisy time, to work as a group. (Interview with Brian)

Charles also used the ‘students as sponges’ analogy to describe traditional teaching: “you give them the information and they absorb it, or they don’t want to absorb it…there’s no processing involved.” Charles differentiated CTL methods as putting
ownership of learning on students, where they need to apply the information you give them to a problem. Emily and Fiona both found the similarities to be quite basic, in that you are still delivering information to the students. But, they differentiated CTL methods because CTL requires students to be more involved and actively engaged as opposed to passive learners. Emily stated that:

> When you have a more hands on [lesson], they’re going to make those connections a little bit better about what they’re learning, than if you just sat in a classroom. I think the kids enjoy it more, and then they become more intrigued and interested in the subject matter. (Interview with Emily)

Additionally, Emily found that CTL methods could be advantageous for students who are less successful in a traditional classroom.

> It kind of evens the playing field for everybody, so it’s not like one person answering all of the questions. The person who may not be able to answer the questions in class is able to actually physically do something, and then it’s a little bit easier for them to ask questions because they may be working in a small group with another student, so they can ask each other questions, or a little bit easier for them to come up and ask you, because it’s not a formal classroom setting, it’s an informal setting. (Interview with Emily)

Denise also noted a change in the classroom setting. For her, the class setting shifted from lecture and discussion to small collaborative groups, which resulted in less work for her. She found that she spent more time helping students break the problem down
into smaller questions, and that she had to be prepared with more resources. Adam identified the main difference as needing more time to prepare a CTL lesson, but he described CTL as more effective. I think Fiona identified the difference in approaches best when she said, “they’re learning the same information, but just in a different mode…. [T]hey’re learning it deeper because they’re involved in doing it. And the excitement of the kids, they’re more excited to be doing something different.”

I asked participants to summarize their experience by outlining the pros and cons of using a CTL approach. Adam, Brian, and Emily all found the cons to include an increase in teacher preparation for the lessons. Emily said:

It takes a little bit more effort and conscious decisions from the teacher on how they want things set up, how they want things to be done…. But I think the more I do it I think the better it will become. (Interview with Emily)

This ability to adjust and eventually decrease preparation time with practice was also noted by Adam. Brian, Charles, Denise, and Fiona all found a decrease in control to be a negative aspect to CTL approaches. Denise described this decrease in control to be over the knowledge base that her students were learning. Fiona’s apprehensions dealt mostly with being outside and having young students who needed additional supervision. Both Brian and Charles described the lack of control with the structure of the classroom. Brian said “some students don’t know what to do with that freedom, and so at times you can have some behavior issues, or lack of motivation, and students not really doing anything other than disrupting others.” Brian also mentioned
the necessity to have student “buy-in” to the CTL model in order for it to be
effective. Charles said there was still structure, but that the classroom was
more chaotic.

It’s hard because they’re on their own, and it’s structured, but it’s not
structured, in the sense that you give them expectations, and you give
them goals to do, and you give them a job to do, or a problem to solve,
and they need to figure it out, but a lot of the times it looks like
ordered chaos. (Interview with Charles)

The main positive aspect identified by Adam was an increase in productivity, while
Denise identified this as a heightened sense of collaboration among her students.
Emily liked the increase in activity she saw with her students. “You see kids being
able to get more into things, and it’s also a way for you to kind of get to know your
students, like I said, outside of a formal setting.” Fiona also identified an increase in
student involvement: “it really gets kids involved in the activity…and to take
ownership of this wetland that we’re developing.” Brian said the positive aspect of
CTL was the process for the students:

They [the students] get more out of it because it’s more directed by
their inquiry rather than what I put forth as what they need to know. So
having just the goals and objectives, and then just giving them the
boundaries, letting them work, and make their way and struggle
through it all, and move forth is a great thing. (Interview with Brian)
Charles listed many positives to the CTL approach, including the students having a better understanding and ability to recall the material “because they experienced it, I think they retain the experience and the information more.”

Charles had a great overall assessment of his experiences with CTL and why he found the method to be beneficial. He said:

Getting them to analyze what they’re learning, and reflect on what they’re learning, and to understand why they’re learning it - I think it’s invaluable. It’s a lot of work to plan and prep for all that sort of stuff, but I think the outcome is just; it far outweighs the time and effort you put into it. (Interview with Charles)

Emily was also very pleased with the results she saw when using a CTL method:

If they can get excited about going outside and doing stuff, then that’s a connection that they’re making, and hopefully it will work out where they’re going to be able to learn more because they’re going to be able to make more connections. (Interview with Emily)

When asked, all participants said they would use their CTL approach again, and that they would try some of the other approaches in their classroom. To close the interviews, I asked participants whether they found CTL approaches to be valuable. All participants said yes. A few shared insights as to why they found it valuable. Charles stated:
I think they’re extremely valuable. I think they’re valuable because it helps kids process information and, whether they’re experiential, or because they collaborate and learn from another student, or they work, or teach another kid, and they learn the reasons why they’re doing it, and that they can see an outcome, you know, and they can get some success with a project, or solving a problem, or doing service learning,

I think it’s extremely valuable for them. (Interview with Charles)

While Charles was very enthusiastic about the value of CTL, Emily brought up the practicality of having balance in a classroom: “I do [find CTL methods valuable]. I think that there needs to be a healthy mix of both types of teaching.” Her desire is to have a classroom balanced with activity based learning as well as more structured, traditional style methods.

**Themes from Interviews**

Trends, recurring topics, and opinions emerged from participant interviews, which I categorized into themes. These themes capture the findings of participant experiences while utilizing the CTL model. Themeing of data is used in qualitative research to provide a metasummary of phenomena that emerge from the data corpus (Saldana, 2009, pp.140-141). In essence, these themes act as my units of analysis.

Participants identified a change in the classroom environment while using a CTL approach. This change resulted physically as increased movement, rearrangement of classroom furniture, and sometimes involved leaving the classroom to work in a nature-based environment. The ambience of the classroom unit also
changed. This altered atmosphere was less formal and more chaotic, providing increased opportunities for students to both ask questions, and be active.

With this new, CTL-driven environment, participants acknowledged changes in their students’ learning and classroom behavior. Learning was primarily initiated by students, often in the form of inquiry, and commonly involved group or self-directed activities. Participants found students to be more engaged, involved, and excited. The increase in activity, collaboration, and productivity created difficulty for students to be passive in the classroom. Participants labeled results of the “active classroom” to be: deeper learning, better connections of and between subject matter, and higher knowledge retention. These results created a positive feedback loop, with students who were more excited about their experiences and the learning process. Instead of students absorbing material delivered by the teacher, much like a sponge, participants said CTL approaches required students to process information.

Participants also noted a change in their roles as teachers. Using CTL, the teachers were less hands-on, and that allowed their students to engage more fully in the process of inquiry learning. Participants spent more time managing the classroom, doing tasks like helping students break down problems into smaller portions, through discussion and encouragement. Participants spent more time managing behavior issues that arose with changes in classroom structure.

Participants identified various barriers they encountered with the change in their teaching approach. The most commonly identified barrier was the increase in lesson preparation time. Another barrier to implementing CTL included time restrictions imposed by the school schedule. Following a rigid time schedule can be
difficult when using CTL approaches. Teachers often require more time for individual classes than the average school structure allows. Some participants perceived a loss of their control of the classroom, whether over student learning or behavior. More freedom in the classroom has the potential to increase issues with motivation and/or behavior.

Participants forwarded suggestions for how CTL approaches might be successfully incorporated. First, to effectively adopt a CTL approach, a teacher needs to be comfortable with changing their classroom style. Second, participants highlighted a need for support from their district or principal before adopting a CTL method. Third, participants noted a need for balance in their teaching approaches. While the CTL model can be highly motivating for some students, other students may benefit from a more traditional classroom structure. Using both active lessons and formal instruction creates a balance that evens the playing field for all types of learners.

**Questionnaires**

I used a questionnaire to close the data collection process with participants, and to collect any final participant opinions (Appendix F). Participants’ ages ranged from 27 to 58 years (mean=42) (Table 6). Years teaching varied greatly, and ranged from two and a half years to 30 years (mean=10). Experience can play a part in how a teacher runs his or her classroom. One expects that participants with less teaching experience have more recently had their teaching evaluated, are more familiar with best practices taught in current teacher education programs, and/or are more likely to
try new approaches in their classroom. More teaching experience, conversely, would lead to a more rehearsed, and fully developed teaching practice.

<table>
<thead>
<tr>
<th>Table 6. Participant Demographics</th>
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<tbody>
<tr>
<td>Participant</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Adam</td>
</tr>
<tr>
<td>Brian</td>
</tr>
<tr>
<td>Charles</td>
</tr>
<tr>
<td>Denise</td>
</tr>
<tr>
<td>Emily</td>
</tr>
<tr>
<td>Fiona</td>
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</table>

I asked participants to provide a definition for traditional teaching methods (Table 7). Their definitions described lecture-based classes where the teacher was the leader of the classroom. They referenced the importance of books, note taking, and an organized classroom setting with rows of students, a situation typically beneficial for teacher control. One participant highlighted the importance of standardized testing, and how teachers have come to drill and test students only on the specific topics that tests will cover. These definitions of traditional teaching methods do not reflect a consideration for differences in student interests or learning styles.
I then asked participants to rate how frequently they used traditional methods on a five-point scale, where 1 = *never* and 5 = *frequently* (Table 8). On average, participants reported their use of traditional methods as 3, or *occasionally*. In practice, this means that all participants are using pedagogy that focuses on teacher led lectures and independent work part of the time in their classrooms. This suggests that teachers are spending the rest of the time using other teaching methods.

Using a seven-point effectiveness scale, where 1 = *extremely ineffective* and 7 = *extremely effective*, I asked participants to rate CTL for effectiveness in their classrooms (Table 8). All participants agreed that CTL was effective, overall, and for natural resources classrooms, specifically. There was a slightly higher average for their belief in the effectiveness of using CTL for other classroom subjects (*mean*=6.2).

<table>
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<tr>
<th><strong>Table 7. Participant Definitions of Traditional Teaching</strong></th>
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<tbody>
<tr>
<td>Teaching that is &quot;teacher-centered&quot;, and less &quot;student-centered&quot;. &quot;Traditional&quot; teaching methods reach students that are auditory and some visual learners. It misses some visual learners and misses most kinesthetic learners.</td>
</tr>
<tr>
<td>Traditional teaching methods are defined, at least in my educational experience, as teacher led lecture, note taking, and some small group discussion on the topic of the lecture.</td>
</tr>
<tr>
<td>Traditional teaching methods are teachers lecturing with students taking notes and reading out of the book.</td>
</tr>
<tr>
<td>Standardized testing requires student proficiency in specific content areas. &quot;Traditional&quot; teaching has come to mean a focus on teaching, drilling, and testing students on limited subjects to ensure a positive outcome on state tests.</td>
</tr>
<tr>
<td>I guess for me a &quot;traditional&quot; teaching method would be that the teacher would be directing the class, lecturing, and that the students would be taking notes and doing paperwork.</td>
</tr>
<tr>
<td>Students sit in rows, teacher lectures, individual work, teacher doesn't leave the 'front' of the classroom.</td>
</tr>
</tbody>
</table>
Participants reported a high level of likeliness that they would use CTL in their classroom in the future (*mean*=6.6, on a seven-point likeliness scale) (Table 8). This means that all of my participants are pretty positive that they will use CTL methods in their classroom again. I also asked participants which CTL method would be their first choice in the future. Four respondents chose project-based learning, one of which also chose problem-based learning. One participant chose cooperative learning, and one chose service learning. No one chose work-based learning as his or her next CTL method of choice. When I asked what determined their first, future choice for a CTL method, participants noted the importance of considering their students in the learning process, effectively engaging students, and giving students a sense of autonomy and responsibility in their own learning. Upon reflection, I realize

<table>
<thead>
<tr>
<th>Table 8. Mean Data of Teaching Approaches in Practice</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>How often do you use ‘traditional’ teaching methods? *</td>
</tr>
<tr>
<td>How effective did you find the CTL approach you used? **</td>
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<tr>
<td>How would you rate the effectiveness of CTL methods for natural resources education? **</td>
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<tr>
<td>How would you rate the effectiveness of CTL methods for other subjects? **</td>
</tr>
<tr>
<td>How likely is it that you will use CTL in the future? ***</td>
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*Note. * 5-point frequency scale where 1= never, 5= frequently. ** 7-point effectiveness scale, 1= extremely ineffective, 7= extremely effective. *** 7-point likeliness scale, 1= extremely unlikely, 7= extremely likely.
I should have asked participants how they rate the effectiveness of traditional teaching methods, which would have provided a more accurate comparison. However, I am only able to address this through information provided during interviews.

**Chapter Summary**

Throughout the data analysis process I found a variety of trends, similarities, phenomenon, and plainly interesting results. During the initial observation phase I found that on average participants spent the majority of their time engaged in activities or lecturing. Additionally, during the primary observations all participants used discussion and instructions in their classroom. During the second round of observations, when CTL approaches were being used, I again found that all participants used discussion. On average, teachers spent the majority of their time engaged in activities and transitions. With the adoption of a CTL approach the most noticeable changes between the two phases of observation appear to be: a decrease in lecture, an increase in student group work, an increase in discussion, and an increase in transition time that resulted from the need to travel to and from an activity. On average, CTL lessons took longer than the initial lessons I observed.

My interview analysis revealed that participants noticed changes in their classroom environment when using a CTL approach. This change was both in the physical nature of the classroom (i.e., having less structure and formality), and in the behavioral nature for both students and teachers. Participants noted their roles as
being more assistive and managerial. Participants also noted an increase in student excitement and engagement with the lesson.

During interviews, participants reported that CTL approaches required more preparation time and flexibility with their classroom and schedule. When adopting new approaches participants reported a desire to feel supported by their school or district. Two participants reported a sense of hesitation or anxiety with the adoption of a CTL approach, but all participants reported positive results in their classrooms. Participants noted the importance of balance in teaching practices.

My questionnaire analysis revealed that participants defined traditional learning as lecture based, with note taking and books, and rows of students in their seats. All participants reported using traditional teaching in their classrooms on occasion. Participants rated CTL as being effective in their classrooms and all stated that they will likely use it again in the future. Most participants showed interest in project-based learning as the next CTL approach they will use. Participants place value on whether or not a method engages students, which CTL methods are reported to do.
Chapter Five: Conclusions and Recommendations

In this chapter I summarize my thesis, which includes my justification, research case, and a summary of my findings. Following, I provide a discussion of my conclusions from this study. Finally, I share recommendations from my research experience. These recommendations are geared towards educators in the field, for those who share an interest in pedagogy or the education system, and for researchers interested in the field of environmental education research.

Summary

It is clear that policy makers are aware of the need for a strengthened environmental literacy both at the international level (UN, 2012), and here in Oregon (HB 2544, 2009). What is not clear is the best way to go about increasing environmental literacy. There are many approaches that can be used to increase environmental awareness and seeing our world as an ecosystem. Most notably this can be accomplished through the reduction of poverty and an educated population that holds a sense of relation to, and ethic towards, the land (UNESCO, 1977). In finding the best way to increase environmental literacy the education process must be examined.

I investigated whether teachers believe using CTL approaches produce positive classroom attributes, or result in increased student learning. I chose CTL as a model to examine because it engages and excites students about learning, moves the classroom outdoors, and helps students solve problems; all of which contribute to
increasing environmental literacy, and are recommended to teachers by the OELP. Experiences and emotion are used to create a meaningful learning experience that is long lasting. CTL is designed to make the learning experience individualized and important for each student, and to foster learning as a lifelong activity associated with positive feelings of success (Johnson, 2002). Engaging a diversity of learner types is possible with CTL, as students relate class material to scenarios outside of the classroom (Reese, 2002). Additionally, I chose to investigate CTL because, while it is acknowledged that CTL practices work, teachers have been hesitant to implement CTL practices in their classrooms (Kirschner, Sweller, & Clark, 2006; Mikkelson, L., personal communication, April, 2011).

I used an explorative case study design to collect lived experiences of six K-12 Oregon educators adopting a CTL approach in their natural resources classrooms. These experiences were examined through observations, interviews, and a questionnaire. I used standard qualitative analysis methods to determine differences when using a CTL approach, and themes from teachers’ experiences (Berg & Lune, 2012).

With the adoption of a CTL approach the most noticeable changes between the two phases of observation appear to be: a decrease in lecture, an increase in student group work, an increase in discussion, and an increase in transition time that resulted from the need to travel to and from activities. On average, CTL lessons took longer than the initial lessons I observed.

Participants noted a change in the environment of their classrooms, and a change in their roles as instructors when using a CTL approach. Participants found
that CTL approaches required more preparation time and a need for a flexible school structure. Finally, participants noted the importance of having a balance of teaching styles in their classroom. Participants acknowledged that CTL approaches are indeed effective, but that they should be paired with a more rigid traditional style in order to best reach all styles of learners. Participants defined these traditional approaches as lecture based, with note taking and books, and rows of students in their seats. Participants placed value on whether or not a teaching method engages students.

Conclusions

My study population consisted of teachers who were employees at two schools in rural communities of Western Oregon. The two schools in my study had recently undergone change, and decided to focus on natural resources in their curriculum in order to meet the demands of their communities. Teachers at these schools had been experiencing a lot of change. They were either, more comfortable and willing to take on change in the classroom, and/or they were more stressed with the constant fluctuation to their workload and structure. These teachers were also involved with the Stewardship Schools Program (SSP) for at least one year prior to my research. I assumed my study participants held a more in-depth knowledge and practice of natural resources education techniques. I am unable to comment upon differences between my participants’ initial observations, and how they might compare to teachers at other institutions.

While my research cannot be generalized to any larger population, other educators and administrators may be interested in the results of my participants’
experiences with CTL. In practice, I found that CTL approaches took more time for my participants. They took more time to prepare, more time to administer in the classroom, and consisted of more transition time for travel to and from activities. The main change was a decrease in lecture time, which contributed to more time in discussion and group work time.

With a switch to CTL, participants experienced a more hands-on, active classroom, reported as both chaotic and engaged. Participants spent more time preparing for the lesson and monitoring small groups or discussing subject matter and expectations with students. Participants found CTL to be effective in that it engaged their students. Participants described a need for more flexibility in the school schedule to implement CTL as a regular approach, and a need to complement CTL with traditional lecture based approaches.

While CTL is a pedagogical approach that holds promise for natural resources classrooms, it seems it might not be easily adoptable by a teacher at any given school. This is because of the need for a flexible structure where the administration trusts teachers to schedule classes how they see fit, and this may be easier for teachers who have their students for the entire day, rather than in higher grades where students typically adhere to a rigid course schedule. Participants also expressed the need for more preparation time and resources to conduct activities.

My participants noted a need for a balanced teaching practice that includes multiple styles for various learner types. However, they unanimously agreed that they would likely use CTL again in the future, as they found it valuable in engaging their students. I see the main concern to be between the need for diverse pedagogy that
engages all students, and teaches through multiple contexts, and the challenge of convincing teachers to take on the extra work, and for administration to change from the rigid requirements that result in a less cohesive learning platform.

**Free-form System**
From my experiences investigating the implementation of CTL, I believe the model could flourish in a more free-form system. This free-form model could abstain from the bell schedule and allow teachers longer lesson time when necessary. This same free-form system would ideally incorporate additional time for teachers to prepare for their lessons, and resources that help aid teachers and students in field scenarios.

I suggest that a shift to a free-form school system, where pedagogy is a main focus for teachers and they are given ample opportunity to practice innovative teaching, rather than the current heavy focus on standards, could have impacting results for environmental literacy. In this free-form system, where CTL could flourish, there would be more opportunities for students to have hands on, long term, meaningful projects. When teaching about the natural world these practices could create the everlasting connections with nature that we need for future generations to develop a greater understanding and motivation to make responsible decisions regarding the ecosystem of which we are a part.

This suggestion could be adopted at the district, statewide, or national level. However, it seems to me, making a structural change to the greater education system, at the national level, would have the greatest influence on the output of our future
society. To know for sure, in-depth research on this free-form system should be undertaken.

**Recommendations**

Although it appears that my participants found CTL to be successful in their individual classrooms, it is clear from their experiences and recommendations that there are certain necessities for its practical implementation in the average K-12 classroom focusing on natural resources education. For these hands-on, experiential, contextual learning experiences, there needs to be (1) greater flexibility in the classroom structure, and (2) better access to useful resources. For example, in Western Oregon it would be helpful if the school supplied students with field clothing such as rain boots and rain jackets for poor weather days in the field. From what I saw it seemed there was a need for things that make both teachers and students feel more comfortable leaving the classroom.

To move towards a system that embraces the CTL practice, I would urge administration to encourage flexible and innovative projects on campuses and in the community; these seem to be things that can grow a community, a school, and the joy of learning. I suggest that teachers take on the challenge of increased preparation time, and become comfortable with the unknown that is intrinsic in inquiry-based learning.

Findings from this study can be used as a starting point for further empirical research on the use of CTL in natural resources education. For those looking to build upon my research, I suggest conducting a structured, longitudinal study of a school,
investigating both teacher and student experiences, with a control school to compare against. The school would need to fall into the ‘free-form’ model where teachers have more flexibility with their schedule. Ideally, teachers at this school would have easy access to land and ecosystems for teaching outside of the classroom, where they can see change, and conduct hands-on, meaningful work, without the added burden of travel time and costs. Additionally, access to useful resources (e.g., jackets, boots, and shovels) would be beneficial for teaching with CTL approaches. Teachers at this school would ideally receive an in-depth introduction to CTL approaches, making them more comfortable and prepared for the challenges that arise when using the CTL model.
References

Adkins, Carol-Simmons, & Bora, (2002). Outdoor, experiential, and environmental education: Converging or diverging approaches? *ERIC Digest.*


Appendices
APPENDIX A: Recruitment Letter

March 5, 2012

Dear Educator,

My name is Kim Greene and I am a graduate student at Oregon State University. For my thesis, *Evaluating Contextual Teaching and Learning Approaches for Natural Resources Education*, I want to assess the effectiveness of contextual teaching and learning approaches for educators at schools focusing on natural resources education.

I am contacting you to gauge your interest in being a part of this study. I want to work with you as you adopt a contextual teaching and learning (CTL) approach for a unit or area of study in your classroom. I would like to observe your classroom at least once before you adopt a new approach and then again when you are intentionally implementing the CTL approach of your choosing. To follow up the observations I would like to conduct an interview with you about your evaluation of the process. Both observations and the interview will be digitally audio-recorded to ensure accuracy. Finally, I would like to administer a reflective questionnaire with you to further understand your appraisal of the CTL approach.

I have chosen this research project because I believe natural resources education is important for our youth. Additionally, I believe that not all teaching methods capture the attention of students in the same way, and that students who are actively engaged are more effective learners. By evaluating the effectiveness of teaching approaches I hope to see whether or not CTL approaches engage students for effective learning.

If you have any questions, comments, or concerns about this study or any interest in participating in this study I would enjoy speaking with you.

You may also contact my advisor, Dr. Joanne Tynon, with any questions, comments, or concerns regarding this study.

Thank you for your time and I look forward to hearing from you soon.

Sincerely,

Kim Greene
M.S. Candidate
Forest Ecosystems and Society
Oregon State University
kim.greene@oregonstate.edu
541-221-3828

Joanne F. Tynon Ph.D.
Associate Professor
Forest Ecosystems and Society
Oregon State University
jo.tynon@oregonstate.edu
541-737-1499
APPENDIX B: Consent Form

CONSENT FORM

Project Title: Examining Contextual Teaching and Learning Approaches for Natural Resources Education
Principal Investigator: Dr. Joanne F. Tynon
Co-Investigator(s): Kim Greene
Version Date: February 28, 2012

1. WHAT IS THE PURPOSE OF THIS FORM?

This form contains information you will need to help you decide whether to be in this study or not. Please read the form carefully and ask the study team member(s) questions about anything that is not clear.

2. WHY IS THIS STUDY BEING DONE?

The purpose of this study is to assess the effectiveness and usefulness of contextual teaching and learning approaches for natural resource education compared to traditional teaching approaches. Contextual teaching and learning (CTL) is an instructional method that helps students connect in class activities to real world experiences, which results in meaningful connections for students, aiding in retention of academic materials.

Findings from this project could help educators in choosing effective teaching methods for natural resource education, which will help prepare youth for: understanding the environment in which we live, green jobs of the future, and problem solving skills for when issues become imperative (e.g., global climate change, population increases, and diminishing fossil fuels).

Kim Greene is conducting this study for the completion of her thesis.

Up to ten participants may be invited to take part in this study.

3. WHY AM I BEING INVITED TO TAKE PART IN THIS STUDY?

You are being invited to take part in this study because you are an educator at a school participating in the Stewardship Schools Program.

4. WHAT WILL HAPPEN IF I TAKE PART IN THIS RESEARCH STUDY?
Your participation in this study is an experimentation of teaching approaches for natural resource education. The study will include your preparation and implementation of a contextual teaching and learning approach in your classroom for a unit or lesson of your choice. We will conduct various study activities to assess your rating of effectiveness for the approach you chose to implement.

The study activities include: an observation of your classroom while you are using typical teaching approaches before you implement the experimental teaching approach. Next we will conduct an observation of your classroom after you have adopted the experimental teaching approach. Once the unit or lesson has been completed we will conduct an interview with you. Each of these study activities will be scheduled with you in advance at a time that is convenient for you. Finally, after each of these study activities have been completed we will send you a reflective questionnaire to be mailed back once completed (return postage will be included).

**Study Duration:** Both of the observation sessions will last the entire length of one class session, or however long your individual lesson lasts, or approximately 30 minutes to one hour. The interview will take about one to two hours to complete. The questionnaire should take no more than one hour to complete. The entire duration of the study is dependent upon your implementation of a lesson or unit (e.g., if you meet with these students on a daily basis you may complete the lesson sooner than if you only meet with them twice a week). It is expected that the entire study will take no less than one month and no more than three.

**Recordings:** Digital audio-recordings will be made of the class observations and interview session. Digital audio-recordings are a required study activity to ensure accuracy and you should not enroll if you do not wish to be recorded.

**Study Results:** Study results will be made available to participants upon request once the study and report has been completed.

5. **WHAT ARE THE RISKS AND POSSIBLE DISCOMFORTS OF THIS STUDY?**

There are minimal risks to in this study.

There is a risk that you will feel uncomfortable being digitally audio-recorded during the class observations and the interview. You may also feel uncomfortable given the nature of interview questions regarding your individual teaching style.

There is a risk that we could accidentally disclose information that identifies you.
The security and confidentiality of information sent by email cannot be guaranteed. Information sent by email can be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses.

6. WHAT ARE THE BENEFITS OF THIS STUDY?

We do not know if you will benefit from being in this study. However, you may discover a new teaching method that is effective for your classroom and topics of study. This could result in higher achieving students and more interactive learning communities. It is anticipated that you will benefit from this study with personal and professional growth.

7. WILL I BE PAID FOR BEING IN THIS STUDY?

You will not be paid for being in this research study.

8. WILL IT COST ME ANYTHING TO BE IN THIS STUDY?

There are no required costs for this study, however potential costs may accrue if you choose to purchase any teaching materials for your teaching method or unit.

9. WHO WILL SEE THE INFORMATION I GIVE?

The information you provide during this research study will be kept confidential to the extent permitted by law. Research records will be stored securely and only researchers will have access to the records. Federal regulatory agencies and the Oregon State University Institutional Review Board (a committee that reviews and approves research studies) may inspect and copy records pertaining to this research. Some of these records could contain information that personally identifies you.

If the results of this project are published your identity will not be made public.

Dr. Joanne Tynon and Kim Greene will be the only individuals with access to digital audio-recordings. Interview recordings will be erased once transcribed, no more than one month after recording. Observation recordings are for researcher accuracy. They will not be transcribed, but will be destroyed after the study has been completed.

Information collected for this study will not be used by school/personnel officials for employee evaluations of any sort.

To help ensure confidentiality, we will use pseudonyms for participants. However, given the small subject population and limited number of external research sites it is possible that some individuals may be able to identify participants. However, given
the lack of sensitivity in the study no harm is anticipated by this ability to be identified.

10. WHAT OTHER CHOICES DO I HAVE IF I DO NOT TAKE PART IN THIS STUDY?

Participation in this study is voluntary. You have the ability to skip any questions you prefer not to answer. If you decide to participate, you are free to withdraw at any time without penalty. You will not be treated differently if you decide to stop taking part in the study. If you choose to withdraw from this project before it ends, the researchers may keep information collected about you and this information may be included in study reports.

11. WHO DO I CONTACT IF I HAVE QUESTIONS?

If you have any questions about this research project, please contact:
Dr. Joanne Tynon          Kim Greene
541-737-1499               541-221-3828
jo.tynon@oregonstate.edu  kim.greene@oregonstate.edu

If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu
12. WHAT DOES MY SIGNATURE ON THIS CONSENT FORM MEAN?

Your signature indicates that this study has been explained to you, that your questions have been answered, and that you agree to take part in all portions of this study. You will receive a copy of this form.

Participant's Name (printed):

(Signature of Participant) (Date)

(Signature of Person Obtaining Consent) (Date)
Contextual Teaching and Learning Approaches:
An Implementation Guide

March 1, 2012

Kim Greene
M.S. Thesis: Evaluating Contextual Teaching and Learning Approaches for Natural Resources Education
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<th>Page</th>
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Dear Educator,

This guide contains information about Contextual Teaching and Learning approaches; it includes an explanation and brief background for the teaching method. Definitions and essential components for implementing each of the Contextual Teaching and Learning approaches are provided along with additional resources if you wish to further your research.

I believe that Contextual Teaching and Learning could be influential as a method for natural resources education. It has been proven to engage students in academic material and create a longer retention period for this academic material.

Please use this guide as a learning opportunity to further build your knowledge of Contextual Teaching and Learning methods, and use these approaches along with new ideas to experiment in your classroom.

Sincerely,

Kim Greene
Contextual Teaching and Learning

Brief Introduction: What is Contextual Teaching and Learning?

Contextual teaching and learning (CTL) represents a concept that involves connecting the content that students are learning with the context in which that content could be used in real life. Connecting content with context is an important part of bringing meaning to the learning process.

Johnson (2002) notes that all CTL approaches are made of eight components that work together to create context for learners. These components are:

1. Meaningful connections  
2. Significant work  
3. Self-regulated learning  
4. Collaboration  
5. Critical and creative thinking  
6. Nurturing the individual  
7. High standards  
8. Authentic assessment

For that connection to take place, a variety of teaching approaches may be used. Over the years, a body of literature has emerged based on research and development on how people learn. The following teaching approaches include context as a critical component and engage students in an active learning process. They can be used individually or in conjunction with each other.

- Problem-based learning  
- Project-based learning  
- Collaborative/cooperative learning  
- Service Learning  
- Work-based learning

"Contextual teaching and learning emphasizes higher-level thinking, knowledge transfer, collecting, analyzing, and synthesizing information and data from multiple sources and viewpoints" (Howey, 1998). Of critical importance:

- The above approaches be used at the student’s developmentally-appropriate level of learning  
- The environment be established to support self-regulated learning  
- Knowledge about multiple intelligences be considered and applied  
- Appropriate authentic assessment is conducted.

Additional resources on Contextual Teaching and Learning:


Following you will find a brief description of the above listed approaches and the pre-dominate components of each approach as well as some references for further study.
Problem-Based Learning

Problem-based learning is an instructional approach that engages learners in problem-solving investigations that integrate skills and concepts from many content areas. This approach includes gathering information around a question, synthesizing it, and presenting findings to others (Moffitt, 2001).

Essential Components of Problem Based Learning (PBL)

1. **Learning cases.** The learning case is the core of Problem-Based Learning. The origin of any learning case can come from teachers, newspaper articles, textbooks, literature, or even texts downloaded from the Internet. Learning cases do not always have a solution; thus, solving the problem is not the ultimate goal. The learning case serves as a learning vehicle. The content knowledge and problem solving skills are the focus. Cases need to have specific learning outcomes embedded and carefully aligned with learning standards.

2. **Student-centered learning.** After identifying the facts of the proposed case and defending their relevance to the case, students identify what they need to learn. They utilize a variety of learning resources, such as the Internet, library, local laboratory, teachers, or experts in the field, to acquire the information needed. They may also use other available resources to design experiments or activities to test their ideas. PBL teachers, as facilitators, need to develop good questioning skills. When students are working on their learning cases an important task for teachers is to use questions to help the students:
   - expand their thinking (through open-ended questioning);
   - frame their ideas and make evidence-based inferences;
   - develop a skeptical mind set with regard to information that lacks supporting data.

3. **Small group cooperative learning.** Ideally, PBL students work within small groups. The ideal group size is five to seven. Cooperative learning in PBL is especially important. All members are held accountable for the successful learning of his or her group members.

(Wang, Thompson, & Shuler, 1998)

Additional resources on Problem Based Learning:


**Project –Based Learning**

Project-based learning is a systematic teaching approach that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks (Buck Institute for Education, 2009).

**Essential Components of Project-Based Learning:**

1. **Student Developed “Driving Question.”** This question is anchored in a real-world problem and ideally uses multiple content areas. Students are inherently engaged due to the development in the question that will drive the investigation, learning and product.

2. **Active Investigations.** Opportunities for students to make active investigations that enable them to learn concepts, apply information, and represent their knowledge in a variety of ways.

3. **Shared Responsibility.** Teamwork and collaboration among students, teachers, and others in the community so that knowledge can be shared and distributed between the members of the "learning community"

4. **Culminating Product.** This product allows use of cognitive tools (telecommunications, computer labs, and graphing applications) in learning environments that support students in the representation of their ideas and meaningfully addresses the driving question.

(Houghton Mifflin, n.d.)

**Additional resources on Project Based Learning**


**Collaborative/Cooperative Learning**

Collaborative/Cooperative learning is an instructional approach that organizes instruction using small groups of two to four students, promoting group learning rather than individual or competitive learning (Johnson & Johnson, 1999). The learning groups encourage students to work together to maximize their own and each other’s learning and achieve learning goals (Holubec, 2001). Cooperative learning groups should be seated next to one another and learning groups should be used for nearly all class activities.

**Essential Components of Collaborative/Cooperative Learning**

1. **Positive interdependence.** Students must depend on their group members to complete the activity. Providing the group with one set of materials, assigning complementary roles, providing joint rewards, or dividing resources among group members can help create this relationship.

2. **Individual accountability.** It is important to ensure all group members are actively participating; this can be achieved by testing each student individually, selecting one student’s work to represent the whole group, or by having each student summarize what they have learned to their group members.

3. **Face-to-face promotive interaction.** Positive contribution and interaction by all group members in necessary. Students promote one another’s learning in order to increase interpersonal dynamics. Activities such as: praising, supporting, encouraging, and assisting in each others success, or explaining how to solve problems to other group members fulfill this component.

4. **Social skills.** Students have the opportunity to learn, use, and develop social skills that are not necessary for individual or competitive learning scenarios. Teachers should be prepared to teach their students about leadership, decision-making, trust-building, communication, and conflict management skills.

5. **Group processing.** Processing and reflecting are necessary steps for group learning to be effective. Groups should be given the opportunity examine their groups effectiveness and cite helpful and unhelpful behaviors within the group in order to solve their problems and become a more cohesive unit.

(Johnson & Johnson, 1999)


**Additional resources on Collaborative/Cooperative Learning**


**Service Learning**

Service learning is an instructional method that provides a practical application of newly acquired or developing knowledge and skills to the needs in the community through projects and activities (McPherson, 2001).

**Essential Components of Service Learning:**

1. **Setting the Context.**
   - Identify instructional goals
   - Develop essential question(s)
   - Determine assessments.

2. **Investigation.**
   - Identify the “community to serve”
   - Assess community needs
   - Research issue
   - Weave in reflection
   - Assess progress

3. **Planning**
   - Preparation
   - Develop an action plan
   - Integrate instruction
   - Weave in reflection
   - Assess progress

4. **Action**
   - Implement action plan
   - Assess progress
   - Intentionally link to curriculum
   - Involve community partners
   - Students collaboratively perform tasks
   - Each student is given a meaningful role

5. **Reflection**
   - Connect class learning with learning from service
   - Question assumptions
   - Develop understanding of roles as citizens
   - Improve problem solving strategies

6. **Demonstration and Celebration**
   - Demonstrate impact on community
   - Demonstrate impact on self
Celebrate accomplishments
(Oregon Department of Education, 2010)

**Additional resources on Service Learning**


**Work-Based Learning**
Work-based learning is an instructional approach in which workplace, or workplace-like, activities are integrated with classroom content for the benefit of students and often businesses (Smith, 2001). Students use the context of the workplace to learn content of school-based courses and how that content is used in the workplace. Work-based learning links theory to practice (Raelin, 1997).

**Essential Components of Work-Based Learning**

1. **Process-Driven Curriculum.** Rather than content-driven curriculum, the focus of the learning should be on the processes and skills needed to complete the activity.

2. **Student-Centered Learning.** Students are given the ability to guide the learning to meet their needs or desired pace.

3. **Contracts.** The learner, employer, and instructor agree upon the learning outcomes in advance by committing to a contract.

4. **Employer Determined Skill Set.** The students work on skills desired by employees to better prepare them for the workplace.

5. **Experiential Environment.** The learning setting provides an opportunity for practice in applying knowledge or skills to the workplace activity.

6. **Accreditation.** Students work towards an accreditation or certification that will better prepare them for the workplace.

(Nixon, Smith, Stafford, & Camm, 2006)
Note: Work-based learning is most commonly used in higher education or vocational education settings where the class is focused on one pre-determined employment objective.

**Additional resources on Work-Based Learning**


**References Cited**


APPENDIX D: Parent/Guardian Letter

March 12, 2012

Dear Parent or Guardian,

My name is Kim Greene and I am a graduate student at Oregon State University. For my thesis, *Evaluating Contextual Teaching and Learning Approaches for Natural Resources Education*, I want to assess the effectiveness of contextual teaching and learning approaches for educators at schools focusing on natural resources education.

As you may know, your student’s school emphasizes natural resources education throughout many subjects. Your student’s teacher has volunteered to participate in my study and I will be observing his or her teaching styles during two class sessions.

You are receiving this letter to inform you that I will be present in your child’s classroom on two separate occasions. During these class observations the session will be digitally audio-recorded in order to ensure accuracy upon revision. The audio-recording device will pick up your student’s voice; however, anything he or she says will not be included as part of the research data. Additionally, any of the information gathered will not affect your student’s grade in the class. I am collecting information on your student’s teacher and his or her teaching style.

If you have any questions, comments, or concerns please do not hesitate to contact me. You may also contact my advisor, Dr. Joanne Tynon, with any questions, comments, or concerns regarding this study.

Sincerely,

Kim Greene
M.S. Candidate
Forest Ecosystems and Society
Oregon State University
kim.greene@Oregonstate.edu
541-221-3828

Joanne F. Tynon Ph.D.
Associate Professor
Forest Ecosystems and Society
Oregon State University
jo.tynon@Oregonstate.edu
541-737-1499
APPENDIX E: Interview Questions

ID#___________  Interview Questions

CTL used: ________________
Unit/Lesson: ______________

Please describe why you chose this CTL approach and how you implemented it?

What was the learning goal of this unit/lesson? And how did it incorporate natural resource education?

How did this differ from the way you have taught this unit/lesson in the past?

Could you describe any difficulties or challenges you faced in implementing this approach?

How was lesson planning or preparation time different compared to your typical teaching methods?

What do you think were the biggest changes in your classroom instruction?

How did your students react to this teaching approach?

Did you see any significant changes among your students? (If yes, please describe.) (If no, why might this be?)

How would you describe the differences or similarities between this contextual teaching approach and traditional teaching methods?
What are some of the pros and cons of this teaching method?

Overall, How did the contextual teaching approach work for you?

Do you think you will use this teaching approach again?

Do you think you will try any of the other contextual teaching and learning approaches? (If yes, which ones interest you?) (If no, why?)

Do you think contextual teaching and learning approaches are valuable?

Is there anything else you would like me to know?

Do you have any questions for me?
APPENDIX F: Questionnaire

Dear Educator,

Thank you again for your participation throughout the duration of this study. My thesis project would not be possible without your help. Good news! Upon returning this exit survey you will officially be finished with your part in the project. Please read the instructions on the following page and fill out the questions to the best of your ability. Your participation in this survey is voluntary. You have the right to skip any questions that you do not want to answer.

If you have any questions please contact me by phone or email.

It was a pleasure getting to know you. Thank you for your hard work in shaping the future of our society.

Sincerely,

Kim Greene
M.S. Candidate
Forest Ecosystems and Society
Kim.greene@oregonstate.edu
541-221-3828
Please answer the following questions to the best of your ability. Your responses are valuable and greatly appreciated. Any information you provide will be anonymous and confidential.

1) How do you define ‘traditional’ teaching methods?

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

2) How often do you use this ‘traditional’ teaching style? (Please circle the best response.)

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Sometimes</th>
<th>Frequently</th>
</tr>
</thead>
</table>

The following questions refer to the Contextual Teaching and Learning approach you recently used in your classroom.

3) Which CTL approach did you use? (Please circle the method.)

<table>
<thead>
<tr>
<th>Cooperative Learning</th>
<th>Problem-Based Learning</th>
<th>Project-Based Learning</th>
<th>Service Learning</th>
<th>Work-Based Learning</th>
</tr>
</thead>
</table>

4) How effective did you find the CTL approach you used? (Please circle the best response.)

<table>
<thead>
<tr>
<th>Extremely Ineffective</th>
<th>Ineffective</th>
<th>Somewhat Ineffective</th>
<th>Neutral</th>
<th>Somewhat Effective</th>
<th>Effective</th>
<th>Extremely Effective</th>
</tr>
</thead>
</table>

5) Given the opportunity, is there anything you would have done differently with the CTL lesson you taught? If yes, what? If no, why?

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
The following questions ask you to assess CTL methods.

6) What teaching styles do you typically use or favor?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

7) How would you rate the effectiveness of CTL methods for Natural Resources Education? (Please circle the best response.)

<table>
<thead>
<tr>
<th>Extremely Ineffective</th>
<th>Ineffective</th>
<th>Somewhat Ineffective</th>
<th>Neutral</th>
<th>Somewhat Effective</th>
<th>Effective</th>
<th>Extremely Effective</th>
</tr>
</thead>
</table>

8) How might you rate the effectiveness of CTL methods for other subjects? (Please circle the best response.)

<table>
<thead>
<tr>
<th>Extremely Ineffective</th>
<th>Ineffective</th>
<th>Somewhat Ineffective</th>
<th>Neutral</th>
<th>Somewhat Effective</th>
<th>Effective</th>
<th>Extremely Effective</th>
</tr>
</thead>
</table>

9) What benefits, if any, do you believe there are in using CTL methods versus traditional teaching styles? (Check all that apply.)

____ I see no benefits in using CTL methods.
____ Students find meaning in academic materials when using CTL methods.
____ Students retain more information when using CTL methods.
____ Students seem more engaged when using CTL methods.
____ Students have more control in the learning process when using CTL methods.
____ Students develop critical thinking skills when using CTL methods.
____ Other (please specify).

_____________________________________________________________________
_____________________________________________________________________

10) How likely is it that you will use a CTL approach in the future?

<table>
<thead>
<tr>
<th>Extremely Unlikely</th>
<th>Unlikely</th>
<th>Somewhat Unlikely</th>
<th>Undecided</th>
<th>Somewhat Likely</th>
<th>Likely</th>
<th>Extremely Likely</th>
</tr>
</thead>
</table>
11) If you were to choose a CTL approach to use in your classroom again, which would be your first choice?

<table>
<thead>
<tr>
<th>Cooperative Learning</th>
<th>Problem-Based Learning</th>
<th>Project-Based Learning</th>
<th>Service Learning</th>
<th>Work-Based Learning</th>
</tr>
</thead>
</table>

12) Why is this your first choice?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

DEMograPHICS

13) Please circle your school district.

Elkton                  Vernonia

14) How many years have you been teaching here? ________________

15) How many years have you been teaching in total? ________________

16) What subject(s) do you primarily teach?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

17) What grade level(s) do you teach? ________________

18) How old are you? ________________

19) Please indicate your gender. ________________