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THE EFFECT OF AN EXTENDED WILDERNESS EDUCATION EXPERIENCE ON ILL-STRUCTURED PROBLEM-SOLVING SKILL DEVELOPMENT IN EMERGING ADULT STUDENTS

by

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STATEMENT OF DISSERTATION APPROVAL

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ABSTRACT

In a society that is becoming more dynamic, complex, and diverse, the ability to solve ill-structured problems has become an increasingly critical skill. Emerging adults are at a critical life stage that is an ideal time to develop the skills needed to solve ill-structured problems (ISPs) as they are transitioning to adult roles and starting to think differently about the world around them. Individuals who are exposed to immediately relevant environments, a change in cognitive equilibration, and supportive and collaborative learning environments show an improvement in ISP-solving skills. These environments can lead to an increase in creative thinking, cognitive flexibility, and tolerance for novelty, all which support ISP-solving skills.

One of the places where these types of environments are found is in the Extended Wilderness Education Experience (EWEE). These experiences serve as a place for students to engage in the critical practice of solving problems and challenging assumptions and norms in a context where students and instructors are able to use one another as resources to practice problem solving.

The purpose of this study was to measure the effects of an Extended Wilderness Education Experience on emerging adults' ability to solve ill-structured problems when compared to peers in a traditional classroom setting. This study looked at the students' ability to represent problems, develop and justify solutions, monitor and evaluate problem spaces and solutions, and recognize all the phases of the ill-structured problem-solving process.

Students in this study were emerging adults (average age 21) who were in enrolled in either an EWEE or in a traditional classroom experience with leadership-focused curriculums. In order to assess their development, two ill-structured scenarios were developed for students to work through and answer questions about. This study used a multivariate analysis of variance test to examine the differences in ill-structured problem-solving performance for each student between the precourse and postcourse scores.

Results of this study suggested that students who were engaged in an EWEE showed significant gains in their ill-structured problem-solving skills when compared to their peers. Gains for each problem-solving skill are discussed as well as implications for outdoor education research and practice.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

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CHAPTER 1

INTRODUCTION

> Life is fired at us point-blank, we cannot say, 'hold it! I am not quite ready. Wait until I have things sorted out.' Decisions have to be taken that we are not ready for; aims have to be chosen that we cannot see clearly. – E.F. Schumacher in *A Guide for the Perplexed.*

Not all the problems that individuals encounter in their lifetimes are straightforward. The postmodern world is increasingly more dynamic and individuals need to adapt. The Western world is encountering a social and economic revolution (Robinson, 2001) that poses bigger and more dynamic problems to every new generation (Schumacher, 1977), including this one. The coming generations will have to wrestle with wicked problems such as changing climate, changing economic circumstances, and new patterns in illness and disease that impact how we approach healthcare (Muratroyd, 2010), to name just a few. The need for physical labor and services is giving way to a greater need for intellectual labor and services, and as a result of this shift, there is an increasing need in the Western world for creative, innovative, and flexible thinkers (Robinson, 2001; Romer, 1994). Additionally, the speed of discovery has increased such that the quantity of available information doubles every 10 to 18 months (Muratroyd, 2010). Thus, the ability to leverage dynamic thinking skills toward the many possible solutions to ill-structured problems is an important skill for people to develop, as most of

the problems they will encounter in their private lives (Noykes, Schunn, & Chi, 2010) and in their careers (Flordia, 2012) present themselves as ill-structured

In a society in which there is an increased need for people to think creatively and contextually, the ability to solve ill-structured problems will become increasingly important (Labouvie-Vief, 2006; Noykes, Schunn, & Chi, 2010). Individuals who are able to achieve these more mature thought structures are less likely to be swayed by emotional reactions to decisions, are less likely to have emotionally distorted views of the world around them, and are more likely to think in a way that is not self-serving or self-protective (Labouvie-Vief, 2006). Such individuals will also have increased tolerance for contradiction, diversity, and ambiguity (Arnett & Tanner, 2006). However, the ability to solve ill-structured problems is not an innate cognitive skill that develops with maturation; rather, the processes used in solving these kinds of problems need to be taught and experienced for individuals to develop this skill.

Emerging Adult Students

The critical period for the development of this type of thinking is emerging adulthood, as this is the time for the rapid expansion of complex thought structures (Tanner, 2009). Emerging adults are those individuals between adolescence and adulthood who are becoming more independent and are exploring adult roles and life possibilities. During the emerging adult years, individuals are going through both social (Tanner, 2006) and cognitive (Labouvie-Vief, 2006) changes that will impact the development of their judgment and reasoning structures. Once this critical period is passed, emerging adults' ability to make significant changes to their neurobiological

structures will be radically reduced (Bjorklund, 2005). Therefore, it is important that emerging adults are exposed to learning experiences that will develop sophisticated reasoning and problem-solving frameworks during this life stage. In order to adapt to a dynamic and changing world, they need to develop the problem-solving skills that will align well with tackling ill-structured problems.

Ill-Structured Problem-Solving Skills

Ill-structured problems are those problems that have answers that are context relevant and context dependent. Solving ill-structured problems requires an individual to be able to generate novel solutions from varying sources. Individuals then must weigh these potential solutions through the lens of the context of the problem to come up with a new solution (Jonassen, 1997). Additionally, people may have to go through many phases of divergent and convergent thinking before a solution can be settled upon (Mumford et al., 1993).

Where well-structured problems are typically solved through additive processes, ill-structured problems require a high level of creative thinking in both defining the problem space and sourcing solutions as these processes involve restructuring, reorganizing, and combining information to better understand the root of the problem and the potential solutions (Lubart & Mouchiroud, 2003). Also, ill-structured problems possess elements that are unknown or not known with any degree of confidence, multiple solutions or solution paths, multiple criteria for evaluating solutions (so there can be uncertainty about rules, concepts, or principles). These problems also require learners to make judgments and express personal opinions or beliefs (Jonassen, 2000). Individuals

who have the ability to solve ill-structured problems also have an increased understanding of relative and contextual knowledge and a higher capacity for cognitive flexibility (Jonassen, 2004; Spiro, Feltovich, & Coulson, 1996).

As an example of a very basic ill-structured problem, consider the problem of what to wear to work in the morning. As the weather changes or a person's meeting schedule changes, the most appropriate answer to the problem might change. Additionally, there really is no right or wrong answer, just better and worse answers depending on the conditions that exist in the problem. In contrast, well-structured problems show a linear development in thinking processes, and require less cognitive complexity to solve.

As ill-structured problems emerge from real life experiences and require the integration of multiple variables in a given context, the solutions generated for these types of problems will require integration across multiple content domains (Jonassen, 2004). Well-structured problems have definitive right and wrong answers that change little over time and context (Kitchener & King, 1990). For example, most story problems that students solve in math classes may be complex, but they will always have one correct answer that can be arrived at through a linear and logical process.

Solving ill-structured problems requires the integration of many cognitive skills (Jonassen, 2004). One of the most critical skills to solving these types of problems is the ability to reorganize all the available information to understand the nature of the problem (Fansko, 2001), as well as to understand changing solutions and generate novel solutions (Mayer, 1992). The ability to create many new and flexible solutions will be determined by an individual's ability to execute divergent thinking skills, which are defined best

within the broader creative problem-solving skill set (Mumford et al., 1998). Creative problem solving, as a domain, aims to address individuals' ability to generate solutions to problems by using both convergent and divergent thinking styles through flexible mental frameworks (Cropley, 2000; Runco, 1991). Therefore, exposure to educational environments that are rich in creative thinking and encourage a tolerance for novelty and cognitive flexibility would help individuals develop the skills needed to solve ill-structured problems.

Extended Wilderness Education Experience

The practice of solving ill-structured problems and working in ill-structured environments is one of the ways that students can develop the schema needed to work on these problems in the future (Jonassen, 2000). Acquiring creative thinking skills requires exposure to authentic learning tasks or inquiry-based learning as the core task (Murgatroyd, 2010). Therefore, exposure of emerging adults to learning environments that engage them in such tasks will help them develop these critical skills. The Extended Wilderness Education Experience (EWEE) provides this type of environment. The EWEE relies on a variety of different learning strategies and experiences for students. These experiences require students to solve problems that do not have definitive right and wrong answers, Furthermore, the problems are encountered in a new environment. EWEE is a setting where students can critically engage in complex problems that are context relevant and in a structure that is supported by an instructor. Additionally, EWEE experiences provide students with the opportunity to engage in real and meaningful challenges. As the critical components of the ideal environment for creative thinking and

ill-structured thought development exist in these Extended Wilderness Education Experiences, exposure to them during the emerging adult years could significantly impact the aptitude of these young adults to solve ill-structured problems.

Educational experiences that are themselves framed as ill structured, such as wilderness education programs, are needed to teach individuals to become ill-structured thinkers. This cognitive transition from well-structured thinking to ill-structured thinking is a process that is biologically primed, though not necessarily biologically imperative (Labouvie-Vief, 2006). The setting and stimulations in which individuals participate will critically determine their ability to achieve these mature thought structures (Labouvie-Vief, 2006). To achieve the ability to solve ill-structured problems, students need to be exposed to an immediately relevant environment that encourages the practice of solving actual problems (Bransford, 1993; Murgatroyd, 2010), a change in cognitive equilibration (Piaget, 1952), and a supportive and collaborative peer-learning environment (Azmitia, 1992; Fleming & Alexander, 2001; Johnson, 2006).

Limits

The educational environment is the dominant factor driving the cognitive changes discussed above, but maturation plays a part as well. We know from studies in cognitive development that there are critical periods for the development of certain types of cognitive processes (Bjorklund, 2006). Additionally, the neurological centers used in this type of problem solving are in the neuron pruning process during the emerging adult stage (Blakemore & Choudhury, 2006; Casey, Giedd, & Thomas, 2000; Nelson, de Haan, & Thomas, 2006). As life itself is ill structured, these cognitive changes could be more a

function of engagement in everyday experiences and biological maturation, rather than a function of any specific educational context or experience.

Therefore, the primary aim of this study is to compare the development of ill-structured problem solving skills in emerging adult students over the course of an Extended Wilderness Education Experience to that of emerging adults enrolled in a more traditional classroom setting.

CHAPTER 2

REVIEW OF LITERATURE

The world is becoming increasingly diverse, and thus calls for more creative and complex thinkers. Those students on the cusp of adulthood will need to develop the ability to engage in this more dynamic style of thinking. As the complexity of society increases, the types of problems that students will face after their schooling experience will become more complex, resulting in a higher demand for proficient thinkers (Noykes, Schunn, & Chi, 2010) as well as creative thinkers (Sternberg & Lubart, 1996). It is estimated that the speed of current discovery of information is such that the quantity of available information doubles every 10-18 months (Murgatroyd, 2010), which makes it imperative that emerging adults learn not only to recall information from schooling experiences, but also to continually incorporate new ideas into what they already know. As it becomes increasingly difficult to define the future, the demand for creative and adaptive thinkers will only grow (Bruner, 1962). Additionally, some theorists (i.e., Romer, 1994) believe that our future economy will be driven by creative and innovative products and solutions that respond to critical societal needs.

Developing the skills to successfully solve ill-structured problems in real-world contexts is critical to emerging-adult students. Therefore, this literature review will discuss the characteristics of the emerging adults and the relevant learning theories for

this population. Next, this review will discuss the nature of ill-structured problems, what makes them unique, and what skills are leveraged in solving them. Finally, this review will highlight the types of learning experiences that might best afford opportunities for emerging adults to develop these skills.

Emerging Adult Development

As the social world has changed, so too have the expectations that society puts on students as they move from adolescent years into adult years (Kenston, 1970). In this changing process, distinct characteristics define the adolescent and the young adult. This life stage (which is typically between the ages of 18 and 29) is observed in contemporary industrialized cultures where the gap between adolescent and adult has broadened (Tanner, Arnett, & Lies, 2006). Characteristics of emerging adults are commonly recognized as (a) exploration of identity, (b) instability, (c) self-focused, (d) transitory, and (e) wrestling with seemingly endless possibilities (Tanner, Arnett, & Leis, 2008). Overall, these emerging adults have high aspirations for their lives (as this is the "age of possibility"), but few of them have the frameworks necessary to execute these aspirations or opportunities (Arnett, 2007).

During the emerging adult years students will develop along two main vectors: their psychosocial identity (Chickering, 1969; Erikson, 1959/1980; Marcia, 1966) and their cognitive structures (Piaget, 1952; Perry, 1999; Kohlberg, 1976; Gilligan, 1993). During this phase of development, emerging adults are are prepared to make the transition from concrete operations to formal operations as (Piaget, 1952) this is a point in their life where the brain has gone through a large over production of synapses and is

now pruning down to maintain the most used synaptic connections (Blakemore & Choudhury, 2006; Nelson, C.A., de Haan, M., & Thomas, K.M., 2006). Individuals who have achieved Piaget's formal operations stage are able to make and test hypotheses, understand that possibility dominates reality, introspect about their own thinking, and think abstractly (Bjorklund, 2005). While Piagetian theory (as well as other like stage theories) add much to the discussion about cognitive development, it has had some challenges over the years. Newer research has started to question whether Piaget's stages really assess an individual's competence, or if it simply assesses their performance (Bjorklund, 2005). Recent studies also show that Piaget underestimated the amount of mental power children have and overestimated the logical power of adults (Bjorklund, 2005). While his stages have been called into question as to whether or not they are still relevant, there is still strong argument that his processes are still very applicable to a modern understanding of cognitive development (Morra, Gobbo, Marini & Sheese, 2008).

Due to these recent challenges, as well as literature that asserts that differentiating between biological cognitive development and development from social context can be increasingly difficult (Gauvain, 2003), this study uses a more inclusive theory (emerging adult development) that accounts for the social context of the students in this study. Thus, by addressing this population of students through an emerging adult theory lens, it allows for the discussion of the development of both cognitive structures and how sociocultural constructions of the postmodern era may act on them.

The concept of emerging adulthood is culturally bound and is a consequence of cultural and social forces (Arnett, 2007; Tanner, 2008). Emerging adults are primarily

occupied with the recentering process, in which they are moving from a dependence on their parents to a dependence on system commitments (vocations, social networks, etc.) (Arnett, 2006; Tanner, 2009), which can make these years unstable and exploratory (Tanner, 2009). These students are working on mastering skills for agency, self-regulation, and impulse control (Arnett, 2006; Tanner, 2009). This emergent life stage also has distinct cognitive characteristics and learning characteristics. Each of these characteristics will be discussed in turn.

Emerging Adult Cognitive Characteristics

Emerging adulthood is a critical stage for the rapid expansion of complex thought structures (Tanner, Arnett, & Lies, 2008). The cognitive structures and intellectual milestones that an individual will need for solving problems in a complex-oriented society are developed during the critical stage of emerging adulthood (Arnett, 2007). Thus, emerging adults are well positioned during a time of life where they are ready to learn these skills. Three of the critical components that characterize their cognitive characteristics are openness to transitional constructions of knowledge, intellectual development, and the maturation of the frontal cortex, which is leveraged heavily in the decision making and judgment thought processes.

Transitional Constructions of Knowledge

As individuals leave adolescence, they encounter a period where their knowledge becomes disequilibrated (Labouvie-Vief, 2006). This disequilibrium not only moves the bottom out from under individuals regarding what they know to be true, but will also

change their models of how they perceive rationality (Kegan, 1982; Perry, 1999). Some emerging adults realize external authority figures do not have all the answers and thus in their college experience move away from "absolute" thinking. Baxter Magolda (2002) states that the transition to higher levels of knowledge construction is partly a process of emerging adults establishing a sense of self-authorship, where they have the ability to identify and construct knowledge for themselves. Also, Perry (1999) articulates that as these young adults develop their views on absolutes, authority of knowledge becomes increasingly more complex and diverse.

Intellectual Development

William G. Perry's (1970, 1999) work is considered one of the cornerstone studies in collegiate student intellectual development. Building on the theories of Piaget and Kohlberg, he addresses the adolescent to adult transition. Perry's (1970, 1999) theory is based on the schemes that college students use to view the world and a set of positions that define a specific intellectual milestone that has been achieved by any given student. Perry (1999) identifies three major positions that are related to the intellectual development of college-aged students. The beginning position is dualism. Students in this position approach problems with the perspective that they are seeking out a single answer to the problem, and they will rely on an instructor to either affirm or deny an answer's correctness. Next is the multiplicity position, in which students gain the ability to recognize more nuanced and creative solutions. Students will also become more receptive to potential solutions that come from nonauthority sources (such as other students). Finally, in the relativism position, students have the ability to recognize that some

solutions to a problem might be more right or wrong than others. In this position students are able to recognize that values embedded in the solutions they are sourcing might contribute to the quality of the solution.

Frontal Cortex Development

Arnett (2006) borrows from cognitive science and brings to the conversation the proposition that the emerging adult brain does not yet have a fully developed center for reason and decision-making. Neurobiologists have discovered that this region of the brain becomes fully mature around age 25, but up until this point the grey matter is still being developed (Labouvie-Vief, 2006). Thus, the average emerging adult has fewer, but faster, connections when it comes to making decisions involving reasoning and judgment. There is evidence of brain reorganization in this region that is associated with rational decision-making (Tanner, 2009). Most people also experience a peak in creative potential in their early 20s (Kaufman, Kaufman, & Lichtenberger, 2011). This development of the frontal cortex is often facilitated through a caring and encouraging environment, with trusted others, and supportive mentors (Johnson, 2006).

Emerging Adult Learning Characteristics

Adult learning theorists argue that Piaget's (1977) formal operations insufficiently account for additional levels of learning (Commons, Ricards, & Armon, 1984). Thus we look to other sources to understand emerging adult learning and epistemological development. Perry's model addresses college-age learning as well (Evans, Forney, Guido, Patton & Renn, 2010), and has been shown to reflect the critical elements of

education and student approaches to learning in the postmodern era (Moore, 2002). Perry (1999) does not necessarily make assumptions about how long a student will or should remain in any one position but, rather, defines a progression of positions and cognitive characteristics of those milestones. Perry articulates that change occurs between positions, and this change (or growth) is encouraged and supported by both academic and social environments. The reflective judgment model, developed by Kitchener and King (1990), also addresses how knowledge is acquired and contextualized for emerging adult learners.

Additionally, authors in the field of adult education (Knowles, Holton, & Swanson, 1998; Mezirow, 1995; Thompson, 2009) agree that adult learners need their educational experience to have context. These authors agree that adult learning is most nurtured when adults learn through a given context that is both student-centered and life-centered. For these mature cognitive structures to be achieved, individuals will rely heavily on context. Therefore, the type of learning experiences that students engage in do have the capacity to impact their ability to develop mature thought structures, and thus a discussion about how learning experiences help or hinder the formation of these mature thought structures is warranted.

Learning Experiences

The presentation of problem solving in traditional classrooms is more characteristic of dualistic rather than relativistic situations and solutions. This presentation of learning is most likely an artifact of the need to quantify knowledge in such a way to measure and meet standards of the schooling system (Litkey, 2004). Most

educational models in the Western world are based on classrooms that are structured in this way (Wurdinger, 2005). It is within this "well-structured" framework that most reviews of the cognitive developmental models are situated (Kitchener, 1990). To some extent, emerging adult individuals still think in a way that is conducive to black and white answers, and their cognitive capacities are such that a heavy reliance on these formalized learning structures and sources can be very helpful (Kitchener & King, 1990; Perry, 1999). However, as the cognitive capacities of individuals change, so do the nature and structure of the types of problems that they need to solve. The concept of learning as a memorization of facts and ideas can be effective at lower levels of thinking, but such learning is fundamentally incompatible with more mature thought structures (Newell, 2003) as well as with changing environments.

The Need for Ill-Structured Problem-Solving Skills

In summary, as emerging adults come out of the recentering process and enter into adult roles, they confront a dynamic world that demands complex and creative thinking skills. They will need to go through a process of reconstructing what they know of as certain and secure to ideas that are more complex and abstract (Kegan, 1982). Additionally, emerging adults who are able to achieve these more mature thought structures will be less likely to be swayed by emotional reactions to decisions, are less likely to have emotionally distorted views of the world around them, and are more likely to think in a way that is not self-serving or self-protective (Labouvie-Veif, 2006). During this phase, in general, individuals develop the ability to systematically orient their views in a way that is beyond the conventional (Labouvie-Vief, 2006).

Students who can learn these skills will be better positioned to work in a dynamic economy with complex problems. The emerging adult mind is focusing on applying acquired intellectual skills to diverse problem-solving scenarios that are relevant (Tanner, Arnett, & Lies). Emerging adults are committing to a social view of the world, but they are also developing the ability to recognize that knowledge may be diverse. This realization in students will lead to a tolerance for contradictions, a respect for diversity, and an acceptance of ambiguity (Arnett & Tanner, 2006). These changes will affect students' recognized sources of knowledge and states of knowledge.

However, the few problems that students do encounter as a part of the schooling system are usually well structured in nature (Jonassen, 2000), in contrast to problems in the real world, which are predominantly ill structured. The development of ill-structured problem solving has also been noted to be a critical component of a range of adult human activities including science, art, business, and politics (Nokes, Schunn, & Chi, 2010). As the settings and stimulations that emerging adults experience are critical to their advanced cognitive development (Labouvie-Vief, 2006), providing these experiences to this population is necessary to ensure that through experience they can develop the skills for ill-structured problem solving before the end of this period of growth (Tanner, Arnett, & Lies, 2008).

Ill-Structured Problems

Ill-structured problems possess elements that are unknown or not known with any degree of confidence, multiple solutions or solution paths, and multiple criteria for evaluating solutions. Such problems require learners to make judgments and express

personal opinions or beliefs. This section will discuss the nature of ill-structured problems and how they are defined and differentiated from other problem types. It will also discuss the process that individuals use to solve these kinds of problems. The section then will outline the types of cognitive skills and resources that are leveraged by individuals while working on ill-structured problems. Finally, it will review different approaches to measuring these skills.

Characteristics of Problems

Problems have a few key universal characteristics (Jonassen, 2004). Problems begin with a goal of some kind, an obstacle to that goal, and the use of some strategy to move from the problem to the goal. Therefore, the process of problem solving is overcoming some obstacle (or set of obstacles) to achieve a goal (Davidson & Sternberg, 1998). This process requires intentional action on behalf of the solver as well as planning and an understanding of the problem.

Problem Structuredness

Structuredness is one of the defining characteristics of problem types (Jonassen, 2004). Structuredness refers to how rigid the frameworks are in which the problems are situated. More structured problems will be very well defined and fall within a specific knowledge domain. On the other hand, less structured problems will incorporate knowledge across domains and have parts of the problem that are unknown or potentially unknowable (Jonassen, 2004). Well-structured and ill-structured problems can be considered on a continuum, with many problem types falling between them. For example

logical, algorithmic, and story problems will typically be more well structured in nature, whereas case analysis, design, and dilemma problems are typically ill-structured (Jonassen, 2000).

Characteristics of Ill-Structured Problems

Ill-structured problems are typically seen in everyday circumstances and in real-life decision-making. These problems are rarely presented in classrooms as they are highly conditional and can be time consuming to solve. Ill-structured problems have answers that are context relevant and context dependent (Kitchener & King, 1990). Additionally, these problems will have elements that are unknown or not known with any degree of confidence (Jonassen, 2000/2004) and where the goal states are vaguely defined (Jausovec, 1994). The solving of ill-structured problems requires individuals to be able to recognize and generate multiple novel sources to solutions (Kitchener & King, 1990). They then weigh these potential solutions in terms of the context in which the problem is situated and come up with a new solution. In this problem-solving process there may be many paths to any one of many potential solutions, and individuals will have to use multiple criteria for evaluating the potential solutions and wrestle with a certain amount of uncertainty about the rules, concepts, and principles of the problem (Jonassen, 2000; King & Kitchener, 1983). As individuals work through the problem-solving process with an ill-structured problem, they will have to make judgments and express personal opinions or beliefs to justify their solution (Jonassen, 2000).

Characteristics of Well-Structured Problems

In contrast, well-structured problems have clearly defined boundaries and have clear and well-articulated solutions (Kitchener & King, 1990). These types of problems present all elements of a problem to the learner at the introduction to the problem (Jonassen, 2000). In solving well-structured problems, individuals need to apply only a limited number of regular and well-structured rules and/or principles (that are domain specific). These predetermined structures are organized and predictable (Jonassen, 2000) and therefore require less cognitive complexity from individuals (Kitchener & King, 1990). Well-structured problems are dynamically stable (Jonassen, 2004); they have definitive right and wrong answers that change little over time and context (Kitchener & King, 1990) and have knowable and comprehensible solutions (Jonassen, 2000). Up until the 20th century, most thinking was regarded in this way (rational and certain, with stable outcomes; Labouvie-Vief, 2006). However, successful well-structured problem solving in the classroom does not necessarily guarantee success in being able to solve ill-structured problems in the real world (Choi & Lee, 2008).

Composition of Ill-Structured Problems

An understanding of the composition of ill-structured problems is necessary to in turn understand how individuals go about solving such problems. This section aims to provide an understanding of the surface and core structures that make up problems, and how the structures relate specifically to ill-structured problems as well as other problem types.

Surface versus Core Problem Structures

In any problem type, there are two levels of structure: surface features and core features. The most easily discernible level of problem structure is the surface. These are the problem structures that are first perceived by a problem solver. Surface features are made up of the individual settings and contextual variables in which problems are situated. Conversely, core problem structures are less perceptible, or hidden in the structure of the problem (Chi, 1997). These core structures are made up of the processes, strategies, and methods that can be leveraged toward finding the solution to a problem.

Instructional design for well-structured problems is rooted in information processing theory; whereas ill-structured problems are addressed through constructivism and situated cognition (Jonassen, 2000). Typically, novice problem solvers are unaware of the underlying structure of a problem and will try to solve problems based on surface features only (Gick & Holyoak, 1987). Novice problem solvers will perceive the similarity of problems based on the surface features of the problem, even if the underlying structural features of a problem are distinctly different. This misperception will set these novices up for the negative transfer of problem-solving skills and processes (Gick & Holyoak, 1987) as these problem solvers are more likely to base the category membership of a problem-solving process on the physical or perceptual similarity of a problem space. However, coding problems based on the category membership of the core attributes will allow novice problem solvers to be more successful in the diagnostics of problem spaces and solutions in future problems (Chi, 1997).

Problem Scaffolding

Existing problem schemas are the result of having dealt with similar types of problems and developing those schemas over time (Jonassen, 2000). In the process of scaffolding problems, individuals attempt to integrate incoming information with a known knowledge structure (or schema) from a previous experience (Williams, Huang, & Bargh, 2009). This scaffolding and integration process is the natural and passive way that new concepts and structures are built in the human mind (Williams, Huang, & Bargh, 2009). When features of less understood or more abstract problems are confronted, the individual will attempt to map the new problem onto existing and well-developed frameworks based on the surface features of the problem. If this process is successful, the new information and existing framework will become associated.

However, this process of association by surface features will most often be unsuccessful in the solving of ill-structured problems. For ill-structured problems, the surface features of the problem are considerably less important than understanding the process of manipulating those surface features through some core process. Through exposure to ill-structured problems, individuals can undergo structure training in the scaffolding process for these types of problems (Halpern, 1999). Structure training allows individuals to recognize what particular thinking skills are needed when they are confronted with new and novel contexts (Halpern, 1999). Individuals can be taught to create retrieval cues from the structural aspects of a problem or an argument. This learning process is called structural sensitivity (Hummel & Holyoke, 1997).

For example, most emerging adult students will have to go through the job application and interviewing process as they enter into adult roles and the adult

workforce. Each job that an emerging adult applies for will have moderately to very different skills sets that are being asked for, and as a result, some of the jobs may appear to be quite different from one another on the job announcements. In this job search problem, the surface structure of the problem is made up of all the job, organization, and personal variables that will need to be accounted for in the application process. However, the process itself is fairly similar across all jobs. Emerging adults who can recognize the pattern, or core structure, or all of these application processes (or how those job application process might be similar to the college application process) will be able to predict and prepare for the upcoming questions and interviews, and will therefore be better able to manipulate and understand the novel surface features. The more application processes emerging adults go through, the better they become at interviewing, regardless of the specific job they are applying for.

Ill-Structured Problem-Solving Process

As stated above, the ill-structured problem is fundamentally different from other types of problems, and as a result requires a different set of processes and resources that are leveraged to solve these types of problems. The metacomponents of the successful problem solvers (Sternberg, 1997) can help students to work through the core structure of a problem. This process will be manifested as a manipulation of the varying surface structures to achieve a successful arrival at the problem's goal state. Ill-structured problems are typically solved in a hypothesis-testing framework, where the goals and boundaries of the problem are loosely or not defined (Runco, 1994). The hypothesis approach to problem solving will result in a process that is a continuous digression from

an approximate answer toward a full solution (Runco, 1994). The nature of ill-structured problems and the lack of a clearly defined goal state (Jacovic, 1994) mean that these problems will require a continuous monitoring and redefining process that will result in multiple framings of a problem and solution set that will result in goal state.

Representing the Problem.

The first stage in the problem-solving process is for the person engaged in the problem to articulate the problem space (Jonassen, 1997). This articulation will include developing statements about whether or not a problem actually exists as well as determining the nature and contextual constraints surrounding the problem space. This stage is also known as problem categorization, where solvers see the problem space in terms of previously experienced meaningful patterns (Noykes, Schunn, & Chi, 2010). In working through the surface of the problem space, successful problem solvers will be able to recognize the existence of a problem as well as define the bounds of the problem space (Runco, 1994; Sternberg, 2003). For example, an elementary problem for an emerging adult student might be what to wear the first day of work. The problem space is then made up of all of the options available for what to wear on that critical first day of work.

Second, the solver will need to identify and clarify if any alternative opinions, positions, and perspectives might impact the problem. In this process, the solver will begin to understand the various perspectives and opinions of the problem space (Choi & Lee, 2008; Jonassen, 1997). This process allows solvers to construct a mental representation of the problem and the space in which the the problem is situated (Noykes

et al., 2010) as well as begin to creatively assess the problem and what constraints might be affecting the problem (Guilford, 1967) by asking questions and guessing at what caused the problem. Through the process of constructing the mental representation, successful problem solvers are intentionally allocating resources in such a way that they will be able to efficiently solve the problem (Sternberg, 2003). The key to solving problems is the construction of the problem space. The solver has to determine the type of problem, what the factors are, and how these factors interact before moving forward to developing solution(s) (Jonassen, 2004). In our example, this step of the problem solving process is where our new worker will start to think about all of the factors that will influence her or his decision of what to wear. Our prospective worker is going to have to consider the work environment being entered and what clothing might be considered appropriate or inappropriate, how the weather and seasons might affect the choices, and what resources are available in her or his closet that morning. All of these variables will need to be considered in the decision of what to wear to make the desired first impression.

Developing and Justifying Solutions

After this problem space has been defined, the solver will then begin to generate possible solutions and assess the viability of these alternative solutions. Assessment of potential solutions usually includes the individual generating as many solutions, guesses, and hypotheses as possible (Kim, 2006) and then constructing justifications or arguments for the solutions that express either reasons for accepting or rejecting the solution as something that can realistically be implemented (Jonassen, 1997). This process will also

include an assessment of potential operators (procedures or strategies) that can be used to solve the problem (Noykes et al., 2010). Successful problem solvers will be able to formulate a strategy to solve the problem though this assessment process and determine whether executing that solution will be possible and or successful (Sternberg, 2003). As developing solutions for ill-structured problems often involves the weighing of opinions and deciding between many viable options, this process could as easily be defined as developing "resolutions" as opposed to "solutions." However, the literature in problem solving most often refers to this phase with the term "solutions"; that same terminology has been adapted here. In the "what to wear" problem, our problem solver will next need to start thinking about possible combinations that are available in her or his closet. Maybe our solver will employ the strategy of trying to match colors, or trying to plan something around a favorite shirt. Regardless of the strategy, our solver will start to parse apart the reasonable solutions available from the unreasonable ones based on the resources available.

Monitor and Evaluate Solutions

Next, solvers will implement and monitor the solution. This process will involve an analysis of how the solution should be implemented as well as how that solution will address the problem. This process begins by starting to estimate the consequences that might result from one decision or another. This convergent thinking process is under researched in creative problem solving but critical to the assessment of a quality solution (Cropley, 2006). Additionally, if there are multiple solvers involved in the implementation of the solution, this stage should involve recognition that the solution is

acceptable by most, if not all, involved parties. Finally, because solutions to ill-structured problems are contextual, solvers will continually need to monitor the solution to see if it needs to be adapted to meet changing conditions (Jonassen, 1997; Sternberg, 2003). Solvers will need to adapt to changing conditions and contexts so that the chosen solution remains viable; they need to be able to anticipate outcomes. Once a satisfactory solution has been shown and remains stable during the monitoring process, then this process will be encoded and stored in the memory (Noykes et al., 2010) for retrieval later in a new problem space. For the "what to wear problem," the new employee might find that the choices made either do or do not match the weather outside, and a jacket or an umbrella might be needed as the weather changes. Additionally, if our solver gets invited out for dinner after work, she or he might decide to alter the solution to fit in multiple environments. (A summary of the problem solving stages is found in Table 1.)

Table 1: Ill-Structured Problem-Solving Process

Representing the Problem	1. Articulate the problem space and contextual constraints
	2. Identify and clarify alternative opinions, positions, and perspectives
Developing Solutions	3. Generate possible problem solutions
Make Justifications	4. Assess the viability of alternative solutions by constructing arguments and articulating personal beliefs
	5. Monitor the problem space and solution options (is the problem solvable?)
Monitor and Evaluation Solutions	6. Implement and monitor the solution (will the solution work?)
	7. Be willing to adapt the solution
* Adapted from Choi and Lee (2008) and Jonassen (1997).	

Skills to Solve Ill-Structured Problems

As ill-structured problems result from real life experiences and require the integration of multiple variables in a given context, the solutions generated will require integration across multiple content domains (Jonassen, 2004). One of the most critical skills to solving these types of problems is the ability to understand changing solutions and generate novel solutions (Mayer, 1992). To solve ill-structured problems, individuals need to have cognitive skills that include creative thinking (including both divergent and convergent thinking), tolerance for novelty, and cognitive flexibility.

Creative Thinking

Creative thinking is important to addressing ill-structured problems because it allows individuals to reimagine problems, generate novel solutions, and reconstruct ideas (Kaplan, 1991). Ill-structured problems are concerned with both problem finding and problem solving, and are not considered one-dimensional cognitive activities. Thus, it takes a creative approach to solve problems in a multidimensional problem space. Guilford (1967, in Lubart, 2003) said that true problem solving involves creativity in that it requires people to actively seek and construct new ideas to fit the context posed by the task and problem space. Those who have a greater capacity for creative thinking are able to restructure parts of the problem space so that they can see problems from various perspectives (Chi, 1997) and consider more options (Lubart, 2003). The critical components of creative thinking to the ill-structured problem solving process are divergent and convergent thinking (Cropley, 2006; Runco, 1991), and the most proficient

creative problem solvers can move fluidly between the two elements of creativity (Brophy, 1998).

Divergent thinking. Ill-structured problems are dynamic, and thus, they will often require the production of multiple and varying solutions to the problem (Sternberg, Kaufman, & Pretz, 2002). Divergent thinking is related to an individual's ability to solve ill-structured problems (Mumford et al., 1998) and creative problem solving tasks (Redmond, Mumford, & Teach, 1993), as divergent production thinking allows an individual to generate multiple solutions to problems with no clear single answer (Kaufman, Kaufman, & Lichtenberger, 2011). Divergent production is also referred to as mundane creativity, which underlies the general power of natural intelligence and is involved with the production of novel solutions (Barsalou & Prinz, 1997). An individual's ability to generate many highly creative solutions will directly impact tolerance for and successful resolution of ill-structured problems through increased divergent thinking ability. However, choices between solutions eventually do need to be made, and this is where convergent thinking comes into play (Pluker & Makel, 2010).

Convergent thinking. In ill-structured problems, information needs to be reorganized, restricted, and combined in order for solutions to be generated; this is the convergent thinking process (Mumford et al., 1991). Divergent thinking without a matching convergent process may lead to reckless resolutions and behaviors (Cropley, 2006). Convergent thinking also helps to reduce the strain of addressing difficult problems as it allows individuals the ability to recognize familiar elements in a problem (both on the surface and core structures), avoiding unnecessary risks, and staying within reasonable limits (Cropley, 2006). Additionally, convergent thinking aids with

information trimming, diagnostics, and synthesis of information (Savranski, 2000). Convergent thinking helps individuals find better or best resolutions and manipulate known elements of a problem to get a better grasp on the true nature of the problem through conceptual reapplications, redirection, and redefinitions of relevant information (Sternberg, 1999).

Tolerance for Novelty

The tolerance for novelty is important in ill-structured problem solving because "complacency thrives on harmony" (Rubenstein & Fitchenberg, 1987, p. 25). The nature of ill-structured problems is such that they engage the solver in a thinking process that is disequilibrated. For individuals to engage in the process of working through an ill-structured problem space, they have to be willing and tolerant to work in this disequilibrated frame. Novelty may cause individuals to become disequilibrated; they can either choose to disengage in the process and conclude that the problem cannot be solved or engage in a process of different thinking to account for the novelty (Morra, Gobbo, Marini, & Sheese, 2008). Emerging adult students are wrestling with and entering into a cognitive position where they are beginning to understand that knowledge and solutions to problems may come from many different sources, such as peers, the environment, and other nonauthority sources (Perry, 1999). Again, on the topic of job acquisition, those emerging adult students who are more open to novel applications of their skill sets will have more opportunities for success in the workplace.

Cognitive Flexibility

Also related to the disequilibrated state is an individual's cognitive flexibility. Cognitive flexibility refers to one's ability to hold multiple potential solutions in mind and move between them. This process can put a significant amount of load on the individual's working memory capacity (Jonassen, 2004). One way to reduce this cognitive load is for the individual to have better integrated and more organized schemas related to problem-solving spaces and processes (Jonassen, 2004). To develop or change one's way of thinking on a subject or problem individuals must become disequilibrated, and they will have to be able to move between pieces of information and potential solutions fluidly (Flavell, 1992).

Increased knowledge will allow an individual greater flexibility in processing options (Chi, 1987). Efficient and creative problem solvers are able to shift to more effective processing strategies to be more effective in the problem-solving process and overcome the limits of short-term memory (Nickerson & Adams, 1979). They do this by thinking about potential responses in terms of categories. Cognitive flexibility also seems to preclude an individual's tendency toward functional fixedness (Runco & Chand, 1994).

An individual who has a high capacity for cognitive flexibility understands that sometimes to attain a given goal state it might not be about just digging deeper for a solution, but abandoning that process altogether to go dig elsewhere (Adams, 1979). Emerging adult students who are entering college may have a set idea of what they want to study and what classes they need to get them to graduation by a certain date. However, if one of the critical classes is canceled in the middle of their program, those students

who are cognitively flexible will be able to understand that their goal (graduation) may be achieved through alternate course work. Those students who are functionally fixed will come to the conclusion that they cannot graduate on time without this class.

Studies of Ill-Structured Problem Solving

Ill-structured problem solving is usually studied by asking students to work on a particular type of problem, and then assessing their ability to work through the variety of conditions that are presented to them. Most problem-solving studies focus on well-structured problems. These studies are typically puzzle based (using Raven's progressive matrices, remotes associates tests, towers of Hanoi, etc.) and require students to deduce a single rule to solve the problem (Cropley, 2000). However, ill-structured problems do not have a single rule in the core structure to deduce as a part of the problem-solving process, and thus, the approach to studying ill-structured problems is different from the approach to traditional problems, or well-structured problems.

Researchers who are interested in understanding ill-structured problem-solving development have pursued three main lines of inquiry. One group of researchers has tried to understand these problems from an epistemological perspective. Another group of researchers have looked at ill-structured problems through the lens of creative problem solving. Finally, some researchers have developed ill-structured problem spaces to investigate how students solve ill-structured problems.

Epistemological Studies

Epistemological studies of ill-structured problem solving most frequently are longitudinal. These studies aim to address the bigger picture: constructions of knowledge and how they change over time and context. Multiple instruments have been developed and used in the pursuit of understanding problem solving from this perspective: the Reflective Judgment Instrument (RJI; Kitchener & King, 1990), the Reflection on Current Issues (RCI; Kitchener & King, 1990), and Shommer's Epistemological Questionnaire (SEQ; Shommer-Aikins, 2002).

Epistemological positioning remains a critical component of an individual's ability to solve ill-structured problems (Schraw, Dunkle, & Bendixen, 1995), but epistemological studies tend to be self-report measures with notable challenges. Most of the instruments available have trouble with the reproduction of results (DeBacker et al., 2008), are often under-powered, and pull from small samples where it is difficult to see real changes (Wood & Kardash, 2002). Additionally, Kitchener and King (1994) caution against looking at interventions from this perspective over a shorter period of time as changes in epistemology develop over years rather than over months.

Creativity Studies

Creative thinking and creative problem solving are most often measured with the Torrance Tests of Creative Thinking (TTCT; Kaufman, Kaufman, & Lichtenberger, 2011; Kaufman, Plucker, & Baer, 2008, Torrance, 1974,2008). Torrance defines creativity as a process of becoming increasingly sensitive to problems, gaps, and deficiencies in knowledge, missing elements, and disharmonies (Kim, 2006). The TTCT

measures individual responses in terms of their fluency, uniqueness, and originality (Cropley, 2000; Hebert et al., 2002; Kaufman et al., 2008). The TTCT has been used in the majority of creativity studies and is the longest running continually published creativity test (Kaufman et al., 2008). Other studies have used the Wecshsler Abbreviated Scale of Intelligence (WASI; Wecshsler, 1999) to understand the interface of intelligence and divergent production (Vartanian, Martindale, & Matthews, 2009). The biggest weakness with the creativity approach to ill-structured problem solving is its focus on divergent solution production rather than converging on an acceptable solution.

Dynamic Problem Spaces Studies

Some researchers in ill-structured problem solving have attempted to define the dynamic types of problem spaces that are involved in measuring ill-structured problems. The instruments they have developed try to leverage as many of the critical ill-structured problem solving skills as possible. The two most robust of these instruments are the Interactive Multi-Media Exercise (IMMEX) program and the Lectical Decision Making Assessment (LDMA).

IMMEX. One of the more comprehensive of these instruments is the Interactive Multi-Media Exercise (IMMEX). IMMEX is a problem-solving and assessment software program that serves as a shell or structure for dynamic problems (Stevens, 1991; Stevens, Johnson, & Soller, 2005). The IMMEX software then serves as the structure on which a specific problem is built and measures the core structure of how the problem is solved. The output for IMMEX problems is represented in a visual map to show how an individual moves through a problem space, and what types of information individuals are

leveraging as they move through this problem space (Stevens, 1991; Stevens & Palacio-Cayetano, 2003). Researchers can then begin to observe patterns of the problem-solving process. Other researchers have built similar structures to evaluate ill-structured problems and individual's solutions, including construction of moderately ill-structured online environments (i.e., Antonenko, Ogilvie, & Niederhauser, 2011; Baker & O'Neil, 2002). However, whereas IMMEX does allow for freedom of choice in navigating the problem space, it does not allow for researchers to measure the divergent thinking that individuals have to engage in when solving ill-structured problems.

LDMA. The Lectical Decision Making Assessment is a part of the Developmental Testing Systems suite of instruments designed on the Lectical scoring system (Dawson, 2002; Dawson & Heikkinen, 2009). The goal of the LDMA is to measure the core problem-solving process that an individual uses when presented with an ill-structured problem (Dawson & Heikkinen, 2009). The LDMA is comprised of seven subscales that aim to measure independent areas of an individual's problem-solving process. The LDMA has potential as an instrument, but it is relatively new to the literature, and is cost prohibitive for most researchers.

Scenario-Based Studies

Similar to the other two instruments above, scenario-based studies provide participants with an ill-structured problem to work on, and then evaluate their ability to work through the problem. What makes these studies unique is that they are typically situated within a relative content domain within which the participants have some level of knowledge (as opposed to the LDMA and IMEX, which are typically domain-free, or

generalist problems). These studies also provide supporting materials, some of which are relevant, and some of which are not, for participants to work with as they make their way through the problems. Outputs from these studies vary from asking participants to create storyboards (Bixler, 2007) to asking them to generate a solution report (Chen, 2010). These studies evaluate an individual's ability to analyze the problem space, develop relevant solutions, make justifications for those solutions, and monitor and evaluate the proposed solutions (Bixler, 2007; Chen, 2010). Scenarios that are based on real-life experiences are best used for this type of study because researchers are able to measure how individuals work through a problem space and arrive at a solution. Also, breaking down participant responses into the major stages of problem solving researchers can identify which stages of the ill-structured problem solving process the participants can understand and which stages are missing or lacking full presentation.

Learning to Solve Ill-Structured Problems

As stated previously, the transition to more mature thought structures is possible, but the transition is not a given biological imperative for all individuals. Only some individuals will have the right combination of contexts and stimulations to allow them to achieve these mature learning constructions (Labouvie-Vief, 2006). Some of the settings and stimulations that are critical to the development of creative problem-solving skills that will enable individuals to work with ill-structured problems are (a) an immediately relevant environment that encourages the practice of solving actual problems (Bransford, 2003), (b) a change in cognitive equilibration (Piaget, 1952), and (c) a supportive and

collaborative learning environment (Azmitia, 1992; Fleming & Alexander, 2001; Johnson, 2006).

Immediately Relevant Environments

Tangible environments are made up of immediately applicable experiences that are bound up in real consequences. The immediacy of these experiences aids in the motivation of individuals to engage in the problem solving process as well as to seek solutions. This motivation is highly related to creative problem solving (Lubart & Mourchiroud, 2003) and is encouraged by the presence of immediately relevant problems that have immediately relevant consequences. Most research shows that intrinsic motivation is positively associated with creative performance and that intrinsic (perceived relevance) and extrinsic (consequences) motivators may work together to facilitate progress on problems (Amabile, 1996, 1997).

Immediate experience. John Dewey (1938) argued that learning from direct experience is one of the best ways to learn. Additionally, Alfred North Whitehead (1929) recognized and wrote about the concept that individuals will remember the knowledge that they can use. An educational environment that can close the gap between the problem and the contextual application or solution of that problem will increase the amount of learning that comes from that experience. In these experiences real-life learning and application are directly related to one another. This idea is furthered supported and expanded with an understanding of the experiential learning cycle (Kolb, 1984). A complete experiential learning cycle includes direct experience, reflective observation, abstract conceptualization, and active experimentation, which lead to

another direct experience (Kolb, 1984). This fluidity in the cycle enables individuals to build stronger and clearer connections between the direct experience and the learning that results from this process. Learning happens best by incorporating experience and reflection (Gookin & Leach, 2009).

When a real-life context can be directly and immediately applied to learning, emerging adults are shown to learn content and processes more fully (Gauvain, 2003; Mezirow, 1995). Also, research has shown that given a choice between directions and examples, individuals prefer to learn and solve problems using examples (Chi et al., 1989). These immediate experiences, in combination with a supportive and positive mentor, have been shown to promote changes in the neural networks that are leveraged in complex problem solving that requires creative solutions (Johnson, 2006). Additionally, Kozbelt, Beghetto, and Runco (2010) demonstrated that permissive environments encourage play and exploration, which can increase creative output. Furthermore, individuals need the time and opportunity to develop creative thinking skills (Soriano de Alencar, 2001). The teaching of creative and diverse thinking skills requires the use of authentic learning experiences as the core activity (rather than teaching, which is subject based; Murgatroyd, 2010).

Real consequences. Whether a solution to an ill-structured problem works or does not work is only part of the process. There is no option to just walk away from the problem without some kind of consequence (positive or negative). The consequences and the problem are bound together in the experience (Choi & Lee, 2008). As a result of the real consequences present in tangible environments, small amounts of anxiety are part of the problem-solving process. This potential confrontation with negative consequences in

a problem-solving process can help spark new and innovative solutions to problems (Armstrong & Sakofs, 1996) and the moderate amount of risk can serve as a useful teaching tool (Hunt, 1999). Also, studies show that stimuli-rich environments or contact with diversity promotes creative thinking (Lubart & Mouchiroud, 2003), and individuals who are willing to take risks in problem solving and confront consequences are better creative problem solvers (Sternberg & Lubart, 1995). Additionally, individuals perceive greater development benefits when then feel that they have an active role in the decision-making process and have responsibility for decisions (Fullerton, 1999).

Change in Cognitive Equilibration

Once individuals are exposed to relevant environments, they are challenged to think about problems in new ways. Such exposure encourages flexibility and creativity in thinking through solutions. Individuals, when faced with a problem, will initially leverage the problem-solving strategies they have used successfully in the past. These mental representations of the problem will allow individuals to try applying known processes to the problem (Davidson & Sternberg, 1998). However, confrontations with novel problems, which have conditional solutions, may drive individuals to think in new and creative ways about problem-solving strategies and solutions. Learning to think beyond the conventional views of problems or challenges can increase creative thinking skills towards problems (Dawson, 2002).

Novel environments. When individuals encounter new environments, they are put into positions where they cannot immediately rely on old methods of problem solving, but must generate new ideas toward the resolution of new problems. This process can be

considered an expression of Piaget's (1952) disequilibrated mind that both encourages and supports the development of complex cognitive structures. When individuals are confronted with new and novel situations, they are forced to adapt the structures that they do have for problem solving to meet the new conditions (Fiez & Schunn, 2010). As a result, growth occurs from the challenges posed by new environments (Hunt, 1999).

The novelty of a new environment necessitates that individuals generate new paths to being successful in that environment. The number of old patterns that individuals could rely on to solve problems becomes very limited in the problem-solving space. Individuals who have adapted to having access to unlimited resources around them to seek answers find themselves in an environment where they have to generate solutions of their own. This solution-generating process helps individuals develop the advanced cognitive processes associated with problem solving (Fiez & Schunn, 2010) and through producing new and appropriate solutions to novel problems they can increase their problem-solving creativity (Barron, 1988; Ochse, 1990).

Conditional solutions. As discussed, most of the problem-solving strategies to which individuals are exposed are well structured in nature. Thus, they are adapted to seeking out a single solution to a single set of criteria. However, to solve ill-structured problems, emerging adults need to understand that solutions for these types of problems are dependent on the problem space, which in all likelihood is dynamic, thus causing the potential solution to be fluid as the problem space changes.

For individuals to achieve the higher order and problem-solving skills needed to solve ill-structured problems and generate novel and iterative solutions, they need to make progress toward self-authorship (Baxter Magolda, 2001). The catalysts for self-

authorship include individuals making decisions where there is no preordained formula for success, realizing that they are sufficiently unsatisfied with their situation and starting to make changes, and then figuring out which changes should be made and making those changes on their own (Baxter Magolda, 2001). Colleges and universities too readily give students formulas for success so that the students are not able to develop self-authored ways of knowing (Pizzolato, 2003).

By changing the environment in which students solve problems, they will realize that old habits of strictly memorizing solution patterns and executing them under controlled conditions will not be successful (Sternberg, 2011). In familiar settings, students can use additive thinking strategies that will lead to a linear solution through a simple recall of information and processes that have worked in the past. However, students who are forced to engage in processing new problems in new conditions will be challenged to restructure problems and solutions in a way that is generative rather than additive (Lubart & Mouchiroud, 2003). In new settings, most of the knowledge constructed is taken on by the learner and not forced upon them by the teacher (Lindsay & Ewert, 1999) because the learning process is driven by problems that need to be solved, instead of being driven by theory or previously assimilated information (Wurdinger, 2005). Students are actively encouraged to adapt their thinking to meet with not only the new environment, but also the changing contexts and conditions in the problem, by using quality and dynamic decision-making styles (Gookin & Leach, 2009). Additionally, when individuals are engaged in problems where they have to hold many conditions and options in mind, working memory capacity of students can be enhanced (Fiez & Schunn, 2010).

Supportive and Collaborative Learning Environments

Through collaboration, individuals come to understand that they are not the only stakeholders in a problem and are not the only individuals impacted by the solution. Through the process of coming to understand another's perspective, individuals exercise their imaginative capacities and thus begin to understand alternative events and perspectives that may be independent of our actual experiences (Kaplan, 1991). Also, by working in collaboration on problems, individuals can aid one another in both convergent and divergent thinking processes, as most individuals struggle with moving between these two phases of creative thought (Brophy, 1998). The ability to move through multiple cycles of both convergent and divergent thinking processes aids in the development of creative thinking in ill-structured problems (Mumford et al., 1991).

Such collaborative problem solving has been shown to increase both the motivation of individuals (Johnson & Johnson, 1987) and the acceptance of peers as sources of knowledge and generators of solutions (Kitchener & King, 1990; Perry, 1999). These social learning environments can expose individuals to new ways of thinking and help them gain an understanding of competing views of a problem (Kuhn, 2001). Also, collaborative learning environments provide individuals with the practice of justifying or "selling" their ideas to their peers. This expression and justification of novel solutions is supported by creative intelligence (Sternberg & Lubart, 1995). Other research shows that individual's peer groups are one of the strongest single influences on cognitive development (Foubert & Grainger, 2006) and that problem-solving skills are increased when individuals collaborate with peers (Azmitia, 1992; Fleming & Alexander, 2001).

Additionally, instructors support problem solving by sharing their experiences, providing guidance where it is needed, and allowing students the space to work through problems. Both freedom and support are important for creative thinking to flourish (Barron, 1997; Soriano de Anencar, 2001). Research shows that when instructors validate a learning experience it increases the learner's capacity to know (Baxter Magolda, 1996). If instructors create a safe and supportive classroom environment for learners, then students are more likely to achieve higher order thinking structures (Johnson, 2006; Labouvie-Vief, 2006). Emerging adults learn best from those individuals who can make them feel safe and alleviate fear (Johnson, 2006), while simultaneously stimulating their ability to address ill-structured problems (Kitchener & King, 1990) in relevant contexts (Mezirow, 1995).

The Role of the Extended Wilderness Education Experience

The Extended Wilderness Education Experience (EWEE) provides experiences and scenarios similar to those described in the literature for developing skills for solving ill-structured problems. The EWEE is defined as an expedition environment where student learning, across a variety of outcomes, is the primary goal (Gookin & Leech, 2009). These experiences use novel environments to produce a variety of different experiences and stimuli for students to learn from and solve problems within. More specifically, the EWEE provides a place for students to critically engage in complex problems that are context relevant and in a structure that is supported by an instructor. This setting allows students to wrestle with more than course content, but also group dynamics, objective and subjective hazards, and the task of living in a novel environment

(Ewert & McAvoy, 2000; Hattie, Marsh, Neil, & Richards, 1997; Walsh & Golins, 1976). All of the above-mentioned factors that increase an emerging adult's creative capacity toward problem solving, and thus their ability to solve ill-structured problems, are present in the wilderness educational setting. A few examples are outlined below.

Immediately Relevant Environments

In the EWEE, students are positioned in an environment where the active learning of problem-solving techniques and the practice of problem solving are placed as close together as possible (Gookin & Leach, 2009). These conditions allow students to put into immediate practice what they have learned through (either direct or indirect) instructional approaches. Students accumulate and construct knowledge not just by retaining and regurgitating it, but by practicing it and applying it to solving problems (Armstrong & Sakofs, 1996). Through this active process, students are given the personal responsibility to change their processes and solutions should the physical elements of the course necessitate a change. The problem-solving process itself is then richer and growth promoting. Students who have previously participated in wilderness education experiences report these experiences as being a significant catalyst to the development of their ability to function under difficult or challenging circumstances (Sibthorp, Furman, Paisley, & Gookin, 2008).

Additionally, instructors in experiential and EWEE encourage the practice of evaluating positive and negative consequences as a part of the larger group process (Gookin & Leach, 2009). If learners (both individual and group) have control of the learning experience, then they will have a sense of ownership in the process and in the

gained knowledge and skill. This sense of ownership has been shown to heighten content retention and the learning curve of individual students (Arthur-Banning & Sibthorp, 2004), which may include the learning of skills to solve ill-structured problems.

Change in Cognitive Equilibration

As students work through problems in an EWEE, they will be faced with solutions that are conditional to the environment. In the EWEE, students are regularly exposed to physical environments that are new and novel to them. An EWEE actively encourages students to challenge their assumptions and question the norms they bring to a program (Gookin & Leach, 2009). The practice of novel problem participation in EWEE has documented benefits for students in ways that support problem-solving development. Students who spend time in EWEE can build better perceptions of their own limitations and gain skill in breaking down problems (Herdman, 1994), and through this process they can achieve greater success in this problem solving (McKenzie, 2003). Just "Googling" an answer is not an option in the wilderness problem-solving environment. Students in these environments are forced to use the resources at hand (Miles, 1999), and to work through a problem-solving process, instead of skipping ahead to an answer generated from an external source.

In EWEE, problems become highly conditional. Consider a navigational problem where students have to get from one lake to another for a new camp. On the day before, students were able to navigate by sight to the next location through an open field by using a river to the south as a guiding landmark. However, today those same students are in a thick forest, and navigation by sight is not possible. The distance, elevation change, and

group have all stayed the same, but the surrounding conditions have changed, and as a result simply repeating yesterday's successful strategy will not be successful today.

Collaborative and Supportive Learning Environments

In an EWEE, students do few tasks alone and the problems, solutions, and consequences (both negative and positive) are shared by the group members. The nature of a traveling group in the wilderness necessitates that all group members work together toward common goals. To build a collaborative experience, instructors in an EWEE encourage students to use one another as resources in solving problems (Gookin & Leach, 2009). Wilderness education instructors intentionally program the experience so that learning happens naturally and safely (Gookin & Leach, 2009).

This adventure education setting also provides an experience where the students and instructors live and travel together. Living with teachers and coursemates, while also learning, is a unique classroom experience with its own challenges and advantages unique to this environment. In these settings, students have to wrestle with what a problem and solution will look like not only for themselves, but also for those around them. Students in these settings wrestle with interpersonal relationships (expedition behavior), tolerance for diversity and adversity, and overcoming obstacles as a unit.

Other Influential Factors

The factors listed above are the major influences for the development of skills needed to creatively solve ill-structured problems, but there are other variables at play as well. Primarily, for emerging adults to benefit from educational interventions, they must

be cognitively mature enough to understand varying solutions (i.e., there might be multiple solutions to problems and those solutions may come from multiple sources; (Perry, 1999). Students who have not yet achieved this level of epistemological understanding of solution sourcing may not be in a position to be influenced by educational interventions. This epistemological development is highly related to education level (King & Kitchener, 2002) and age.

Ill-Structured Problem-Solving Support in Wilderness Education Curricula

An analysis of the leadership and decision-making curriculum of an EWEE reveals curricular components that support and encourage the stages of ill-structured problem solving. Among the many types and forms of EWEEs, one of the largest schools that use this teaching mechanism is the National Outdoor Leadership School (NOLS). NOLS's robust curriculum base and longstanding position in this field makes them one of the leaders in developing and providing these experiences to many students, including the emerging adult population.

The EWEEs focus on real-world problems and acknowledge that working with these unpredictable and changeable problems is beneficial for students. Additionally, they teach the evaluation of hazards and risks that are inherent to a problem before trying to solve it and to set goals for resolution (Gookin & Leach, 2009; Martin et al., 2006). These two concepts support the primary step of solving ill-structured problems, which is to evaluate the problem space (Choi & Lee, 2008) and to identify constraints and opportunities within the problem. The NOLS analytic decision making model emphasizes

the importance of defining the problem, before trying to solve it (Flach, 1997; Gookin & Leach, 2009). A comparison of problem solving paradigms can be found in Table 2. The NOLS curriculum is one example of curricular design that supports ill-structured problem-solving skill development, and many other EWEEs use similar curricular components as these are considered some of the best practices in wilderness and experiential education. The NOLS decision-making model teaches students to gather information. The model encourages the finding of facts and highlights points that could use additional clarification. Wilderness education curriculum emphasizes that students

Table 2: Comparison of Problem-Solving Paradigms

Ill-Structured Problem Solving Process[1]	Scoring Framework for Problem Solving Scenarios[2]	NOLS Analytic Decision Making Model[3]	NOLS Creative Problem Solving: Brainstorming Curriculum[4]
1. Articulate problem space and constraints	1.1 Define the problem	Define the problem	2. Define problem
	1.2 Generate subgoals	Identify goals	
2. Identify and clarify alternative options, positions, perspectives, and stakeholders	1.3 Identify relevant information	Gather information	1. Find facts
	1.4 Seek needed information		4. Identify points for clarification
3. Generate possible solutions	2.0 Develop solutions	Identify alternatives	3. Generate ideas
4. Choose appropriate solutions and rationales	3.0 Make justifications	Compare alternatives	5. Sort like ideas 6. Find solutions (discuss pros and cons of solution)
5. Implement and evaluate solutions	4.0 Monitor and evaluate the problem space	Implement decision	7. Choose solution 8. Test solution

1. Adapted from Choi and Lee (2008); Jonassen (1997); 2. Ge (2001); Bixler (2007); Chen, (2010); 3. Gookin and Leach (2009); 4. Flach (1997) LEN, p. 68

should make decisions based on criteria, not rules (Gookin & Leach, 2009), and thus this "data gathering" phase is critical in the EWEE as well as in solving ill-structured problems, including teaching students to challenge assumptions and norms as well as working collaboratively to gather information about the problem.

Additionally, the decision-making models used in EWEE encourages students to seek out novel solutions to problems through creative and cooperative solution sourcing within the peer group. More specifically, the NOLS curriculum emphasizes there may be many plausible solutions to any given problem, and thus encourages students to employ critical thinking skills as they evaluate the merits and pitfalls of any solution. The curriculum strongly emphasizes the use of judgment instead of reliance on authority figures or existing rules. As students compare solutions, they are taught to think about the potential consequences of any decision or solution, and how those consequences might affect the larger problem they are facing. The curriculum also includes teaching communication skills that aid students in developing a position and articulating this position within the peer group as they collaborate. This strong communication curriculum helps students keep others informed as the problem changes, as well as articulate their own needs throughout the process.

Finally, EWEEs teach about the importance of not just implementing a solution, but monitoring it as well. Many times in educational contexts, solutions are articulated, but never executed, so students do not have the opportunity to receive feedback on the overall problem-solving process or the viability of the solution. Additionally, the situational leadership curriculum (Gookin & Leach, 2009) often taught in wilderness settings teaches students that as conditions change, solutions many need to be adapted

over time. Thus, solving the problem is not the final step, but rather the ongoing monitoring of the implementation serves as an evolving final stage. The EWEE views feedback as a critical component in the learning process, and this applies to the learning of problem solving skills as well. More concretely, EWEE focuses on teaching students to give feedback that is both timely and specific, allowing them to critically monitor and reflect upon their problem-solving processes. Most EWEE curriculum reinforces in each situation with students that there may be no "right" answer, but rather better answers, and that how students implement those answers may matter as much as the solution itself (Gookin & Leach, 2009).

Conclusion

The world is becoming increasingly diverse, and thus calls for more creative and complex thinkers to work in a postmodern economy. However, throughout their school years, most students engage in well-structured classrooms that may not provide the ill-structured experiences needed to cultivate the skills needed to compete in this economy. Students who can learn these skills will be better positioned to work in a dynamic economy with complex problems as well as have higher tolerance for adversity and diversity, and are more likely to think in ways that are less egocentric.

Emerging adults are well positioned in a time of life where they are ready to learn these skills. Many developmental theorists articulate development as biological, social, and environmental (Lewis, 2000). For emerging adults to achieve the thought structures used in resolving ill-structured problems, they must be in a developmental stage in which

they are biologically prepared to be influenced by the right kind of educational environments (Labouvie-Vief, 2006).

The literature in problem-solving theory and constructions of knowledge bases helps clarify the uniqueness of ill-structured problems, and what core resources might be used in the development of problem-solving abilities. Through the identification of divergent thinking, convergent thinking, tolerance for novelty, and cognitive flexibility, how these cognitive skills apply to both problem identification (Mumford et al., 1991; Runco, 1994) and solution production (Ericsson, 1999; Weisberg, 1999, 2006), a strategy for understanding the resources needed by an emerging adult to be successful in solving ill-structured problems can be devised.

Furthermore, Extended Wilderness Education Experiences may provide ideal conditions for the development of ill-structured problem solving due to the nature and characteristics of an EWEE. EWEEs may promote growth in convergent thinking and flexibility through immediately relevant environments where students have immediate experiences that allow them to develop solutions with real consequences. It has been shown that the practice of pragmatic reasoning towards real problems can increase performance on problems that involve conditional reasoning (Lehman, Lempert, & Nisbett, 1988). These classrooms may also promote divergent production of ideas and tolerance for novelty by encouraging a change in cognitive equilibration that encourages students' reasoning development through a process of disequilibration and application of skills brought on by conditional solutions and novel environments. Additionally, EWEEs provide a supportive and collaborative learning environment, which may impact multiple cognitive resources used in ill-structured environments through exposure to new ideas,

processes, and support structures. Thus, this study was designed to see if there was a measurable difference in the development of problem-solving skills based on the two different deliveries of a leadership curriculum: the EWEE and the traditional collegiate classroom.

Hypothesis

Given the preceding literature on ill-structured and creative problem-solving development in emerging adulthood, the following hypothesis (H1) will be tested:

H1: Students will show significant gains in ill-structured problem-solving skills after completion of a wilderness expedition compared to students engaged in a leadership curriculum in a traditional classroom setting. Problem-solving skills are characterized as:

Representing the problem

Developing solutions

Making justifications

Monitoring and evaluating solutions

Identifying problem-solving stages

CHAPTER 3

METHODS

This study explored the effect of extended wilderness education experience on the development of skills for ill-structured problem solving in emerging adult students. Specifically, it compared the development of ill-structured problem-solving skills between National Outdoor Leadership School (NOLS) program participants and students enrolled in leadership-oriented college courses in traditional classroom settings. This chapter is divided into five sections: (a) Setting, (b) Sample, (c) Measurement, (d) Procedures, and (e) Data analysis.

Setting

The EWEE used in this study is the National Outdoor Leadership School (NOLS). NOLS has been in existence since 1965 and has long been one of the leading schools in teaching wilderness leadership and outdoor skills. Additionally, NOLS is ideal for this study as it has a standardized education curriculum across modes of travel and base locations.

The specific program being examined in this study is the NOLS semester program. NOLS operates semester courses year round and at all of their seven base locations. NOLS semesters are between 75 and 90 days in length, and include between 12

and 16 participants who live and travel together for the duration of the semester. NOLS semesters typically have two travel sections that consist of two skill sets (e.g., kayaking and mountaineering; backpacking and climbing; canoeing and backpacking), followed by a section of independent group travel. NOLS semester courses are also similar in college credits and length to an average college semester, allowing adequate dosage and incubation of ill-structured problem-solving process skills. Therefore, NOLS semesters were chosen for this study because they are long enough that students will have sufficient time for the practice of a variety of different problem types and situations to have sufficient opportunity to engage in the practice of problem-solving skills.

Sample

The participants for this study were from two distinct groups of students. The NOLS group of students were engaged Extended Wilderness Education Experiences that were held in domestic locations (Wyoming, Arizona, and Washington). These semesters share some similar technical skill sections (backpacking), as well as similar curriculum. The comparison group of students was enrolled in semester-long leadership courses in the parks and recreation departments at their respective colleges. All participants in this study were exposed to a curriculum that included leadership credit in accredited parks and recreation courses.

The experimental participants for this study were students from NOLS semester courses offered during the 2013 spring semester at the Rocky Mountain and Southwest branches. Different NOLS semester courses may vary in regards to environment, terrain, and mode of travel, but the curricular core remains the same across these courses.

Additionally, instructors on all NOLS semester courses receive the same briefings and are expected to deliver the NOLS core curriculum. Thus, all NOLS semester courses will be considered as similar treatment experiences regardless of the location or mode of travel.

The comparison group of students included college students from two universities (located in Virginia and North Carolina). These students were all enrolled in semester-long leadership courses in the parks and recreation departments at their respective colleges. These courses had similar leadership course objectives, but did not include an extended wilderness field experience. Students enrolled in these courses were between 18 and 24 years old. The comparison courses were taught in a mainly classroom-based style. Both comparison courses provided the students with the opportunity to practice leadership and facilitation skills either within the classroom or within the local community. Both comparison courses listed course objectives that included learning leadership techniques, learning how to apply these techniques to different leadership situations, and facilitating experiences for a variety of groups. This comparison group was selected because the students were of similar ages to the treatment group, and was engaged in similar life experiences. The comparison group of students was not engaged in an extended field experiences, and were not specifically learning problem solving skills for ill-structured problems. Rather, these students were familiar with similar problem contexts (the scenarios are based on college setting) and were learning similar leadership content as the treatment group. Thus, the comparison group was used to control for maturation effects in skill development and was not intended to serve as an "alternative treatment."

Measurement

Measurement for this study involved problem-solving scenarios that were developed for this study based on models from previous studies (Bixler, 2007; Ge, 2001). Coding structures for these scenarios were based on previous work in this area and were consistent with problem-solving stages outlined in the literature. Coding was checked by a second rater to ensure reliability of the coding scheme.

Problem-Solving Scenarios

The capacity of student ill-structured problem-solving skills was measured using a scenario-based, ill-structured problem-solving task. For this study, two scenarios have been developed (see Appendix A: Scenarios). Each of these scenarios presented an ill-structured problem to students, and provided them with four question prompts to answer. The problem-solving packet also contained a series of artifacts for students to use as they worked through the problem. As ill-structured problems are best understood situated in context, these scenarios were developed in a leadership context based on the collegiate student experience to best leverage each student's domain knowledge.

Both scenarios were pilot tested with a group of college-aged students enrolled in a semester-long leadership class to ensure balance between the two scenarios, A and B. In all, 70 students participated in the pilot test with 35 students solving each scenario. During the scoring of the pilot test scenarios, it was determined that Scenario B was more challenging for students to solve and therefore this scenario was given a more concrete timeline and constraints so that it was more parallel with Scenario A. Additionally, after pilot testing it was determined that many students were not articulating the problem

adequately, and so Question 1 (see adjusted language below) was adjusted to directly ask students to articulate what they believed the problem to be.

Each scenario presented students with four questions regarding the problem presented to them:

1. *What are some of the important things to consider in this situation? In one or two paragraphs, explain what they are and why they are important. (In your responses to all questions, feel free to include considerations that go beyond the immediate situation.) What is the problem? Are some of these considerations more important than others?*
2. *What do you think is an appropriate solution to this kind of problem? Please explain why your proposed solution is appropriate and will be effective.*
3. *Is this the best way to solve the problem? Could there be another way to solve this problem? Describe another reasonable response to this kind of situation. Compare the potential risks and benefits of this response with those of your original response.*
4. *You will need to send a letter out to your club soon explaining the state of the club and your plans for this year. In 2-3 paragraphs please outline what process you would recommend for deciding how to respond to this situation. Please describe this decision-making process in general terms—in a way that would allow another person to use the process in a similar workplace situation—and explain why you would recommend each step in this process.*

Scoring the Scenarios

The scoring of the scenarios was done in five major categories: Representing the problem, developing solutions, making justifications, monitoring and evaluating solutions, and identifying problem-solving stages. These categories represent the dependent variables in the study and are listed below.

Representing the problem. The representing the problem section evaluates students' ability to understand the problem space in which the scenario is situated. This section is divided into subsections that include the students' ability to define the problem, generate subgoals, identify relevant information from the problem, and seek any additional information that is needed. The maximum score on this item is 10 points.

Developing solutions. The developing solutions section evaluates students' ability to generate appropriate solutions given the problem presented. This section is divided into two subsections that evaluate students' ability to select a solution with explanations and the quality of those solutions. The maximum score on this item is 8 points.

Making justifications. The making justifications section evaluates students' ability to judge how effective the solution they have generated will be. This section includes evaluation of the students' ability to construct an argument that justifies their solution and the ability to provide evidence that supports the solution. The maximum score on this item is 7 points.

Monitoring and evaluating problem space and solutions. This section evaluates students' ability to evaluate the solutions they have come up with as well as assessing any alternative solutions that could be used in solving the problem presented to them. The maximum score on this item is 7 points.

Problem-solving processes. The final question asks students to give advice to someone else who is presented with the same problem. It evaluates students' ability to articulate their understanding of the ill-structured problem-solving processes. The maximum score on this item is 7 points.

The scenarios were scored based on a scoring rubric developed for this study based on previous work of a similar nature in other content areas (Bixler, 2007; Ge, 2001). These rubrics were applied to students' responses to questions in the problem-solving scenario. For example, one student's response regarding the Making Justifications category was:

> *Change does not occur without widespread support from many different types of people. This is the only way to see true results, by changing the culture. If enough people start to enthusiastically use refillable bottles, others will want to be accepted and will join the trend. Snowball effect occurs and we are successful. The money will only come once the movement gains enough momentum to justify the program to the grant committee. Then you will be able to build some filling stations.*

In this response the scorer first looked to see if the students are able to construct arguments to explain the effectiveness of their solutions. In this example response, the student constructs an argument by stating, "*If enough people start to enthusiastically use refillable bottles, others will want to be accepted and will join the trend.*" Thus, this student is exhibiting logic that articulates why the solution will be effective. This response then was scored 4 out of 4 points for constructing an argument. Furthermore, this response provides some examples that are conceptual or based in imagery to support the justification. This student mentions that he will need additional funds to build water bottle filling stations (a reference to information provided in the artifacts section of the problem) and that he will know he is being effective when others "join the trend." This response would have scored 2 out of 3 points for providing evidence. This student scored

3 full points by providing evidence that had been tested previously (which was provided in the artifacts) or based on his own previous experience. A detailed scoring rubric with descriptions, criteria, scoring, and examples can be found in Appendix B.

Procedures

Participants in this study were divided into two major testing groups. The experimental group consisted of 91 students who were enrolled in NOLS semester courses during spring semester 2013. The comparison group was made up of 65 students who were enrolled in classroom-based leadership courses. Both of these testing groups completed a leadership scenario twice in a quasi-experimental design.

Two leadership scenarios were developed in parallel forms (A and B), so that students are not asked to solve the same problem twice during the study. The order in which students received the two parallel forms was randomly assigned by course. At the beginning of the course, both experimental group and comparison group students took the first leadership scenario as a part of their course experience before they departed for the field. The follow-up scenario was given at the end of the course experience. Students were given 45 minutes to complete all the questions in the scenario. Specific questions were not timed, and students were allowed to answer questions in any order they chose (as consistent with real-life ill-structured problems).

Data Analysis

This study used a repeated measures multivariate analysis of covariance (MANCOVA) to examine the differences in problem-solving performance for each

student over the two testing periods as well as any differences between the 2 testing groups over time. This section discusses scoring, screening, and assumption testing, as well as the primary and secondary analyses of these data. The first independent variable in this study is the leadership curriculum, which was delivered through a semester-long experience that was either part of the Extended Wilderness Education Experience or the traditional classroom experience. The second independent variable for this study was time between tests. Three covariates were included in this study as well as the literature indicates that they are potentially related to these kinds of skills. These covariates include age of participant age, years of schooling (Kitchener & King, 2002), and gender (Strough, Cheng, & Swenson, 2002).

The five dependent variables were the problem-solving processes as characterized above: Representing the problem, developing solutions, making justifications, monitoring and evaluating solutions, and identifying problem solving stages. Each was hypothesized to show greater increases over time for the students engaged in a leadership curriculum in an Extended Wilderness Education Experience compared to the more traditional classroom experience.

CHAPTER 4

RESULTS

This study explored the effect of Extended Wilderness Education Experiences on the development of skills for ill-structured problem solving in emerging adult students. Specifically, it compared the development of ill-structured problem-solving skills between EWEE program participants and students enrolled in leadership-oriented college courses in traditional classroom settings. This chapter shares the results of this study. This chapter includes data processing procedures and results as well as a descriptive analysis, primary analysis, and follow-up analysis (hypothesis testing)

Data Cleaning and Screening

The data were coded and entered into Statistical Package for Social Science (SPSS) 21 for analysis. Data were cleaned and screened for both univariate and multivariate outliers to ensure that all scores fell within plausible ranges. Sample demographics are reported as well as the statistical assumptions that were tested.

Sample Demographics

This study included 194 students in the pretesting group and 167 in the posttesting group. In total, 156 students completed both pretests and posttests and thus were included

in the analysis to ensure consistency of the data across sample times. Box plots and visual inspections of tests were used to check for any univariate or multivariate outliers. Univariate outliers identified in the Box plots were hand checked for accuracy before inclusion in the analysis. Multivariate outliers were checked through an analysis of Mahalhanobis distances and Cook's D. No tests showed signs of outliers or inconsistencies that warranted their deletion. Four students in the EWEE group were below the lower end age (18 years) for the emerging adult population and two students were above the upper end age (30 years) and were considered for removal. However, as this population is not strictly defined by age, and these individuals' scores did not appear to be outliers and were consistent with the other group members, these students were included in the analysis.

After cleaning and screening of tests, 156 students had complete tests and matched pairs pre- and posttest. Of the remaining students, the average age of the sample was 21 (ranging between 16 and 32 years of age), 80 of which are females and 76 of which are males. Participants had an average of 14 years of school. During pretesting, 91 students took pretest A and 65 took pretest B. A fully summary of the demographics is provided in Table 3.

Assumption Testing

Data were tested for assumption violations and for assumptions of multivariate normality by testing the skewness and kurtosis scores of all dependent variables (Field, 2009). Though some of the variables appear to have mathematical violations of normality, all the profile plots of the variables appeared to be within normal range given

Table 3

Study Sample Demographics and Summary Information

	Comparison	EWEE	Full Study
Participants	65	91	156
Age range	19-29 years	16-32 years	16-32 years
Age average	21 years	21 years	21 years
Females	50	30	80
Males	15	61	76
Average years of school	14 years	14 years	14 years
Pretest A	44	47	91
Pretest B	21	44	65

Note: All numbers reported are in raw counts, except where otherwise noted

the nature of the scoring of these tests.

Data were tested for the assumption of linearity through visual analysis of plots and the assumption of homogeneity of covariance using Box's test and Levene's test. Box's M did yield significant results indicating that the covariance matrices of the dependent variables were not different across the levels of the independent variables. However, this test is often overly conservative in larger sample sizes (Tabachnick & Fidell, 2007). Nonetheless, Pillai's statistic was used for the MANCOVA as it is more robust to these types of assumption violations when the two sample sizes are similar or equal (Field, 2009).

In Levene's test, all the dependent variables had significant values with the exception of Developing Solutions (p=.091), which means that representing the problem, making justifications, monitoring and evaluating solutions, and stages tdentification may have violated the assumption of homogeneity of variance. Because there were minor violations of homogeneity of variance, a one-way ANCOVA of each of the dependent variables using Welch's F adjustment (Mayers, 2013) was conducted. This adjustment

verified that the possible assumption violations did not change the conclusions from the primary analyses. Given the interdependent nature of the EWEE courses, there was some concern that the sampling might violate the assumption of independence of observations. To address this concern, null multilevel models were run for each of the dependent variables postcourse where course was the second-level random effect. The course level did not explain a significant ($p > .05$) amount of variance in any of the null models, and thus the independence of observations assumption was satisfied.

Additionally, all dependent variables were found to be significantly correlated ($p<.001$), although the correlations are moderate to small ($R=.27$-$.45$). These low correlations show that the dependent variables are related and should be well suited for a multivariate analysis such as MANCOVA, which assumes correlated dependent variables (Field, 2009).

Interrater Reliability

As most ill-structured problem tests were scored by a single researcher, a random sample of 10% of the tests was independently scored by a second researcher. The percent agreement between the two scorers for the four variables that make up the problem-solving process was 71%, with percent agreements ranging between 62% and 83% depending on the variable. Percent agreement for identification of problem solving processes was considerably lower (30%). All intraclass correlations between the raters' scores were statistically significant and ranged between ICC=.48 and ICC=.93. All problem-solving process items had significant kappa's statistics, indicating that these

agreements are not likely due to chance. However, identification of problem-solving stages did not yield a significant kappa's statistic.

Descriptive Analysis

Problem-solving skills were characterized into four categories: Representing the problem (RP), developing solutions (DS), making justifications (MJ), and monitoring and evaluating solutions (ME). Students were also assessed on how many stages of problem solving they could identify throughout their process (Stages). Means for each of these scores were calculated by adding together all the subcomponents of that respective variable. For example, to get the making justifications score, students' scores on constructing an argument and providing evidence for that argument were summed. (The full lists of the scoring components that make up each score are available in Appendix B on the scoring rubric.) Means for each variable by pretest, posttest, and grand mean are listed in Table 4. The highest scores overall were in the developing solutions (GM=3.89) and Representing the problem (GM = 3.43) variables. Scores were lower for those variables pertaining to justifying solutions and monitoring and evaluating solutions.

Hypothesis Testing

The primary data analysis was a repeated-measures MANCOVA where the testing times and sample groups (classroom-based students or EWEE students) are considered as the independent variables and the five problem-solving-process scores were considered dependent variables. Students' age, gender, and number of years of schooling were included as covariates. Repeated measures MANCOVA is considered the

Table 4

Means and Standard Error for ISP Subscales by Two Times

Subscale	N	M (se) Pretest	M (se) Posttest	Grand Mean
Representing the Problem (com)	65	2.75 (1.38)	2.68 (1.95)	3.43
Representing the Problem (txt)	91	3.26 (1.82)	4.69 (2.02)	
Developing Solutions (com)	65	3.48 (1.11)	3.11 (0.94)	3.89
Developing Solutions (txt)	91	3.53 (1.36)	5.15 (1.30)	
Making Justifications (com)	65	0.91 (1.04)	0.75 (1.03)	1.28
Making Justifications (txt)	91	0.73 (1.04)	2.49 (1.96)	
Monitoring and Evaluation (com)	65	2.45 (1.03)	2.00 (0.92)	2.64
Monitoring and Evaluation (txt)	91	2.30 (1.02)	3.63 (1.58)	
Identification of Problem Solving Steps (com)	65	1.72 (1.07)	1.85 (1.08)	2.08
Identification of Problem Solving Steps (txt)	91	1.62 (1.29)	2.92 (1.68)	

appropriate analysis technique for multiple interdependent dependent variables measured over time on single participants (Tabachnick & Fidell, 2007). However, repeated measures designs can be sensitive to order effects and learning effects. Learning effects were controlled through methodology by having two different scenarios for pre- and post-test delivery. To test for order effects, the initial analysis was a three-way repeated-measures MANCOVA that included the scenario (A or B) taken at pretest as an independent variable.

As the test version order did not significantly differ, I concluded that there was no order effect in the data and, thus, the goal of the primary analysis became to examine if differences existed in problem-solving scores between pre- and posttests by group. This two-way interaction was used for the following analysis. Partial eta squared is reported as a measure of strength of association.

Primary Analysis

The hypothesis presented in this study was that students would show significant gains in ill-structured problem solving after completion of a EWEE . A summary of results is found in Table 5. Effect sizes for the significant results ranged from partial $\eta^{2=}$.072 to partial $\eta^{2=}$.414. The study hypothesis posited that those students engaged in an EWEE would show significant gains in problem-solving tests after the completion of their course when compared to a group of their peers engaged in a leadership curriculum. An analysis of main effects showed that time itself was not significant $F_{(5,145)}$=1.165, p=.39, partial η^2=.039, but the interaction of time and testing group was significant

Table 5
Between and Within Subjects Effects

	df	*F*	*p*	*Partial* η^2	*Observed Power*
Covariates					
Age	5	1.917	.314	.040	.416
Gender	5	5.137	<.001***	.150	.984
Schooling	5	3.129	.010**	.097	.868
Between Subjects					
Group	5	20.458	<.001***	.414	1.00
Within Subjects					
Time	5	1.165	.329	.039	.405
Time*Age	5	1.678	.143	.055	.569
Time*Gender	5	2.252	.052	.072	.719
Time*School	5	0.225	.951	.008	.103
Time*Group	5	22.266	<.001***	.434	1.00
Error	145				

*Significant results at the .05 level
**Significant results at the .01 level
***Significant results at the .001 level

$F_{(5,145)}=22.27$, $p<.001$, partial $\eta^2=.434$. The experimental group improved their scores overall between pre and posttesting while the comparison group's scores remained the same.

In addition to the hypothesized relationships discussed above, three covariates were included in the model to reduce expected error variance in problem-solving skills: age of participant (age), gender of participant (gender), and years of schooling completed by participant (schooling). These covariates were included in the analysis as they should be related to the DVs and should account for unexplained variance in the overall model. Both years of schooling (schooling) and gender were significant covariates. Gender revealed an approaching significant interaction over time.

Gender was included as a potential covariate in the analysis as there is some evidence in adults of a difference in problem-solving preferences between genders (Strough, Cheng, & Swenson, 2002) although there is not strong evidence of a difference in problem-solving skills. The findings for this study found the interaction effect for gender over time to be approaching significance, but ultimately the result was not significant. Additionally, the effect of this difference is relatively small, explaining only 7% of the variance.

Years of schooling was also included as a covariate. Higher order thinking skills can be tied to education level (King & Kitchener, 2002). As a part of the study design, this study included a question asking students how many years of schooling they had completed. This result, as expected, was significant. However, the strength of this result is relatively weak, partial $\eta^2=.097$. The inclusion of this covariate helps to decrease the error variance in the overall model.

Follow-up Analysis

To follow up the significant multivariate interaction, univariate ANCOVAs were performed on each DV. A summary of the results for the interaction of time and group for each dependent variable is listed in Table 6. Interpretation of these results used a Bonferoni adjustment to account for violation of a type I error (Field, 2009). Overall, the EWEE group showed significant and substantial increases in ill-structured problem-solving skills when compared to a group of their peers. The comparison group of students showed minor losses in scores between pretesting and posttesting (average change scores less than 1 point, most less than .5 points). Individually, 62% of comparison group students showed overall positive growth in problem-solving skills. The treatment group showed gains in all variables. Average gains across dependent variables ranged from 1.3 points to 1.9 points. Individually, 70% of the treatment group students showed overall positive growth in problem-solving skills.

Table 6
Results of 2x2 Repeated Measures ANCOVA on Outcome Measures

Measure (Time*Group)	*SS*	*df*	*MS*	Error	*Error df*	F_a	*p*	Partial η^2	Observed Power
PR	43.95	1	43.95	371.54	149	17.63	<.001	0.106	0.986
DS	75.16	1	75.16	207.40	149	53.99	<.001	0.266	1.0
MJ	51.62	1	51.63	249.20	149	30.87	<.001	0.172	1.0
ME	72.25	1	72.25	173.40	149	62.08	<.001	0.294	1.0
Stages	36.63	1	36.63	204.24	149	26.73	<.001	0.152	0.999

Representing the Problem

The representing the problem (RP) variable assesses the students' ability to recognize the problem space and define a problem including any subgoals associated with that problem. Results of the analysis show that the EWEE students had significantly greater growth on their problem representation scores compared to the comparison group $F_{(5,149)}$ 17.626, $p<.001$, partial $\eta^2=.106$. At the end of their course, EWEE students increased from a mean pretest score of 3.26 to a mean posttest score of 4.69 (out of maximum possible score of 10 points). This was mean increase of 1.43 points. The comparison group's scores were relatively stable between pre- and posttests. Graphical representation of mean scores for each group is represented in Figure 1.

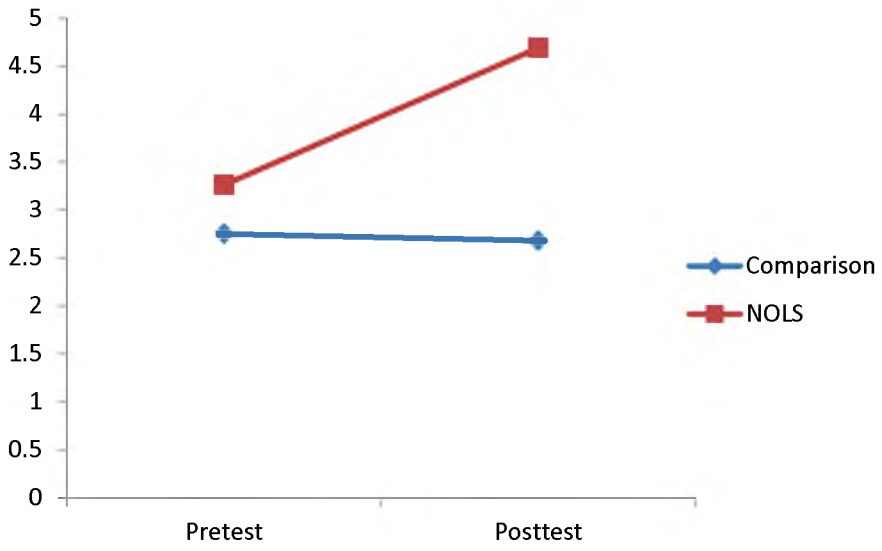

Figure 1: Means for Representing the Problem

Developing Solutions

The developing solutions (DS) variable evaluates students' ability to generate appropriate solutions to the problem they have previously defined. Results of this study indicate that the EWEE students showed significant growth in their ability to develop quality solutions and provide evidence to support those solutions when compared to their peers $F_{(5,149)}$ 53.99, $p<.001$, partial $\eta^2=.266$. EWEE students increased their scores on this variable from 3.53 points to 5.15 points (out of a maximum available 8 points). The comparison group did not show similar gains between testing times. The comparison group showed a decrease of less than half a point (See Figure 2).

Making Justifications

The making justifications variable assesses students' ability to judge how effective the solution they have developed will be. Results of the analysis for this variable

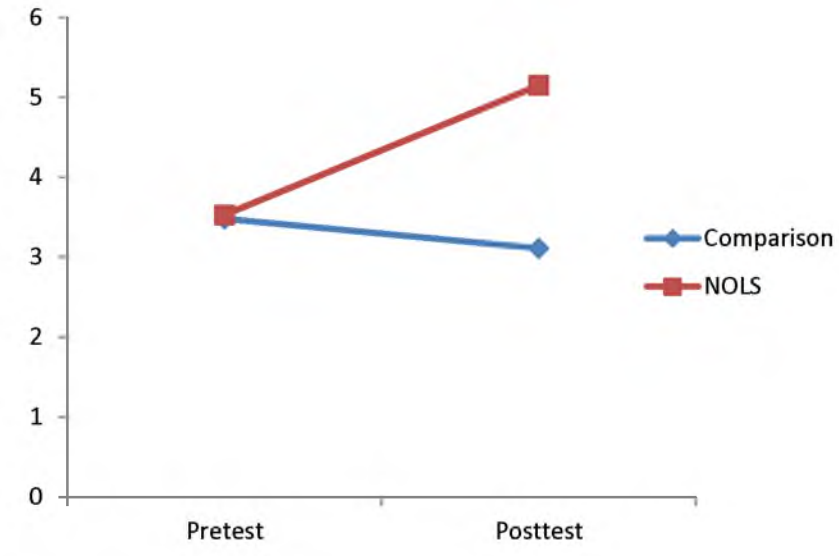

Figure 2. Means for Developing Solutions

showed that the EWEE students showed significant gains in their ability to articulate their choices in solution development when compared to their peers F(5,145) 30.87, $p<.001$, partial $\eta^2=.172$. The EWEE group increased from .73 points to 2.49 points (out of a maximum available 7 points). These results are shown in Figure 3. Students in the comparison group showed decreases on this variable of less than 0.2 points.

Monitoring and Evaluating Solutions

This variable evaluates students' ability to judge how effective they believe the solution they generated will be. It evaluates their ability to construct an argument to justify their solution and provide evidence for that solution when compared to their peers, $F_{(5,149)}$ 26.73, $p<.001$, partial $\eta^2=.294$. Results of this study indicate that on average EWEE students gained 1.33 points between pre- and posttesting (out of a maximum available 7 points). The comparison group's scores decreased by less than half a point

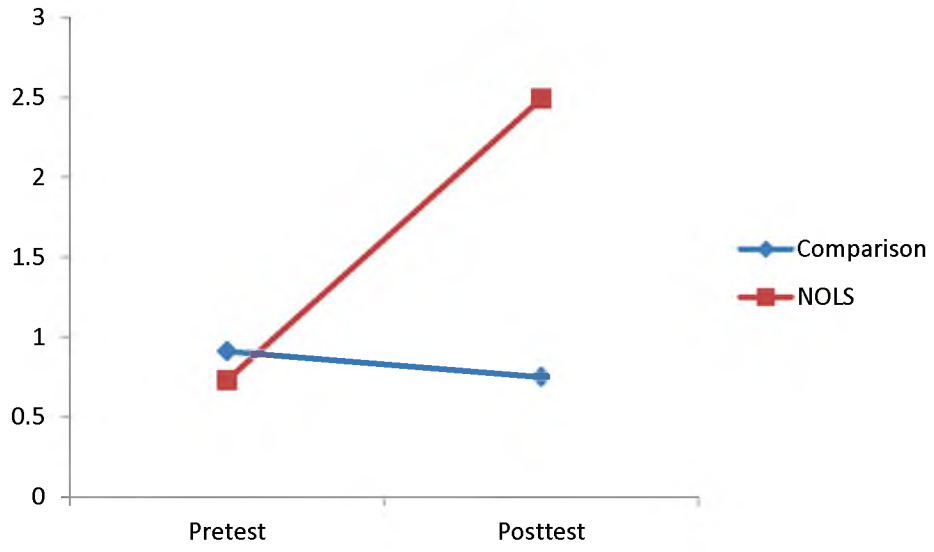

Figure 3: Means for Making Justifications

between pre- and posttesting. Results are shown in Figure 4.

Problem-Solving Stages

This variable measures students' ability to articulate the different stages of the problem solving process. Overall, EWEE students showed significant gains in their ability to identify problem-solving stages when compared to their peers $F_{(5,149)}$ 26.73, $p<.001$, partial $\eta^2=.152$. Results of this study indicate that on average EWEE students gained 1.3 points between pre- and posttesting (out of a maximum available 7 points). Comparison group scores increased on average by .13 points between pre- and posttesting. Results of these outcomes are summarized in Figure 5.

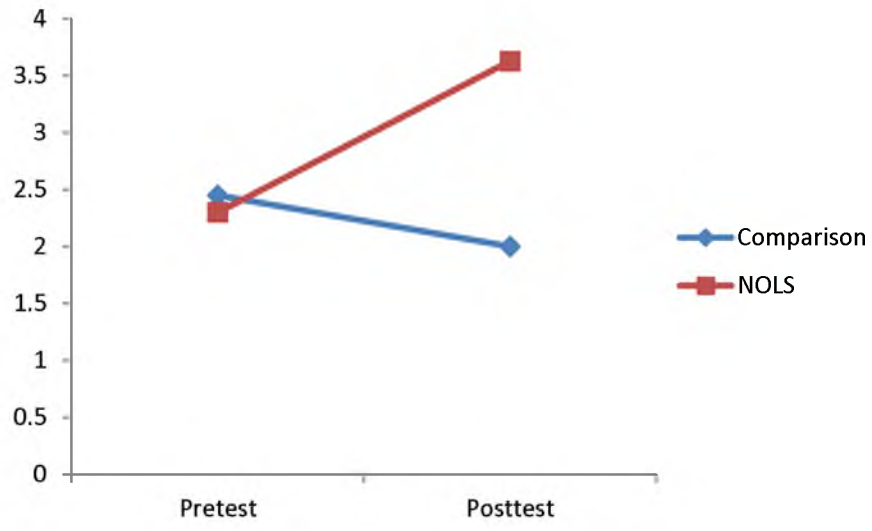

Figure 4: Means for Monitoring and Evaluation

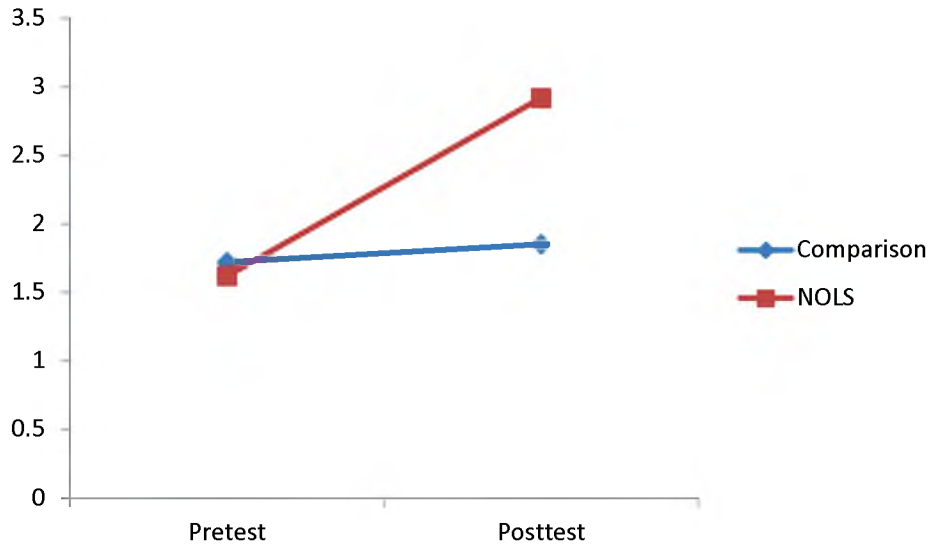

Figure 5: Means for Problem-Solving Stages

Exploratory Analysis

To further explore the role of participants' gender in this study, an exploratory analysis using gender as an independent variable (instead of as a covariate) within each testing group was done. Results of this analysis showed no difference between gender over time for the EWEE group $F_{(5,83)}$ 1.74, p=.135, partial η^2=.095. In this group, females tended to have higher overall means at both pre- and posttest. However, there was a significant difference between genders for the comparison group $F_{(5,57)}$ 3.43, p<.010, partial η^2=.227. In this group, males tended to have higher means at the pretest, and their means decreased over time whereas the means of females increased over time.

Summary

In summary, the students who were engaged in wilderness education experiences showed significant gains over time in their problem-solving skills as measured by the ill-

structured problem-solving instrument (ISP), while the comparison group did not show similar gains. Thus, the source of the gains can be attributed to the treatment effect rather than time itself. Additionally, the treatment group showed significant gains in each of the individual problem-solving skill sets. The findings presented here will be discussed in further detail in the following chapter.

CHAPTER 5

DISCUSSION

Developing the skills to successfully solve ill-structured problems in real-world contexts is important to emerging adult students. Therefore, this chapter will discuss the development of ill-structured problem-solving skills in students who were engaged in a Extended Wilderness Education Experience (EWEE) compared to a group of their peers. This discussion will include both factors that may contribute to the overall development of these skills and those related to specific skills in the set.

Overview of Findings

In an increasingly complex and ill-structured world, the ability for emerging adults to work and think in ill-structured environments relies on a critical set of skills. By the time emerging adult students arrive at this life stage, they are contextually and cognitively in a position to take on acquisition of these skills in a meaningful and retainable way (Labouvie-Vief, 2006). Thus, it is important to provide these students with ill-structured learning environments so they can start to build on these skills. One context that was hypothesized to be beneficial to these students at this point in their development was the EWEE.

The purpose of this study was to examine if an EWEE could improve emerging adult students' problem-solving skills so that they would have a greater capacity to solve

ill-structured problems. It was hypothesized that students who engaged in an EWEE semester would show significant improvement in their problem-solving skills by the end of their course experience when compared to a group of peers who were engaged in a more typical classroom-based experience. More specifically, this study hypothesized that EWEE students would be able to increase their ability in (a) representing the problem, (b) developing solutions, (c) making justifications, (d) monitoring and evaluating solutions, and (e) identifying problem-solving stages. This hypothesis was supported by the results of this study. This chapter discusses the results and implications of this study. Results of the hypothesis are discussed first, followed by a discussion of each individual problem-solving skill. Study limitations are also discussed.

Discussion of the Main Hypothesis

This study found that students who participated in an EWEE showed significant growth in their problem-solving skills at the conclusion of their semester-long experience (when compared to peers engaged in a leadership curriculum in a more traditional classroom setting). A survey of the literature finds that Extended Wilderness Education Experiences and adventure education experiences lead to a variety of social, intrapersonal, interpersonal (Hattie et al., 1997), and environmental outcomes (Bobilya et al., 2010). Experience-based education has been shown to have positive educational outcomes for students (Wurdinger, 2005; Wurdinger & Carlson, 2010). Additionally, studies have shown that the intentional scaffolding of problems for students can help in their skill development in problem solving (Bixler, 2007; Ge, 2001) and that outdoor programs specifically can have a positive influence on general problem-solving abilities

(Viadero, 1997). However, few studies have explored the development of discrete problem-solving skills in an EWEE context. This study explores the application of these problem-solving development theories in the context of an EWEE. More precisely, this section connects the three main factors that can influence skill development in ill-structured problems, and discusses how the results of this study support the hypothesis.

Immediately Relevant Environments

Immediately relevant environments are made up of those learning experiences where students can work with problems, solutions, and consequences of the solutions that are all bound up together in the experience. These problems that are experienced with immediacy motivate students to engage in the process as well as seek solutions (as problems that are immediately relevant do not go away on their own). This immediacy drives motivation, which is highly related to the development of creativity in problem solving (Lubart & Mourchiroud, 2003). Students who are highly motivated to solve problems are also highly invested in them. This sense of ownership has been shown to heighten content retention and the learning curve of individual students in the EWEE context (Sibthorp & Arthur-Banning, 2004), which may include the learning of ill-structured problem-solving skills. Additionally, this active participation in a problem environment can help with the development of expertise in skill development (Lave & Wenger, 1991).

Other studies have shown that children learn better when they are in a real-life context (Gauvain, 2003), and it can be assumed that this is true for emerging adults and perhaps throughout the lifespan. In a setting where actions can be immediately connected

to learning, objects, and others, stronger associations are built (Resnick, 1987) that could be used in future problem-solving scenarios. As students in an EWEE are immersed in an experience, they are forced to use the only resources at hand (Miles, 1999) and to work through a problem-solving process, instead of skipping ahead to an already established solution or leveraging a solution generated from an external source. By restricting sources to the immediate environment, a process of cognitive change can occur that shifts the conceptual focus of how an individual understands an object or resource by incorporating more or differing information (Lewis, 2000). For example, a student may come into an EWEE experience thinking of a piece of webbing as a tool used in climbing, but during the course of the experience the student may employ that webbing as a belt, a bear hang, or any other number of uses. Thus, by changing the environment, and limiting resources, students learn to think more diversely about their options in defining problems and potential solutions.

It is true that meaningful and immediate problems are present and available in the more traditional schooling setting; however, it may be that these problem types are just not as prevalent or attractive to students (Sakofs & Armstrong, 1996) and as a result students may not engage in them as readily or often. The EWEE provides a context where students and instructors are immersed in such problems. The experience of living with instructors and peers, while also learning, creates a classroom experience with its own challenges and advantages unique to this environment. This setting allows students to wrestle with more than course content, such as group dynamics, objective and subjective hazards, and the task of living in a novel environment (Ewert & McAvoy, 2000; Hattie, Marsh, Neil, & Richards, 1997; Walsh & Golins, 1976). Therefore, this active

engagement of problem solving as a part of immediately relevant experiences while in an EWEE setting could be a factor in the overall development of problem-solving skills observed in this study.

Change in Cognitive Equilibration

Another factor that is related to the development of ill-structured problem-solving skills is a change in cognitive equilibration. While the development of cognitive skills is driven by maturation, the physical environment, and social transmission, these factors alone are not sufficient to promote the kind of cognitive growth needed to develop ill-structured problem-solving skills. When individuals are forced to disequilibrate, they have to change their cognitive structures to work in a new environment (Bjorklund, 2005). This is the same process that students in EWEE experiences engage in as they have to solve problems in a context that is novel to them and for which they do not have preestablished patterns or rules. When students become disequilibrated, they have the opportunity to modify the cognitive systems to permit integration and possibly anticipate novelty and account for it (Morra, Gobbo, Marini, & Sheese, 2008). The practice of this integration and the reapplication of strategies in successive problems could account for the overall skill growth observed in this study.

Additionally, one of the major obstacles to solving ill-structured problems is functional fixedness, where individuals have a blind attitude toward the problem and do not assess the problem based on its merits (Mayer, 1992). Emerging adults who are taken out of their routine environments and exposed to new problems with new variables are forced to assess the problem space for its own merits and not jump to conclusions based

on past experiences. This break from functional fixedness is not just a matter of circumstance, but also a curricular component of most EWEE experiences. NOLS, for example, encourages the active questioning of norms and assumptions in the field so that students learn to make decisions based on situations, conditions, and evidence gathered from problems, rather than simply from retained rules (Gookin & Leech, 2009).

Supportive and Collaborative Learning Environments

The third factor related to ill-structured problem-solving skill development is the supportive and collaborative learning environment. Emerging adults in this study who were engaged in an EWEE were in an environment where they were living together and traveling together on a daily basis. This context allows them to encounter problems in an immediately relevant context (as discussed herein) and to collaborate in creative thinking toward problem solving (Cain & Jolliff, 1998). These traveling groups become each individual's primary social group, and as a result these groups frequently build supportive and collaborative networks for accomplishing daily and course goals, where students cite communication, conflict resolution, living with others, relationship building, and group dynamics as some of the critical skills they learn in semester-long EWEE experiences (Jostad, Paisley, & Gookin, 2012). Some studies in other fields have found that question prompting, expert guidance, and peer feedback all improve novices' skills in ill-structured problem-solving environments (Ge et al., 2005). EWEE students are engaged in the process of questioning and providing feedback to one another with the support of an instructor throughout the course experience. This guidance and structure provided by

instructors often increases learning in self-directed tasks (Wurdinger & Carlson, 2010) as well as tasks requiring higher order thinking skills (Johnson, 2006).

Students in traditional classroom experiences do occasionally engage in some group work, and certainly receive guidance from instructors, so this aspect is not necessarily unique to the EWEE setting. However, some psychologists argue that students in the Western world are not often engaged in active knowledge construction, but rather have knowledge handed to them, which can handicap their learning (Rogoff, 2003). In an EWEE, the amount of practice, practical application, and active knowledge construction that students engage in during problem solving helps them to retain knowledge (Sakofs & Armstrong, 1996), thus enabling these students to move noticeably toward expert problem-solving schemas. Other studies in EWEE settings have shown that students who are actively engaged in the decision-making process have more responsibility for the outcomes and also perceive greater developmental gains (Fullerton, 1999; Sibthorp, Paisley, & Gookin, 2007). Consequently, the supportive and collaborative environments found in EWEE experiences could help students engage more actively in the problem-solving and knowledge-construction processes.

Role of Gender

Results of this study indicate that gender played a statistically significant (though not very strong) role in the outcome of problem-solving skills. Additionally, exploratory analysis revealed that there were significant differences on the "problem solving skills" between genders in the comparison group of students over time. Studies have shown that when it comes to problem-solving preferences, there can be some differences between

genders (Strough, Cheng, & Swenson, 2002), mainly that females tend to collaborate more, whereas men tend to work on problems alone. In this study, women tended to score higher overall and in the comparison group showed growth in problem solving skills where the men did not. This could be the result of women engaging more in the collaborative environment in both settings and this exhibiting greater skill in ill-structured problem solving.

Alternative Hypothesis

The students who were a part of the EWEE semesters took their posttest instruments while they were still engaged in their field experience, and not when they returned to basecamps or classroom settings. The higher scores on posttests for those students taking tests in wilderness settings would be consistent with other work on attention restoration theory (ART), as this theory asserts that time in nature can improve prefrontal cortex-mediated activities (Kaplan, 1995), such as solving ill-structured problems. Recent studies have found that after spending time in natural settings individuals' demonstrated greater skill in a creative reasoning tasks (Atchley, Strayer, & Atchley, 2012; Berman, Jonides, & Kaplan, 2008).

Additionally, the design of this study aimed to account for maturation effects that could be present in the development of ill-structured problem solving skills, but teasing apart what is developed as a result of maturation versus intentional training can be a difficult task and many believe that biology of mind and social context might be two sides of the same coin (Gauvain, 2003). The educational environment is the dominant factor driving these changes, but maturation plays a part as well. As the neurological

centers used in this type of problem solving are in the neuron pruning process during the emerging adult stage (Blakemore & Choudhury, 2006; Casey, Giedd, & Thomas, 2000; Nelson, de Haan, & Thomas, 2006), this population of students is cognitively primed for learning and codifying these skills. As life itself is ill structured, these changes could be more a function of engagement in everyday experiences and biological maturation, rather than a function of any specific educational context or experience.

Discussion of Specific Problem-Solving Skills

As discussed, immediately relevant environments, a change in cognitive equilibration, and supportive and collaborative learning environments contribute to the overall development of problem-solving skills. Additionally, specific aspects of an EWEE may aid in the development of specific problem-solving skills. Therefore, this section will discuss each problem-solving skill that was assessed as a part of this study and the aspects of an EWEE that could promote growth in these areas.

Representing the Problem

Results of this study showed that students engaged in an EWEE showed growth in their abilities to define and represent problem spaces as a result of their course experience when compared to their peers. This included the ability to identify problem goals and identify relevant variables in the problem space. The problem-solving literature states that novices spend little time defining the problem (Ge et al., 2005; Ge & Land, 2005), and thus gaining the ability to correctly identify the problem and the related variables is important in solving ill-structured problems.

In related literature, students are shown to be better at breaking down problems as a result of adventure education courses (Herdman, 1994), and students engaged in these types of learning experiences learn how to challenge assumptions (Gass, 2003). More specifically, the NOLS curriculum teaches students to engage in real world problems and that by engaging in problem spaces that are unpredictable students are learning to tolerate dynamic problem-solving scenarios that are ill defined (Gookin & Leech, 2009). One of the critical errors in problem solving occurs when students get stuck on surface symbols instead of the referents, which can lead to persistent errors throughout the problem-solving process. Courses in EWEE settings teach the evaluation of hazards and risks on a daily basis and how to reevaluate these circumstances for changing conditions (Martin et al., 2006). As a result of this evaluation and reevaluation, students learn to rely not only on the most obvious problem, but also on potentially deeper questions related to the problem space. This more divergent approach to problem identification is important in successful resolution of ill-structured problems (Mumford et al., 1991; Runco, 1994).

Additionally, an EWEE challenges students to set goals and develop strategies to achieve these goals (Gookin & Leech, 2009; McKenzie, 2003). Goal setting in an ill-structured problem is important at it allows for the future solutions to be measured and assessed in terms of their appropriateness. This practice of goal setting before acting on a problem helps students work through the rest of the problem-solving process with a clear framework. Results of this study indicate that these curricular objectives of challenging assumptions, monitoring the problem space, and goal setting can be translated into measureable outcomes in ill-structured problem solving.

Developing Solutions

Results of this study showed that students who were engaged in an EWEE were better able to develop quality solutions and provide evidence and logic for those solutions. The literature in creativity and divergent thinking states that divergent production skills can be increased through the active practice of ill-structured problem-solving skills (Fansko, 2002) and more specifically through creative activities such as brainstorming (Treff, 1980). This divergent production ability allows students to see a wider range of choices and options in the development of their solutions, ultimately leading to their selection of higher quality and more robust solutions. The practice of thinking divergently about available resources is pivotal for emerging adults as they are in a phase of their cognitive maturation where they are able to understand varying solutions (Perry, 1999).

Additionally, students in EWEE environments are forced to use only the resources readily available to them (Miles, 1999), which means that they will have to pay greater attention to the convergent thinking process and select a solution that is reasonable and feasible given the problem space in which they are situated and the resources available. Students in EWEE settings will have to work through a problem-solving process in the attendant context, instead of skipping ahead to an answer generated from an external source or from a previously encountered problem.

The NOLS curriculum encourages students to find their own creative and cooperative solutions to problems. In doing so, students learn that there might be many solutions to a problem (Gookin & Leach, 2006), and they are encouraged to seek out those answers through active brainstorming. Additionally, the decision-making

curriculum often used in EWEE settings teaches that there may be many ways to solve a problem and to think critically about solutions instead of relying on authorities or preestablished rules (Martin et al., 2006). This relative novelty of challenges in an EWEE setting promotes growth in individuals (Hunt, 1999). In this study, the increased quality and clarity of solutions could be due to the exposure to opportunities to practice divergent and convergent thinking in novel settings.

Making Justifications

Results of this study showed that emerging adults who were engaged in EWEE showed greater skill in providing justifications for the solutions they developed when compared to peers who had not engaged in a similar experience. One of the differences between novice and expert problem solvers is that novice problem solvers are more likely to continue with incorrect or ill-fitting solutions, whereas experts will tend to have rich and well-organized knowledge structures that support their solutions (Nokes, Schunn, & Chi, 2010). The results of this study showed that students who participated in an EWEE course provided deeper and more robust justifications and rationales for their solutions than did their peers, which is indicative of a move toward expert problem solving.

This result could be attributed to specific elements of the EWEE environment. Novice decision makers attend to only a limited number of factors when making decisions in EWEE contexts (Galloway, 2002). Thus, EWEE curricula often teach students to think through consequence and solution evaluation (Martin et al., 2006). This helps students to turn information into solutions and to use that information to justify solutions (Gookin & Leach, 2007). Students with EWEE experiences are also often being

taught communication skills that engage them in the practice of informing others not only of their decisions, but also about how and why those decisions were made (Gookin & Leech, 2007) as well as how their decisions will impact others and the group (Jostad, Paisley, & Gookin, 2012).

The practice of verbalizing and communicating justifications for solutions helps students engage in the practice of understanding the importance of not just developing a solution, but understanding why it is the best solution. This also is a way for students to actively challenge their own as well as their peers' assumptions that might have been used to correctly or incorrectly justify decisions made in solution selection (Gass, 2003; Gookin & Leech, 2009). Additionally, the practice of programmatic reasoning toward real problems can increase overall performance on problems that involve some form of conditional reasoning (Lehman, Lempert, & Nisbett, 1988). Therefore, the increased robustness of solution justification found in this study could be due to the practice of communication skills and the practice of justification with peers.

Monitoring and Evaluation

Results of this study showed that emerging adults who were engaged in an EWEE showed greater postcourse ability to evaluate their solutions as well as explore alternatives when compared to their peers. This monitoring and evaluation of solutions over time is a critical part of the ill-structured problem-solving process as it allows for the adaptation of solutions should conditions of the problem change or should the solution not adequately fit the problem presented. Expert problem solvers in EWEE settings are

able not only to solve the problem, but also to monitor performance and provide active feedback (Galloway, 2002).

Many curriculums in EWEE settings teach students situational leadership and to understand that if conditions to a problem or situation change, so must the leadership style. They learn that those styles (or solutions) should be monitored and adaptable depending on the need or the conditions at the time (Gookin & Leach, 2007; Martin et al., 2006). Students are encouraged to exhibit their understanding of this process by giving and receiving feedback to others that is both timely and specific so they can learn from one another about how solutions are adapting to situations and vice versa. Students may be able to apply this flexibility to their solutions as they gain an understanding of the importance of situational awareness.

Monitoring and evaluation of solutions is further encouraged through judgment curriculum that teaches students that direct experiences and active reflection on those experiences can help guide future experiences (Dewey, 1938; Gookin & Leach, 2007) and that this active engagement in thoughtful reflection can aid the development of thoughtful decision-making processes and judgment overall (Priest & Gass, 1997). Other studies on semester-long EWEE experiences have found that this overlearning, or critical repetition, could be a logical explanation for the achievement of outcomes in semester-long courses (Jostad, Paisley, & Gookin, 2012). This balance of learning from past experiences and being sensitive to changing conditions is critical to the monitoring and evaluation phase of problem solving, and the intentional practice of these two skills is likely responsible for the EWEE students' improvement on this measure.

Problem-Solving Stages

Results of this study measured students' identification of the relevant stages of problem solving. At the conclusion of their course, students engaged in an EWEE experience were able to identify more problem-solving stages than their peers. It is common practice in EWEE settings for instructors to teach a decision-making model (Martin et al., 2006) that closely models the ill-structured problem-solving model (cf Choi & Lee, 2008; Jonassen, 1997). Thus, positive growth in this area is most likely attributed to the exposure and repeated practice of these models as part of their daily decision making while on the course (Gookin & Leach, 2007). Thus, when students were asked to communicate to others what the posited problem is, and what they were going to do about it as a part of this study, those students were already practiced in outlining the processes of articulating the problem, a potential solution, and the logic that connects the two as this is something they would have done regularly while engaged in the EWEE.

Often, teaching this type of problem-solving process is critical as learning is increased when students can practice problem-solving techniques before receiving new content (Wurdinger & Carlson, 2010) and they have mental models that can be more flexible when responding to new circumstances (Resnick, 1987). These models allow students to adapt to the novel or unexpected circumstances and changing conditions (Resnick, 1987) that are often present in the EWEE context. Thus, growth in students' ability to identify problem-solving stages is most likely attributed to familiarity with similar models and problem-solving processes during their EWEE experience.

Order Effects

There was not a statistically significant effect from the order of the scenarios themselves, but this result is close to significant, and thus deserves some discussion. The scenarios and test questions were pilot tested on like-type students prior to this study. These scenarios were developed for use in this study based on scenario structures used in other work on similar topics (Bixler, 2007; Chen, 2010; Ge, 2001). After the pilot test, the scenarios were adjusted to stabilize the difference in scores between the two forms. In this study, students engaged in an EWEE tended to score better on scenario B than on scenario A. Although both scenarios were designed to leverage leadership knowledge domains, scenario B asked students about a recycling issue, whereas scenario A asked about a membership issue. In this study, the students engaged in an EWEE also received instruction about environmental awareness. This additional curriculum might have increased their ability to work on this problem. We know that domain knowledge can impact a student's ability to solve problems (Choi & Kyunghwa, 2009).

Delimitations

There are several delimitations to this study. Firstly, the wilderness education programs that are accessible to the average emerging adult student are typically shorter in length (30 days or less). Other studies in this field have shown that course length is a mediating factor in learning outcomes (Hattie, Marsh, Neil, & Richards, 1997; Sibthorp, Paisley, & Gookin, 2007). Thus, a comparison to courses that are shorter or longer in length than semester-long courses is limited. Additionally, without sufficient practice, it could be difficult to move problem-solving processes to a permanent place in the

student's schema. As this study looked at changes only from pre-to postcourse, the potential transfer of these skills beyond the course experience cannot be addressed.

Finally, this study looked only at a specific age group and a specific leadership curriculum that was delivered from a convenience sample of students. Whether or not similar results would be found in other ages of students engaged in a leadership curriculum is still unknown. Similarly, emerging adult students engaged in an EWEE experience that is a part of a college course or other outdoor program may or may not have similar results to those students who participated in this study and this specific curriculum.

The nature of the design necessitated that students complete the scenarios during their courses. As the EWEE students were in a relatively remote wilderness environment and the comparison group was in a traditional college classroom, any differences between these two testing environments would manifest as differences between the two groups. In addition to the potential of a remote natural environment being restorative and more free from competing interests, it is also possible that the EWEE students were more invested in the project and were more diligent in responding to the scenario prompts.

Limitations

Additionally, during the course of this study a few limitations arose. First, the results of the interrater reliability cast some doubt on the stability of the rubric for this study. Whereas other studies using the same scoring framework were able to find good interrater reliability (Ge, 2001), this study found that the percent agreement between raters was moderate, although the intraclass correlations between the scores were

significant and moderate to strong (ICC=.48 to ICC=.93), indicating that the ranking of students between scores was reliable. However, the variable for identification of problem-solving skills had low percent agreement between scorers and was challenging to train a second scorer on due to the range of potential interpretations of how problem-solving stages were articulated. Secondly, the imbalance of genders within the two groups is an unintended limitation that makes interpretations based on gender difficult.

Furthermore, there is some question as to whether or not problem-solving skills are domain specific or not. Some researchers argue that problem-solving skills are cross-disciplinary (Hoskins & Fredriksson, 2008) as those skills are tied to an individual's ability to execute a set of processes while being sensitive to changing conditions that may affect the solutions. Domain knowledge is one of the major predictors in performance in problem solving (Choi & Kyunghwa, 2009), which is why this study situated the testing problem in a knowledge domain (leadership) that would be familiar to both groups of students in the study. However, the results may have differed if a knowledge domain were tested that was further removed from the curriculum students in this study were learning as a part of their respective course experiences.

Finally, the results of this study could include some response bias on the part of the EWEE participants. Typically, these students are very engaged in their program and invested in the program being effective. Thus, these students may have been more engaged in the posttest than the comparison group students and thus may have worked harder at representing EWEE well during posttesting.

Implications for Future Research

The measurement of problem solving skills remains challenging. Changes in emerging adult's knowledge constructions, epistemological values, and reflective judgment typically require assessment that is from a longitudinal perspective (Kitchener & King, 1994). A longitudinal perspective can make studying the specific interventions that might serve to increase this skill set challenging. However, this study provides evidence that measuring growth in specific judgment and decision-making domains, namely, ill-structured problems, is achievable for a semester-long (90-day) intervention.

Most studies of this nature in the field of outdoor and adventure education ask students to reflect on their own abilities and report their level of comfort or skill in solving problems via a self-report instrument (cf Sibthorp et al., 2007). What is critically different about this study is that it asked students to solve an actual problem to assess their displayed abilities rather than self-perceived abilities. The research question addressed in this study was less concerned with whether or not students thought they would/could use all the problem-solving steps to solve an ill-structured problem, and more concerned with whether or not they would exhibit these skills in an actual problem. As this research was successful using this methodology, future researchers should consider the critical difference between performance of a skill and self-perception of a skill.

Also, most courses that are offered in EWEEs use shorter time frames (30 days or fewer). In a shorter course students may or may not have enough time to not only learn the types of problem solving structures they would need to solve ill-structured problems, but also use these skills. Thus, future research should consider looking at shorter courses

to see if similar effects can be identified. Additionally, this study looked to see if there was an overall effect in problem solving skill as a result of participation in an EWEE. As EWEEs are collective experiences, that are made up of curriculum, instructors, environment, course design, and other students, it is difficult to differentiate what element of the course is driving the development of these skills. Future research should try to identify which of these course qualities actively contribute to the development of ill-structured problem solving skills so as to inform implementation and design of these experiences.

Additionally, this study did not assess if students would be able to exhibit the same level of problem-solving skills in a different context. The literature does articulate that the acquisition of expert schema takes time (Bransford, 2000). It is unknown whether or not these skills will be able to be maintained over a long period of time, or if these skills have peaked at postcourse and will not be retained at a follow-up time. Studies that evaluate students again after a period of time could tell if those skills would be maintained for a prolonged period.

Finally, further studies into ill-structured problem-solving skill development should consider removing the variable of identification of problem-solving skills. This variable made it challenging to attain agreement between raters and was not a strong contributor to the overall results of the study. It was added to see if students could identify the steps they were using to solve a problem, but ultimately it might be more useful to measure actual skills at resolving these problem stages (through the other variables) than identifying what the stages are.

Implications for Practice

As hypothesized, this study showed evidence that immersion in environments that are ill structured in nature, and providing a structure for practicing ill-structured problems, can lead to positive outcomes in ill-structured problem-solving skills. Numerous studies have addressed the development of technical skills resulting from EWEE experiences, as well as the development of intrapersonal skills (Hattie et al., 1997), but few studies have explored the educational or cognitive skills that could be achieved as a result of these types of courses. This study provides evidence for the development of a skill set that could be transferable to emerging adults' everyday lives and future vocations. Therefore, inclusion of an EWEE experience, along with other ill-structured educational interventions, could positively supplement the educational experiences in which emerging adults engage during their college years.

Educators who are already using EWEEs, or immersion experiences in other contexts, should recognize that this an excellent venue for teaching not only content but also thinking skills. Results of this study indicate that the active practice of processing ill-structured environments can improve students' skills in solving ill-structured problems. Thus, adventure and wilderness educators should continue to look for opportunities to engage students in creative thinking, tolerance for novelty, and exposure to new environments while allowing them the space to work through these environments.

For those educators who do not have the resources to use EWEEs as a part of their courses and would like to develop a student's ill-structured problem solving skills, they should consider how to incorporate the key elements of these experiences for problem solving development in their classrooms. Educators should consider how they can make

learning environments immediate for students and relevant to their lives. They should also consider how to help students overcome functional fixedness through creating problems and educational environments that challenge students to think differently about problems. This might not need to be a wilderness environment specifically, but rather an environment that is novel to the students. Finally, educators who can cultivate supportive and collaborative environments, regardless of curriculum or setting, could aid students in their problem solving development.

Conclusion

This dissertation explores the effect of Extended Wilderness Education Experiences on the development of ill-structured problem-solving skills in emerging adult students. Specifically, it hypothesized and confirmed that National Outdoor Leadership School (NOLS) program participants showed significant increases in ill-structured problem-solving skills compared to a group of their peers who were enrolled in leadership-oriented college courses in traditional classroom settings. This positive increase in skill may be attributed to the EWEE experience, as a comparison group of similar students receiving curriculum in similar domains did not show such increases. Thus, it is concluded that EWEE can positively affect emerging adults' skills in defining, solving, justifying, and evaluating ill-structured problems and their potential solutions.

Up to this point, much of the research involving EWEEs has explored social, interpersonal, and intrapersonal outcomes (Bobilya et al., 2010; Hattie et., 1997). In a stage of life where there may be many opportunities competing for an emerging adult's attention, EWEE programs may be able to cite educational and cognitive benefits along

with other known outcomes. This study provides evidence that these educational and cognitive benefits, with respect to ill-structured problem solving, could be achieved during an EWEE experience.

Finally, as emerging adult students move from this life stage into early adulthood, they will be asked to take on adult roles in a context that is becoming ever more diverse and ill-structured. Those students who have tolerance for and skill in solving ill-structured problems will be better able to assume roles in the creative or ideas economy. This dissertation and the related literature strongly support the notion that, for emerging adult students, spending time in an EWEE could promote the development of this skill set that will better enable them to think creatively and contextually about problems in the world around them.

APPENDIX A

ILL-STRUCTURED PROBLEM SCENARIOS

Scenario A

Ill- Structured Scenarios for Leadership: Scenario A

Before we get started, please give us a little information about you:

Date of Birth: _____

for example: (12/30/1987)

School or Branch: _____

Course Code: _____

(if you do not know your course code, please leave this blank)

Years of School Completed: _____

(for example completed high school is 12 years, completed college is 16 years)

Instructions: *The goal of this activity is to see how well you can apply your leadership skills to a new situation that you may not have encountered before. In front of you is a description of a problem and some follow up questions and a few pages of resources related to the problem. Please answer the questions are thoroughly as you are able and include evidence to support your answers. You may write on any part of this packet as you develop your answer, and may use the back side of pages if you need more space to answer. You will have 45 minutes to solve this problem.*

Problem A: Outdoor Adventures

Last May you were elected the president of your school's Outdoor Adventures club. Now it's a week before the school year starts in the fall and you just sat down with the rest of the board to make a plan for the coming school year. You all went through the documents left you by last year's club board and the club treasurer, Tony, told you that due to your big drop in membership from last year, you will not be getting as much money from the school's student government association (SGA) this year. The SGA says that clubs need to have at least 50 members to get full funding from the SGA, and after a large graduating class last year, you are down to 20 members. The club fair is coming up in two weeks, and one week after that, the SGA will finalize the budgets for student groups this year.

Q1: What are some of the important things to consider in this situation? In one or two paragraphs, explain what they are and why they are important. (In your responses to all questions, feel free to include considerations that go beyond the immediate situation.) What is the problem? Are some of these considerations more important than others?

Q2: What do you think is an appropriate solution to this kind of problem? Please explain why your proposed solution is appropriate and will be effective.

Q3: Is this the best way to solve the problem? Could there be another way to solve this problem? Describe another reasonable response to this kind of situation. Compare the potential risks and benefits of this response with those of your original response.

Q 4: You will need to send a letter out to your club soon explaining the state of the club and your plans for this year. In 2-3 paragraphs please outline what process would you recommend for deciding how to respond to this situation. Please describe this decision-making process in general terms—in a way that would allow another person to use the process in a similar workplace situation—and explain why you would recommend each step in this process.

Q5: Of the following resources available to you, please mark one as the Most Valuable (+) and one as the least valuable (-).

Available resources:

____ Last's year's club spending
____ Budget for coming school year
____ Trip schedule from last year
____ GSA budget information
____ Advice from a friend
____ Advice from faculty sponsor
____ List of Current club members & board members
____ List of other school clubs
____ Article on Fundraising for outdoor clubs

Outdoor Club — **Last Year Spending**

		Participants	Cost	Total	
September					
Student Government Stipend		50	$100.00	$5,000.00	
			$200.00	$200.00	
				$5,200.00	
	September				
		Participants	**Cost**	**Total**	
Fall Canoe Trip	Trip Fee	30	$100.00	$3,000.00	Treasurer's Notes:
	Instructors	8	-$50.00	-$400.00	looks like we did ok on the trip.
	Food	30	-$50.00	-$1,500.00	had to buy some new boats for
	Fees	30	-$15.00	-$450.00	the trip that cost us $1,000
	Transportation	30	-$20.00	$600.00	
			Total	$50.00	
Gear Rental	New Gear Purchase			-$1,000.00	
	Rentals			$53.53	
			Monthly Balance	-$896.47	
			Yearly Balance	$4,303.53	
	October				
Fall Backpacking	Trip Fee	36	$100.00	$3,600.00	Treasurer's Notes:
	Instructors	9	-$50.00	$450.00	We ended up making a good
	Food	36	-$50.00	-$1,800.00	amount of money on this trip.
	Fees	36	-$15.00	-$540.00	
	Transportation	36	-$20.00	-$720.00	
			Total	$90.00	
Gear Rental	New Gear Purchase			$0.00	
	Rentals			$75.00	
	Gear repair			$120.00	
			Monthly Balance	-$45.00	
			Yearly Balance	$4,258.53	
	November				
Gear Rental	New Gear Purchase			$0.00	
	Rentals			$323.12	
	Gear repair			-$100.00	
			Monthly Balance	$223.12	
			Yearly Balance	$4,481.65	
	Dec / Jan				
Ski Trip	Trip Fee	32	$700.00	$22,400.00	Treasurer's Notes:
	Instructors	0	-$50.00	$0.00	This trip cost us big time this
	Food	32	-$300.00	-$9,600.00	year, we had to use $13,200 of
	Fees	32	-$400.00	-$12,800.00	club funds to cover expenses for
	Hotel	32	-$350.00	-$11,200.00	this trip. At the end of this month
			Total	-$11,200.00	we are $6,000 over budget for
Gear Rental	New Gear Purchase			$0.00	the year.
	Rentals			$456.78	
	Gear repair			-$100.00	
			Monthly Balance	-$10,743.22	
			Yearly Balance	-$6,261.57	
	Feb				
Banff Mountain	Ticket Sales	100	$25.00	$2,500.00	Treasurer's Notes:
Film Festival	days	3	-$500.00	-$1,500.00	We ended up making money on
	Building	3	-$200.00	-$600.00	this event again this year. It
			Total	$400.00	wasn't as much as we hand
Gear Rental	New Gear Purchase			$0.00	hoped for, but we didn't lose
	Rentals			$158.00	money. We could have sold
	Gear repair			$100.00	double the tickets
			Monthly Balance	$558.00	
			Yearly Balance	-$5,703.57	
	March/April				
Spring Break	Trip Fee	32	$275.00	$8,800.00	Treasurer's Notes:
Rafting Trip	Staff	6	-$50.00	-$300.00	this trip was really popular this year,
	Food	32	-$50.00	-$1,600.00	It allowed us to sell a lot of spots
	Fees	32	-$15.00	-$480.00	and it doesn't cost us very much to
	Transportation	32	-$20.00	-$640.00	run. This majorly helped us recover
			Total	$5,780.00	some revenue from the ski trip
Gear Rental	New Gear Purchase			$0.00	
	Rentals			$212.98	
	Gear repair			-$100.00	
			Monthly Balance	$5,892.98	
			Yearly Balance	$189.41	Treasurer's Notes:

Finished off the year with an extra $189 dollars. Tight budget this year, we might want to consider some adjustments before next school year.

Outdoor Club — **Current Year Budget**

		Participant	Cost	Total
September				
Student Government		20	$ 100.00	$2,000.00
	September			
		Participants	**Cost**	**Total**
Fall Canoe	Trip Fee	10	$100	$1,000.00
	Instructors	2	-$50.00	-$100.00
	Food	10	-$50.00	-$500.00
	Fees	10	-$15.00	-$150.00
	Transporta	10	-$50.00	-$500.00
			Total	-$250.00
Gear Renta	New Equipment Purchase			
	Rentals			
			Monthly Balance	-$250.00
			Yearly Balance	$1,750.00
	October			
Fall Backpa	Trip Fee	10	$100.00	$1,000.00
	Instructors	2	-$50.00	-$100.00
	Food	10	-$50.00	-$500.00
	Fees	10	-$15.00	-$150.00
	Transporta	10	-$50.00	-$500.00
			Total	-$250.00
Gear Renta	New Equipment Purchase			$0.00
	Rentals			
	Gear repair			
			Monthly Balance	$0.00
			Yearly Balance	$1,750.00
	November			
Gear Renta	New Gear Purchase			$0.00
	Rentals			
	Equipment repair			
			Monthly Balance	$0.00
			Yearly Balance	$1,750.00
	Dec / Jan			
Ski Trip	Trip Fee	10	$700	$7,000.00
	Instructors		-$50.00	$0.00
	Food	10	-$300.00	-$3,000.00
	Fees	10	$400.00	-$4,000.00
	Hotel	10	-$350.00	-$3,500.00
			Total	-$3,500.00
Gear Renta	New Equipment Purchase			$0.00
	Rentals			
	Equipment repair			
			Monthly Balance	-$3,500.00
			Yearly Balance	-$1,750.00
	Feb			
Banff Mou	Ticket Sale	100	$25.00	$2,500.00
Film Festiv	days	3	-$500.00	-$1,500.00
	Building	3	-$200.00	-$600.00
			Total	$400.00
Gear Renta	New Equipment Purchase			$0.00
	Rentals			
	Equipment repair			
			Monthly Balance	$400.00
			Yearly Balance	-$1,350.00
	March/April			
Spring Bre	Trip Fee	10	$275.00	$2,750.00
Rafting Trip	Instructors	2	-$50.00	-$100.00
	Food	10	-$60.00	-$600.00
	Fees	10	-$15.00	-$150.00
	Transporta	10	-$60.00	-$600.00
			Total	$1,300.00
Gear Renta	New Equipment Purchase			$0.00
	Rentals			
	Equipment repair			
			Monthly Balance	$1,300.00
			Yearly Balance	($50.00)

Current Outdoor Program Roster

Board Members
President- you
Vice President- Rebecca Colby (Business Major)
Secretary- James Donovan (Education Major)
Treasurer- Scott Bacon (Finance Major)
Undergrad Rep- Sabrina Newfield (Psychology Major)
Grad Rep- Alexis Fieldstone (Recreation Major)

Undergraduate Students
1. Tom Wright
2. Duane Gustafson
3. Jake Jacobson
4. Brandon Mahoney
5. David Steller
6. Adam Mayer
7. Kelly Mayer
8. Scott Appleton
9. Sarah Weibel
10. Jenny Scott
11. Lisa Sweezey
12. Brett Swensen
13. Devon Thornley
14. Heather Bixler

Graduate Students
1. Earnest Teller
2. Patrick Perry
3. Danielle Grover
4. Kyle Ardell
5. Eve Bleier
6. John D'Alba

Outdoor Club Trip Schedule
Upcoming Year

September
Sept 20-22
Fall Canoe Trip - $100 per person
Includes- transportation, permits, food, canoe equipment

October
Oct 10-12
Fall Backpacking - $100
Includes- transportation, permits, food,

January
Jan 8-15
Ski Trip (Big Sky, MT) - $700 before airfare
Includes- hotel, lift tickets, food and transportation at Big Sky

February
Feb 2, 3, 4
Banff Film Festival- Tickets $25 each

March
Mar 7-14
Spring Break Rafting - $275
Includes- transportation, permits, food, rafting equipment

Arts: Organizations that promote the fine arts, including drawing, filmmaking, graphic design, music, painting, photography, printmaking, and sculpture.

Alliance for Dance - Art of the Book Club - Art Trade - Cartooning Society - Irish Dancers - Knitting Club

Athletics/Games: Organizations whose activities involve education about and involvement in sports activities for personal growth and leisure. Intramural, club sports, and competitive athletic events with University-sponsored athletic teams must register with the Athletics Department.

Blue Aces - Club Swim Team - Colorguard Club - Outdoor Club - Paddling Club - Ski and Snowboard Club

Communications: Organizations that publish information on-line or in print medium.

All-Access	Fist Lux: A Journal of Religious Life and Theology	Her Campus
Politic, The	Helicon: Undergraduate Journal of Classics	

Cultural: Organizations that promote knowledge of and involvement in issues of class, diversity, ethnicity, and race.

808: The Hawai'i Club	Asian American Students Alliance	Eastern European Society	Minnesota Club
African Students Association	Black Women's Coalition	KASAMA:The Filipino Club	Undergraduate Canadian Students
Alliance for Southeast Asian Students	Brazil Club	Latin American Student Organization	Association

GLBT: Organizations whose primary activities are focused on gay, lesbian, bisexual, and trans-gendered issues.

Athletes and Allies	Prism	Resource Alliance for Gender Equity

Political/Student Government: American Civil Liberties Union - Freshman Class Council - Sophomore Class Council - Junior Class Council - Senior Class Council

Service/Outreach: Organizations that promote and are involved in community service work based in the City of New Haven, or who offer counseling services requiring specialized training in cooperation with University Health Services.

Academic Associate Program	BookMarks	Emergency Medical Services	Public Health Coalition
Amnesty International: College Student	Children's Theater	Future Project, The	RESTORE
Chapter	Circle of Women	PALS:Tutoring and Mentoring	Uganda Hope Network

Student Association Budget Process

Purpose: To inform students of the process used to financially support student activities. At registration a Student Activity Fee is charged to every student enrolled in credit classes. The funds collected through this fee are given to the Student Association to allocate in support of student activities. All officially recognized student organizations may submit a budget request to the Student Association Financial Affairs Committee. The annual budget process begins in February to request funds for the following fiscal year from July 1 to June 30. Additional budget requests may be submitted throughout the year for new clubs or additional activities not previously submitted.

1. Annual budget request forms are distributed at the February Student Association Advisory Council meeting. Additional forms will be available in the Student Life office. Included with the Budget Request should also be included any information that you feel would better enable the financial committee to review your request.
2. Completed budget request forms are due at the March Student Association Advisory Council meeting. At that time, each club will have the opportunity to schedule a time for their budget hearing with the financial committee.
3. At each budget hearing, representatives from each club will have the opportunity to explain the budget request and the proposed activities. The members of the financial committee may ask questions in regards to the details of the proposed activities.
4. The budget is submitted to the Dean of Student Services for approval after the Student Association approves the complete budget.
5. Student organizations receive final approved budget requests in May.
6. As student memberships may change from year to year, final membership numbers for the year should be submitted to the GSA on September 30th and your club budget will be amended as appropriate.

Criteria for allocations: The Student Association Financial Affairs Committee considers the following criteria when reviewing budget requests:

- Attendance at Advisory Council Meetings
- Ability to present knowledge of activities planned
- Number of **active** members in club
  - ($100 per member annually + $100 for every members)
- Success of activities held during current year
- Number of participants in those programs
- Number of students who will benefit from proposed activity
- Educational, social, cultural or recreational value of programs
- Fund raising activities planned by club
- Fiscal efficiency of the organization

List of Student Groups

Academic/Honors: Organizations whose membership and activities require association with an academic department or a regional or national society with specific membership eligibility requirements based on grade point average and specialization in an academic field of study. (top)

Women in Physics
Biomedical Engineering Society
Club Gee
Leadership Institute
Undergraduate Economics Association
the American Society of Mechanical Engineers Chapter for Undergraduate Students
Contemporary Korea Studies Society
Society of Physics Students (SPS)
American Indian Science and Engineering Society (AISES)

From: Prof Joe Smith [joe_smith@university.edu]
Sent: Wednesday, August 24, 2012 11:26 AM
To: Me

Subject: Re: Outdoor Club- Faculty Sponsor

Hi-

It was nice to see you too! I'm also looking forward to another year with the Outdoor Club. It's always such a great group of students to work with.

I think you have some valid concerns about the budget for this year. I don't know that I can tell you exactly what to do, because there are so many things that could be done. Have you thought about what the mission of the outdoor club is? I think if you start to really think about what the outdoor club is trying to accomplish, it will help you come up with a solution. Do you want the outdoor club to be about having more members to experience the outdoors? Or do you want to focus the funding you have on doing more with a smaller membership?

I know in past years students have struggled with what to do about the reputation of the outdoor club. It's been seen as a really clique-y group in the past, I don't know how much it plays into this year, but every year I like to remind the new president that they have an opportunity to grow the club. Maybe there is an opportunity to collaborate with some other clubs this year on trips or events?

Let me know if you need anything else from me.

- Prof Smith

From: Me
Sent: Wednesday, August 24, 2012 8:24 AM
To: Joe Smith [joe_smith@university.edu]

Subject: Outdoor Club- Faculty Sponsor Advice

Hi Prof Smith,

It was great to see you the other day, and I'm looking forward to a great year with the Outdoor Club. Thanks for agreeing to be our faculty sponsor for another year, I know the past board has always appreciated your help with the club.

I know we had a big drop in members when all the seniors graduated last year, and I'm not sure what to do about the drop in funding we are going to have coming from GSA this year given our low membership numbers.

Any ideas?
Thanks!
Me

From: Kyle Lindblom [kyle@university.edu]
Sent: Wednesday, August 25, 2012 1:26 PM
To: Me

Subject: Re: Outdoor Club- Friend Email

Hey there-

I bumped into some of the other outdoor club folks this afternoon and they said that there might be some changes coming this year?

I had an idea, I really think the club should be doing more trips. We all love them! I know it's always the same people on all of them, but they are such a big part of what we do! Could we maybe get a few more on the calendar this year?

Are we going to have a table at the campus club fair this year? I know we haven't in the past, but the RESTORE club usually does one and they find that it really helps them get new members every year.

Lunch sometime this week?
- Kyle

From: Me
Sent: Wednesday, August 25, 2012 8:55 AM
To: Kyle Lindblom [kyle@university.edu]

Subject: Outdoor Club- Friend Email

Hi Kyle,

We're back!! Can you believe that we are seniors, it's crazy!!

Let's get together soon!
Me

FUND RAISING: THE OPTIONS AVAILABLE TO OUTDOOR PROGRAMS
INTRODUCTION TO FUNDRAISING FOR OUTDOOR CLUBS

Fund raising is an aspect of income generation that many in the outdoor recreation field shrugged off. There's a mistaken feeling out there that fund raising just won't work for outdoor activity programs. That couldn't be further from the truth. To wit: Outward Bound Schools generate ten of thousands of dollars a year for scholarships and programs, the Cornell University Outdoor Education Program received a $160,000 donation to build a climbing wall and another $50,000 to start an equipment outfitting center, and over the past 10 years, the Idaho State University Outdoor Program has brought in nearly one million dollars of outside funds.

There is no one set way of fund raising that works for everyone. You'll need to evaluate and dabble with several methods before settling on some that work well in your situation. For the purposes of this paper, I'll discuss four broad categories: grants, fund raising events, non- cash donations and cash contributions. Each of these categories covers a lot of ground and there are many options to try within each.

GRANTS

Federal and private foundation grants are some of the largest potential sources of funds. But it's not without a catch. To obtain federal grants you will need to adapt an outdoor recreation project to the purposes and guidelines of the grant program, and you will need to commit a large block to time to researching and developing the grant proposal.

FUND RAISING EVENTS

Another way to bring in revenues is through fund raising events. Examples of fund raisers include fun runs, triathlons, dinners, outdoor equipment sales, *etc*. As long as you watch expenses, a fund raising event almost always can be expected to bring in income. I try to make sure that during the year, we hold several fund raising events. Sometimes the return from the event is only $100, but combined with other events, it adds up. Realistically, unless you put together an annual event that stimulates a lot public interest, you can't expect a large return from fund raisers. They do, however, provide some revenues that haven't been there in the past, and they can be incorporated in your regular schedule program activities.

One fund raiser which has good potential for many programs is a used outdoor equipment sale. Students and community members bring in their used equipment and price it (20% of the sale goes to the program and 80% goes to the seller).

NON-CASH DONATIONS

Programs can be helped by non-cash donations of such things as library books, back issues of magazines, outdoor equipment and other supplies. For instance, the local ski club gives all their unclaimed skis to our handicapped group after their large community used ski equipment sale. Books and back issues of magazines can be useful for programs with resource center. Get the word out that you need magazines. Somewhere out there is someone with a set of old back issues of **Climbing** or *Backpacker*, and they would be delighted to get them out of the house and in the hands of someone who could use them. The most important point is to let people know that you welcome donations. Include a mention on your newsletters and brochures. Every so often suggest specific items that you need--a computer, van, raft. It may not produce anything, but at least it will start people thinking that you do accept equipment donations. If you don't tell them, they'll never know. Lastly, remind potential donors that you can provide them with a tax deduction for their donation.

CASH CONTRIBUTIONS

There are different ways to solicit cash contributions for the program. One method is making a donation box available in the office or at special programs. The most common method of soliciting cash contributions is to send out a letter. In order to conduct a direct mail campaign, you'll need to develop a mailing list. A good way to develop a list is to put out a sheet of paper at various program functions and have people sign up. Especially, keep track of alumni of your program. Those who have done activities with your program will be supportive. If you have evening programs and public events, it won't take too long to get a mailing list underway. Be aware that if you are in a college program, you can't expect to receive donations from students. They're pressed for funds and are not in a position to donate. Your best audience are those in the community and program alumni. That's why it's a good idea to make some or all programs open to the community. You can't expect the community to help if they don't have access to at least part of your program.

Scenario B

Ill-Structured Scenarios for Leadership: Scenario B

Before we get started, please give us a little information about you:

Date of Birth: _____

for example: (12/30/1987)

School or Branch: _____

Course Code: _____

(if you do not know your course code, please leave this blank)

Years of School Completed: _____

(for example completed high school is 12 years, completed college is 16 years)

Instructions: *The goal of this activity is to see how well you can apply your leadership skills to a new situation that you may not have encountered before. In front of you is a description of a problem and some follow up questions and a few pages of resources related to the problem. Please answer the questions are thoroughly as you are able and include evidence to support your answers. You may write on any part of this packet as you develop your answer, and may use the back side of pages if you need more space to answer. You will have 45 minutes to solve this problem.*

Problem B: RESTORE Club

Last May you were elected the president of your school's RESTORE club. Now it's a week before the school year starts in the Fall and are about to sit down with the rest of the board to make a plan for the coming school year. Your group promotes "green" activities on campus, like recycling, planting, etc. You have noticed in the last few weeks of school last year that there were a lot of water bottles in the trash bins and on the ground around campus that are not getting recycled. You did some informal questioning about the issue and found that about half the students you talked to said that they buy bottled water because they think filling a water bottle is too inconvenient. You think that the college's sustainability office might be able to help you, but you have never worked with them before, so you're not sure what they would be able to do. The sustainability office is offering a grant to student groups of $1,000 for new campus initiatives, but the application is due in three weeks.

Q1: What are some of the important things to consider in this situation? In one or two paragraphs, explain what they are and why they are important. (In your responses to all questions, feel free to include considerations that go beyond the immediate situation.) What is the problem? Are some of these considerations more important than others?

Q2: What do you think is an appropriate solution to this kind of problem? Please explain why your proposed solution is appropriate and will be effective.

Q3: Is this the best way to solve the problem? Could there be another way to solve this problem? Describe another reasonable response to this kind of situation. Compare the potential risks and benefits of this response with those of your original response.

Q 4: You will need to send a letter out to your club soon explaining the state of the club and your plans for this year. In 2-3 paragraphs please outline what process would you recommend for deciding how to respond to this situation. Please describe this decision-making process in general terms—in a way that would allow another person to use the process in a similar workplace situation—and explain why you would recommend each step in this process.

Q5: Of the following resources available to you, please mark one as the Most Valuable (+) and one as the least valuable (-).

Available resources:

____ Last's year's club spending
____ Budget for coming school year
____ Event schedule from last year
____ Sustainability grant application
____ Advice from a friend
____ Advice from faculty sponsor
____ List of Current club members & board members
____ List of other school clubs
____ Campus article on recycling

RESTORE Club — Last Year Spending

September		Participants	Cost	Total
Student Government Stipend		51	$100.00	$5,100.00
			$200.00	$200.00
				$5,300.00

Ongoing

			Cost	Total
Football	Staff	4	-$50.00	-$200.00
	Volunteers	0	$0.00	
	Starting Fee		-$21.00	-$21.00
Number of Games Covered			6	-$1,326.00
Basketball	Staff	2	-$50.00	-$100.00
	Volunteers	0	$0.00	
	Starting Fee		-$27.00	-$27.00
Number of Games Covered			10	-$1,270.00
Total Games Cost				-$2,596.00

Treasurer's Notes: This program ended up costing us $2,500 in funds this year. The volunteers helped keep costs down, but not enough maybe

September

		Participants	Cost	Total
Welcome Back Social	Food	35	-$10.00	-$350.00
	Room Rental	1	-$50.00	-$50.00
			Total	-$400.00
			Monthly Balance	-$400.00

October

E-Waste Recycling	Items	44	-$2.00	-$88.00
	Fliers	100	-$0.08	-$8.00
			Total	-$96.00
			Monthly Balance	-$96.00

Jan

Earth Aware Symposium	Food (per day)	2	-$153.77	-$307.54
	Room Rentals (per day)	2	-$200.00	-$400.00
	Fliers	212	-$0.08	-$16.96
			Total	-$724.50
			Monthly Balance	-$724.50

Treasurer's Notes: This event costs us, but we got great feedback on it. People said it was a

Feb

Seed Planting	Seeds	100	-$0.06	-$6.00
	Pots	97	-$0.53	-$51.41
	Soil (bags)	5	-$20.00	-$100.00
	Fliers	200	-$0.08	-$16.00
			Total	-$173.41
			Monthly Balance	-$173.41

March

Tree Planting (campus)	Food	30	-$4.40	-$132.00
	Trees (provided by facilities)	25	$0.00	$0.00
	Fliers	200	-$0.08	-$16.00
			Total	-$148.00
			Monthly Balance	-$148.00

April

Tree Planting (community park)	Food	30	-$5.75	-$172.50
	Trees (provided by facilities)	25	$0.00	$0.00
	Fliers	200	-$0.08	-$16.00
			Total	-$188.50
			Monthly Balance	-$188.50

TOTAL 2012/13	$973.59

Treasurer's Notes:

We ended this year with a good amount of money that went unspent. these funds don't roll over, so we should probably look at trying to figure out what to spend this money on next year so we don't just lose it

RESTORE Club — Current Year Budget

September	Participants	Cost	Total
Student Government Stipend	$0	$ 100.00	$5,000.00
		$ 200.00	$200.00
			$5,200.00

Ongoing

			Cost	Total
Football	Staff	$4.00	-$50.00	-$200.00
	Volunteers	$6.00	$0.00	
	Starting Fee		-$25.00	-$25.00
Number of Games Covered			$6.00	-$1,350.00
Basketball	Staff	$2.00	-$50.00	-$100.00
	Volunteers	$6.00	$0.00	
	Starting Fee		-$25.00	-$25.00
Number of Games Covered			$10.00	-$1,250.00
Total Games Cost				-$2,600.00

September

		Participants	Cost	Total
Welcome Back Social	Food	$40.00	-$10.00	-$400.00
	Room Rental	$1.00	-$50.00	-$50.00
			Total	-$450.00
			Monthly Balance	-$450.00

October

E-Waste Recycling	Items	$60.00	-$2.00	-$120.00
	Fliers	$100.00	-$0.08	-$8.00
			Total	-$128.00
			Monthly Balance	-$128.00

Jan

Earth Aware Symposium	Food (per day)	$2.00	-$150.00	-$300.00
	Room Rentals (per day)	$2.00	-$200.00	-$400.00
	Fliers	$200.00	-$0.08	-$16.00
			Total	-$716.00
			Monthly Balance	-$716.00

Feb

Seed Planting	Seeds	$100.00	-$0.05	-$5.00
	Pots	$100.00	-$0.50	-$50.00
	Soil (bags)	$5.00	-$20.00	-$100.00
	Fliers	$200.00	-$0.08	-$16.00
			Total	-$171.00
			Monthly Balance	-$171.00

March

Tree Planting (campus)	Food	$30.00	-$5.00	-$150.00
	Trees (provided by facilit	$25.00	$0.00	$0.00
	Fliers	$200.00	-$0.08	-$16.00
			Total	-$166.00
			Monthly Balance	-$166.00

April

Tree Planting (community park)	Food	$30.00	-$5.00	-$150.00
	Trees (provided by facilit	$25.00	$0.00	$0.00
	Fliers	$200.00	-$0.08	-$16.00
			Total	-$166.00
			Monthly Balance	-$166.00

TOTAL 2012/13	$803.00

Current RESTORE Club Roster

Board Members

President- you
Vice President- Rebecca Colby (Business Major)
Secretary- James Donovan (Education Major)
Treasurer- Scott Bacon (Finance Major)
Undergrad Rep- Sabrina Newfield (Psychology Major)
Grad Rep- Alexis Fieldstone (Recreation Major)

Undergraduate Students

1. Tom Wright
2. Duane Gustafson
3. Jake Jacobson
4. Brandon Mahoney
5. David Stellar
6. Adam Mayer
7. Kelly Mayer
8. Scott Appleton
9. Sarah Welbel
10. Jenny Scott
11. Lisa Swezey
12. Brett Swensen
13. Devon Thornley
14. Heather Bixler

Graduate Students

1. Earnest Teller
2. Patrick Perry
3. Danielle Grover
4. Kyle Ardell
5. Eve Bleier
6. John D'Alba

RESTORE Event Schedule

Upcoming Year

Ongoing
Sports game recycling collection

September
September 1
Welcome back Social

October
October 30
E-waste recycling day

January
Jan 16-17
Earth Aware Symposium
*student and faculty research presentation on climate, restoration, and related topics.

February
Feb 22
Seed Starting Workshop
*seeds, dirt, and containers provided by RESTORE.

March
Mar 7
Tree Planting- On Campus

March 14-16
Campus Garden work weekend

April
April 1
Tree Planting- Community Park

From: Joe Smith [joe_smith@university.edu]
Sent: Wednesday, August 24, 2012 11:26 AM
To: Me
Subject: Re: RESTORE Club- Faculty Sponsor Advice

Hi-

It was nice to see you too! I'm also looking forward to another year with the RESTORE Club. It's always such a great group of students to work with.

I think you have some valid concerns about the recycling on campus, we have seen more and more people drinking bottled water on campus, especially at sporting events. Every time I leave a basketball game I feel like there are bottles everywhere.

I agree with you, that there might be something that the club could do about it, but it could be a really big project that will take up a lot of resources. What do you think the real problem is? Are there not enough places to fill up bottles? Not enough incentive to recycle the bottles? I've noticed some other campuses are starting to put more water bottle filling stations around campus (instead of just drinking fountains, where you can fit a whole bottle underneath). I think these run about $2,000 each if you are installing new ones, abut about $500 to retrofit existing drinking fountains.

Do you think there are any other clubs on campus that would want to collaborate with you on this project?

Let me know if you need anything else from me.

- Prof Smith

From: Me
Sent: Wednesday, August 24, 2012 8:24 AM
To: Joe Smith [joe_smith@university.edu]
Subject: RESTORE Club- Faculty Sponsor Advice

Hi Prof Smith,

It was great to see you the other day, and I'm looking forward to a great year with the RESTORE Club. Thanks for agreeing to be our faculty sponsor for another year, I know the past board has always appreciated your help with the club.

I feel like it's been a few years since the club has taken on a big project, and I really think we need to do something to improve the recycling on campus, mostly the bottled water.

Any ideas?
Thanks!
Me

From: Kyle Lindblom [kyle@university.edu]
Sent: Wednesday, August 24, 2012 1:35 PM
To: Me

Subject: Re: RESTORE Club

Hey there-

I bumped into some of the other RESTORE club folks this afternoon and they said that there might be a big project coming up for the club this year?

I know there are a few games coming up soon. last year I helped the president coordinate recycling collection in the lobby, so let me know if you need my help again this year. I think last year we only had enough people and cans to do about half the home basketball games.

Lunch sometime this week? Also, are there any of those RESTORE water bottles around the club closet? I lost mine over the summer, and I used it all the time last year, there are like no drinking fountains near my classes this semester!

- Kyle

From: Me
Sent: Wednesday, August 24, 2012 7:24 AM
To: Kyle Lindblom [kle@university.edu]

Subject: RESTORE Club

Hi Kyle,

We're back!! Can you believe that we are seniors, it's crazy!!

Let's get together soon!
Me

CAMPUS SUSTAINABILITY GRANT PROGRAM – GUIDELINES

Purpose: To provide funding for competitive, student-proposed projects and initiatives designed to advance campus sustainability through education, research, service, and operations.
Deadlines: Pre-proposal – Oct 5 - Proposal – Oct 21 - Award Notification – Nov 9 - Project Completion – All project funds must be expended by June 30
Eligibility: Available to all current full-time UNIVERSITY students with a minimum G.P.A. of 2.0 on a 4.0 scale.
Amounts: A maximum of $5,000 is available for individual projects. Successfully approved proposals will receive funding based on merit and feasibility.

Proposal Instructions

Part I. Criteria

1. All proposals shall address a strategic priority or illustrative benchmark as stated in Direction VII of The University 2020 Strategic Plan.
2. Appropriate University departments must be contacted, and Faculty / Staff Sponsor identified, to ensure that proposed projects can be implemented. Priority will be given to collaborative projects with measurable outcomes that involve effective partnerships between multiple University students, faculty, staff, organizations, and/or departments.
3. Projects must be completed within the same academic / fiscal year that the project receives funding; all awarded project funds must be expended before June 30th.

Part II. Allocation & Selection

1. Funds allocation for successful proposals will be determined by the Campus Sustainability Grant Program Selection Committee.
2. The Campus Sustainability Grant Program Selection Committee will include 6 or more voting members - comprised of current University students, faculty and staff - with at least 50% student representation.

Part III. Application Requirements

1. Cover Sheet; 2. Proposal Overview (2-page limit); 3. Budget Sheet; 4. Implementation Plan (4-page limit); 5. Communications Plan (1-page limit); 6. Faculty / Staff Sponsor Letter of Support (1-page limit); 7. Additional Supporting Documents &/or Recommendations for Future Support (optional); 8. Report of Grant Project Expenses and Metrics (attach an outline of anticipated project metrics, 1-page limit)

Program Description

The Office of Sustainability solicits proposals from University students for financial support of educational, research, outreach, and operational projects and initiatives through the Campus Sustainability Grant Program. This program is sponsored through the allocation of student green fee funds. The goal of the program is to support and encourage the development of campus sustainability initiatives, programs, and/or projects proposed and in most cases carried out by students throughout the University. Grants can be considered "seed money," in that implemented projects could lead to the growth and development of ongoing campus programs. Applications for funding through the Campus Sustainability Grant Program will be accepted in the following areas: education, research, service and outreach, and campus operations.

Budget / Funding

Successfully approved proposals will receive appropriate funding based on merit and implementation feasibility. All Campus Sustainability Grant Program funds must be expended before June 30th and in accordance with UNIVERSITY policies and procedures. Campus Sustainability Grants may provide support for the following categories of expenditure:

- General expenses of project implementation, such as supplies, materials, services, etc., that are essential to completion of the project.
- Equipment essential to the research or operational program being proposed. All purchased equipment must specifically relate to the particular project and shall be the property of UNIVERSITY.
- Labor costs for personnel essential to the project, including UNIVERSITY student workers, Facilities Management Division employees and outside contractors / consultants.
- No food or beverages can be purchased with Campus Sustainability Grant funds.

Application Procedures and Documentation

Proposals should effectively communicate the significance of the proposed projects in advancing campus sustainability initiatives at UNIVERSITY and the goals, strategic priorities, or illustrative benchmarks set forth in Strategic Direction VII of the UNIVERSITY 2020 Strategic Plan. When required, the proposal should include sufficient detail to permit technical evaluation by those more familiar with the subject area. Proposals should also describe coordination with appropriate academic or operational departments required for implementation and verify commitment by those departments to assist implementation of selected projects.

Pre-proposal submission (optional): A pre-proposal submission to the Office of Sustainability is *strongly encouraged* for constructive feedback regarding proposal content and implementation feasibility. Pre-proposals should follow guidelines for the Proposal Overview, including a project description, expected outcomes, contribution to sustainability at UNIVERSITY, and a list of relevant partner organizations and/or departments (not to exceed 2 pages).

Proposal Application Format: Proposals must be 1) prepared using the Campus Sustainability Grant Proposal Application Form, 2) saved and entitled "*Proposer's Last Name*_Campus Sustainability Grant_*Project Title*.PDF" and 3) submitted in PDF format via email to the Office of Sustainability at sustain@University.edu by the midnight on the Proposal Deadline date.

The Proposal Application must contain the following components:

a. ***Cover Sheet.*** The first page of each proposal must be a completed Campus Sustainability Grant cover sheet indicating proposal participants, date, project title, and budget summary.

b. ***Proposal Overview*** *(2-page limit).* This section should briefly and clearly describe the project.

c. ***Compliance Requirements Form.*** This form *must* be submitted, indicating which areas of compliance (if any) will be required for the project. If your proposal is selected, funding will not be released until the compliance requirements have been met and certified.

d. ***Budget Sheet.*** The form provided will assist in deriving budget amounts for the proposal cover sheet and are important in providing additional information. Budgets will be evaluated during the review process. The Campus Sustainability Grant Program Selection Committee may adjust budgets as required or deemed appropriate.

e. ***Implementation Plan*** *(4 page limit).* Describe in detail methods and procedures for implementing proposed projects, including:

f. ***Communications Plan*** *(1-page limit).* Describe creative communication strategies that will be employed to promote the project, its outcomes, and sustainability at UNIVERSITY.

g. ***Faculty / Staff Sponsor Letter of Support*** *(1-page limit).* A letter should be completed by the applicant's faculty or staff sponsor and should 1) endorse the project and its significance with respect to campus sustainability, and 2) state willingness to actively engage in the project throughout the planning and implementation process.

h. ***Additional Documentation &/or Recommendations for Future Support*** *(optional).* 1) Additional supporting documentation including graphics, maps, etc. may be attached for consideration by the Selection Committee. 2) Potential sources of financial support for continuing a program initiated by the grant should be identified. If external support will be required, agencies to be approached should be specified. Also, if this research is included in any currently pending external proposal, that proposal should be identified. (Note: *Recommendations for Future Support* can also be submitted at the end of the project.)

i. ***Report of Grant Project Expenses and Metrics.*** Attach an outline of anticipated project metrics, 1-page limit. (Note: A completed written Report including photographs or other graphic media will be required upon completion of awarded projects.)

Grant Selection & Award Procedures

- All proposals must be submitted in accordance with program schedules, deadlines and other rules defined by this guideline.
- A pre-proposal submission is not required, but is strongly recommended to ensure project feasibility and to receive constructive feedback for incorporation into final proposal.
- Selected proposals may be invited for an open presentation to the Campus Sustainability Grants Program Selection Committee for final consideration of award. If requested, presentations shall be no longer than 15 minutes, followed by a period of questions and answers.
- Primary Student Investigator (Proposer) will be notified of project award and funding in accordance with the Campus Sustainability Grants Program schedule.
- All awarded funds must be expended by June 30th of the fiscal year in which the grant project is awarded.

Reporting Requirements for Awarded Campus Sustainability Grant Projects

The Primary Student Investigator (Proposer) on awarded projects is responsible for 1) presenting project information and progress (graphically and verbally) during UNIVERSITY Earth Week events in April, and 2) submitting a final written Report of Grant Project Expenses and Metrics by June 30th - including photos or other graphic media, project expenses, resources conserved, partnerships formed, educational benefit / academic courses engaged, return on investment, &/or other relevant metrics.

List of Student Groups

Academic/Honors: Organizations whose membership and activities require association with an academic department or a regional or national society with specific membership eligibility requirements based on grade point average and specialization in an academic field of study.

Women in Physics	Undergraduate Economics Association	Society of Physics Students (SPS)
Biomedical Engineering Society	the American Society of Mechanical Engineers Chapter for	American Indian Science and Engineering Society (AISES)
Club Geo	Undergraduate Students	
Leadership Institute	Contemporary Korea Studies Society	

Arts: Organizations that promote the fine arts, including drawing, filmmaking, graphic design, music, painting, photography, printmaking, and sculpture.
Alliance for Dance - Art of the Book Club - Art Trade - Cartooning Society - Irish Dancers - Knitting Club

Athletics/Games: Organizations whose activities involve education about and involvement in sports activities for personal growth and leisure. Intramural, club sports, and competitive athletic events with University-sponsored athletic teams must register with the Athletics Department.
Blue Aces - Club Swim Team - Colorguard Club - Outdoor Club - Paddling Club - Ski and Snowboard Club

Communications: Organizations that publish information on-line or in print medium.
All-Access - Politic, The - Fiat Lux: A Journal of Religious Life and Theology - Helicon: Undergraduate Journal of Classics - Her Campus

Cultural: Organizations that promote knowledge of and involvement in issues of class, diversity, ethnicity, and race.

808: The Hawai'i Club	Asian American Students Alliance	Eastern European Society	Minnesota Club
African Students Association	Black Women's Coalition	KASAMA:The Filipino Club	Undergraduate Canadian Students
Alliance for Southeast Asian Students	Brazil Club	Latin American Student Organization	Association

GLBT: Organizations whose primary activities are focused on gay, lesbian, bisexual, and trans-gendered issues.

Athletes and Allies	Prism	Resource Alliance for Gender Equity

Political/Student Government: American Civil Liberties Union - Freshman Class Council - Sophomore Class Council - Junior Class Council - Senior Class Council

Service/Outreach: Organizations that promote and are involved in community service work based in the City of New Haven, or who offer counseling services requiring specialized training in cooperation with University Health Services. Academic Associate Program

Amnesty International: College	Children's Theater	Future Project, The	RESTORE
Student Chapter	Circle of Women	PALS Tutoring and Mentoring	Uganda Hope Network
BookMarks	Emergency Medical Services	Public Health Coalition	

BOTTLED WATER REDUCTION

Actions at Other College: Other College is taking actions to reduce bottled water use. In the Fall of 2008 water fountains were upgraded with "water filler" attachments and new sinks were added in Usdan. All undergraduate students received a reusable water bottle in 2008- and incoming students will get a new one. Dining Services now offers water urns and containers for events. Students were encouraged to "Drink Responsibly" during a year long educational campaign- including tap water taste tests, contests, and movie showings.

A committee of students, faculty, and staff reviewed the issues involved in the use of bottled water on campus and submitted a report to the President in October 2008. The consensus of the committee was to restrict bottled water use where tap water was easily accessible, but to remain selling bottled water in the "convenience store" locations on campus with room to open discussion for further reductions at a later time. As of Fall 2009, bottled water is not sold in Usdan or Boulevard Cafe, locations where tap water is easily accessible and there had been a high volume of bottled water sales. The actions taken in 2008-2009 school year (water fillers, free containers, and educational activities) were crucial to implement before restricting sales- and have made this change easy for the community to adapt to. The Other College community is encouraged to avoid purchasing bottled water for events and daily use. If you need any help planning an event or have questions about reducing your bottled water consumption please contact, Campus Sustainability Coordinator.

Background Information

Environment and Energy: Bottled water use has implications for global warming pollution as well as additional environmental and social impacts. There is a great amount of energy wasted and there is uncertainty over the long-term health effects created by plastic containers made of petroleum products. While bottles can be recycled the process is still very energy intensive. Other College must also pay to dispose of waste- often individual bottles are put in the trash. While the rate of recycling at Other College maybe better, nationally 86 percent of water bottles in the United States are sent to landfills [1].At large events empty bottles can create unsightly litter. Additionally, bottled water must be trucked to campus using fuel and adding to traffic congestion. The Pacific Institute estimates that the total amounts of energy embedded in our use of bottled water can be as high as the equivalent of filling a plastic bottle one quarter full with oil.

Health: Bottled water can provide a convenient source of sanitary hydration, helping avoid medical issues in hot weather. However widespread use can be cited for negative health implications. Bottled water companies have long been charged with deceptive marketing practices that reduce confidence in local water supply. Other College is served by the City of Waltham's water supply, comes from the Massachusetts Water Resources Authority (MWRA) which is known to provide healthy and safe drinking water. Often bottled water is found to be less healthy or contain fewer minerals than typical tap water because of lower standards of regulation[3]. Dasani, the brand purchased through Aramark is just processed tap water[4]. Poland Spring, which maintains many of the office coolers on campus, does comes from a spring source that has additional minerals. However, many health advocates believe tap water is a better choice than office coolers as the stations are not frequently cleaned- leading to spread of disease.

Social Justice and Financial: Bottled water presents social justice implications; it can deplete areas of their water supply through privatization. Using bottled water could even reduce funding for tap water protection leading to equity issues for low income people. Bottled water can cost 1,000 times more than tap water, a cost much of the world will not be able to afford. While there may be additional labor costs to provide tap or filtered water at large events and in dining locations, the cost expenditure of single serve bottled water will continue to rise. Investing in alternative methods of providing drinking water is a hedge against these costs. Other College is already paying a "fuel surcharge" on office water coolers and this charge could rise.

Action on the Issue: Cities and institutions across the country are focusing on the economic implications of bottled water use - frequently disallowing the purchase of bottled water for official purposes, and reducing access in dining facilities. The President's Office at Johns Hopkins University is discontinuing bottled water in their operations.[5] Salt Lake City, San Francisco, and New York have restricted the municipal purchase of bottled water. Mayor R Anderson of Salt Lake City described the "total absurdity and irresponsibility, both economic and environmental, of purchasing and using bottled water when we have perfectly good and safe municipal sources off tap water.[6]

Sources:
[1] Earth Policy Institute."Bottled Water Boycotts Back-to-the-Tap Movement Gains Momentum. 2007. [2] The Pacific Institute.Bottled Water And Energy. 2006. [3] Natural Resources Defense Council. Bottled Water: Pure Drink Or Pure Hype?. March 1999 . [4] Earth Policy Institute."Bottled Water Boycotts Back-To-The-Tap Movement Gains Momentum. 2007. [5] Brody, William R. "Thinking Out Loud". The JHU Gazette April 2, 2008.. [6] Earth Policy Institute."Bottled Water Boycotts Back-To-The-Tap Movement Gains Momentum. 2007

APPENDIX B

SCORING RUBRIC FOR ILL-STRUCTURED PROBLEM SCENARIOS

Scoring for ISP Leadership Scenarios
(Based on Ge, 2001 & Bixler, 2007)

Q1: What are some of the important things to consider in this situation? In one or two paragraphs, explain what they are and why they are important. (In your responses to all questions, feel free to include considerations that go beyond the immediate situation.) What is the problem? Are some of these considerations more important than others?

Q2: What do you think is an appropriate solution to this kind of problem? Please explain why your proposed solution is appropriate and will be effective.

Q3: Is this the best way to solve the problem? Could there be another way to solve this problem? Describe another reasonable response to this kind of situation. Compare the potential risks and benefits of this response with those of your original response.

Q 4: You will need to send a letter out to your club soon explaining the state of the club and your plans for this year. In 2-3 paragraphs please outline what process would you recommend for deciding how to respond to this situation. Please describe this decision-making process in general terms—in a way that would allow another person to use the process in a similar workplace situation—and explain why you would recommend each step in this process.

1.0 Representing the Problem (10 points)

	Score	Description	Criteria	Sample of Criteria	Example from Study (criteria in context)
1.1 Define the problem	0	No problem stated			-
	1	Problem stated vaguely or incompletely		*We need to increase our membership*	"The main thing to consider is getting 30 more people to join the club."
	2	Problem clearly stated		*We aren't going to have enough funding to run our programs this year if we don't increase our membership. We either need to figure out how to do more with less or increase our membership*	"Some important things to consider would be trying to gain members who that the club can get full funding from the SGA. This is important because the club will need the money that the SCA will provide for events this year.
1.2 Generating Subgoals	0	no subgoal stated			-
	1	at least one goal stated, but vague or generally		*to increase membership*	"…thing is to try harder to get the word out there about the club…"
	2	at least one goal is clearly and completely stated		*to ensure that the club has adequate funding to provide events and outings this year.*	"Without additional members the club will not receive enough funding to do all the trips that we have planned for the year"
1.3 Identify relevant info (listed in the problem)	0	0 known factions and constraints are identified	Known Factors (identified in the problem): - time - number of current group members - target audience		-
	1	1-2 known factors and constraints identified			"…so many people graduated so there's not enough members to create the club…"

	2	3-4 known factors or constraints identified	- what the club wants in members - information from resources		"you are going to need to figure out how to sell this to the sustainability office so that they will help you. Also you need to consider why students are leaving bottles around campus and where they are leaving them."
	3	5-7 factors or constraints identified.			"We need to consider the timing of sporting events, cost of water bottle filling stations, or retro fit of stations, cost of the grant, timing of the grant proposal, timing to complete the project in one year, and other factors."
1.4 Seek Needed Info (information sought or leveraged not present in problem or resources)	0	0 known factions and constraints are identified	Seeking new information: - leadership skills - leadership styles - gathering information - other novel ideas		-
	1	1-2 known factors and constraints identified			"you need to figure out why students aren't recycling before you can really solve the problem"
	2	3-4 known factors or constraints identified			"...what are some of the additional trips that members want to have? Can we budget for them? How much time are we going to have to pull the budget together?"
	3	5-7 factors or constraints identified.			There is not a lot of time to gather a mixed team of people from the university (like council reps from each grade, university faculty, sports coaches, campus special events coordinator), and then complete extensive paperwork.it is important to move quickly to get somewhere financially"
2.0 Developing Solutions (8 points)					
	Score	**Description**	**Criteria**	**Example**	Example from Study
2.1 Selecting or Developing Solutions, with explanations	0	no solution stated			-
	1	not explained solution	a solution is selected, but without any explanation as to how it works	*we'll do a membership drive*	"Filling water on campus. It removes one part of the problem completely"
	2	minimal explanation solution	a solution Is selected but with minimal exploitation to how it works	*we'll host an event to promote the club and gain new members through increased exposure*	I think coming up with a comprehensive and effective recycling program will be the most appropriate and effective. I also think it would be important to find a good way to market this plan."

	3	well developed solution	a solution is selected is selected or developed with explicit explanation on how it works	*we'll get a table at the club fair (which is free) and bring some borrowed games from the outdoor club and host a contest to draw people into the booth. This would be cost effective given the budget problem and high profile to increase club membership*	"An appropriate solution to this kind of problem would be to advertise and get the word out about what the club is and what it does. This could help get people interested and want to join the club. This will be effective in spreading the word and informing students about the club so that it can gain 30 members."
2.2 Quality of solutions	0	no solution stated	Factors for assessment: (a) arriving at a solution (either increasing membership or redoing the budget to function with less funds) (b) Number of factors addressed in supporting solution		-
	1	poor		*it will increase our membership*	"Banning bottled water on campus, it removes one part of the problem completely."
	2	weak		*it will increase our membership because more people will see our booth*	"The club should work with the sustainability office and find a way to make resuable water containers easily accessible. There should also be some sort of education on the importance of disposing of waste properly"
	3	good		*it will increase our membership because we will increase our visibility and show people how much fun they can have in our club*	"Upgrade water fountains with a water filler attachment on campus so it's easy and accessible. Start a year long educational campaign which would include tap water taste tests, contests and moving showings".
	4	excellent		*our problem is that we need to have more members to get full funding, so because our current members are so fun and energetic, we will provide an opportunity for the school to see how much fun our club is through the club fair that will hopefully lead to increases in membership and funding*	"One solution is to make the recycling process more obvious and convenient. Recycling bins are cheaper than installing new drinking fountains. Also, the application for the grant is important as well that would open up options for more expensive solutions such as retrofitting drinking fountains and maybe installing a new one"
	5	exceptional		*our problem is that we need to have more members to get full funding, so because our current members are so fun and energetic, we will provide an opportunity for the school to see how much fun our club is through the club fair that will hopefully lead to increases in membership and funding. By increasing our funding we will be able to provide more trips and programs for our members.*	"I think the appropriate solution would be to do three things. First off to install more water fountains around campus so there isn't an inconvenience to walk around refill up. Secondly grab students attention by doing something that engages them in wanting to recycle or refill up water bottles. Thirdly, resent a presentation on what happens when things don't get recycling so that people are then more motivated to recycling in order to prevent the awfulness of what happens when you don't recycle."

3.0 Making Justifications for solutions (7 points)					
	Score	**Description**	**Criteria**	**Example**	Example from Study
3.1 Constructing an Argument	0	No subgoal stated	premises are missing, and no factors or constraints are discussed		-
	2	At least one goal for the problem is clearly sated but it is vague or general	irrelevant or incoherent premises are provided to support the proposed solution, and factors or constraints are partially discussed	*We will increase our membership because other students will see how cool the outdoor club is because we are really popular.*	"Raising awareness will lead to people talking about the group and they may become more interested"
	4	good argument	coherent and persuasive premises are provided to support the proposed solution and actors or constraints are discussed	*I think that by getting a booth at the club fair we will increase our membership because we didn't do this last year, and we didn't get any new members. Therefore, we are trying something new to increase our visibility and let the campus community see what we have to offer. Then, by increasing our membership we can achieve our larger goal of increasing the funding for our club and being able to offer more trips and programs.*	"The positive side to a recycling center is it would be centralized on campus for ease of access. The downside is that installing or building one would cost a lot of money."
3.2 Providing Evidence	0	no evidence provided			-
	1	evidence to support the argument is weak or irrelevant	the evidence is not plausible ore relevant at all	*I think people will sign up for our club because we are there.*	"I have seen water fountains that have another faucet for filling water bottles" (86)
	2	evidence to support the argument is relevant	the evidence is plausible or based on imagery examples	*I think that if we let students know the types of trips and activities that we do, that we will attract members*	"A lot of students feel rush and the conventional water fountains don't fill bottles fast enough, this solution could help change the minds of students" (179)
	3	evidence to support the argument is strong and relevant	evidence has been tested, or is based on the previous experience or real examples	*We have done these tables in past years, and they have been a successful recruitment tool. We didn't do it last year because we didn't think it was worth the money, but we ended up really struggling to get members, so I think this year we should do it again.*	"There is not enough info for a full solution yet. The food service company may not be willing to stop selling bottled H20. The sustainability center may have already tried to solve this problem. There may not be enough time to interview the important people."

4. Monitoring and evaluating problem space and solutions (7 points)					
	Score	**Description**	**Criteria**	**Example**	
4.1 Evaluating Solutions	0	solution is not evaluated	no statement is made about the effectiveness or benefits of the solution		-
	1	evaluation of the solution is stated, but no reasoning is provided, no constraints mentioned	a statement is made about the effectiveness of the solution but the constraint of the solution are no mentioned	*Yes, this will work.*	"I believe this is the best way to solve the problem"
	2	the proposed solutions is evaluated, and constraints mentioned, but no reasons are provided	a statement is made about the effectiveness or benefits of the solution, and the constraints of the solution are mentioned but not discussed in relation to pros and cons are not mentioned	*Yes this will help us get more members because it will increase our visibility.*	"Getting people to join by being interactive is an excellent way to engage people to become interested in joining a club"
	3	the proposed solution is evaluated, and constraints are discussed, supported with reasoning	a statement is made about the effectiveness or benefits of the solution. The pros and cons of the solution are discussed, supported with relevant evidence as well as how constraints can be overcome.	*Yes this will help us get more members because it will increase our visibility and is relatively cost effective way to advertise our club compared to other ways.*	"I believe this is the best solution. This solution will make filling bottles less of an inconvenience but won't totally love the problem which will still allow the school to make money of selling water bottles at sporting events"
4.2 Assessing Alternative Solutions	0	no alternative presented			-
	1	alternative solution is stated, but no reasoning presented	at least one optional solution is stated, but the constraints or reasoning for that solutions is not discussed.	*We could change our budget instead of trying to get more money.*	"Instead of going to the fair they could just do our own even with incentives."
	2	alternative solution is stated but the viability of the solution is not discussed. (Pros or Cons, not both)	at least one optional solution is discussed over the others, with constraints discussed.	*we could change our budget to work with less funds. We have some trips (the ski trip) that cost the club lots of money*	"Another way to minimize the number of projects that they club works on in order to maximize funds and efforts put into recycling."

	4	alternative solution is stated, and the viability of the solution is discussed	at least one optional solution is discussed. Reasons are given on why an option is selected over the others with the constraints discussed
5. Problem Solving Processes (7 points)			
	Score	**Description**	**Criteria**
5.1 Identification of problem solving processes	0-7	Number of phases Identified	Phases 1 Articulate problem space and contextual constraints 2 Identify and clarify alternative opinions, positions, and perspectives 3 Generate possible problem solutions 4 Assess the viability of alternative solutions by constructing arguments and articulating personal beliefs 5 Monitor the problem space and solution options (is the problem solvable?) 6 Implement and monitor the solution (will the solution work?) 7 Willingness to adapt the solution

We could change our budget instead of trying to raise membership to get more money. By looking at the budget we might decide that we can do other activities that cost less, or ask the members to contribute more to the trips. I think this would work because students would be willing to pay a bit more for each trip over not going on the trips at all.	Another way to solve this problem could be to invite members from clubs that are similar to the Outdoor Adventure club. For example, a club focused on keeping the environment clean would be a good club to partner with. The benefit is that everyone would like being outdoors. The risk is that certain members could not be active/athletic and would not want to participate in events.

Example	Example from Study
I would tell them that they really need to think about what they are tying to accomplish with the club that year, and figure out how much money they think they will need. They could try to raise membership and money, but they also cold decided that they can do with less money. Then they should decide to do a membership drive or not and then figure out whether or not that is going to be worth the time and money invested. They can look at what we did this year and see if it worked or didn't and how that might impact their decision, they can also talk to other group members to see what they think about your plan. Then just do it. As you are working on setting up the new plan keep checking in that you are still making good decisions leading up to the membership drive or fund raiser and be willing to change course of something changes or there are better ideas that come up.	I would look at all the possible information I have available, I would consult those whose opinion I trusted. Once I have analyzed the data, I would be assertive with my decision. By using all of our resources and data it is just about broadening your view to see what really looks best. To take your time and analyze assures it is not a "terrible" idea. And driving toward the solution assure that it gets done. While consulting others can help with your decision making, but it can also help get supporters behind you." (Score of 7)

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