ANALYSIS OF CREATIVE AND EFFECTIVE TEACHING BEHAVIORS OFUNIVERSITY INSTRUCTORS

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by

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The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled:

ANALYSIS OF CREATIVE AND EFFECTIVE TEACHING BEHAVIORS OF UNIVERSITY INSTRUCTORS

Presented by Mollie S. Aschenbrener

a candidate for the degree of Doctor of Philosophy

and hereby certify that in their opinion it is worthy of acceptance.

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DEDICATION

This work is dedicated to my family.

This sounds so easy, yet the past three years my family has made many, many sacrifices to allow me to complete graduate school. Even on the worst days, I arrived home to three sets of arms which never failed to remind me what is truly important in life.

Ashton, Lauren and Gavynn Rose, thank you for all you have done to allow mommy to become "Dr. Aschenbrener." Moving two thousand miles away from friends and family has not been easy, but we have found out our family is strong when we are bonded by faith and love. While I have learned many things during the past three years, nothing compares to what you teach me every day. Initials will fade and this dissertation will become achieved, but my love for my children will live eternally. Thank you kids for making life so much fun.

To my extended family, thank you for your prayers and support. Mike and Ginger, thank you for understanding that God lead us here and thank you for supporting us from so far away. To my sisters, thank you for everything! Much of what I learned about children started with our "little girls" and I will always treasure those memories. Robin, thanks for understanding and supporting my decision to attend school… again! Anna, thanks for teaching me about patience and sacrifice as you take care of your little ones. Polly, I simply cannot thank you enough for the countless phone calls and moral support. I love you girls! Mom and dad, thanks for everything. Mom, your dedication and work ethic are beyond reproach. Thanks for giving all you had to allow us opportunities in life. Dad, thanks for giving me a love for the land and ties to an amazingly large and strong family. And to my precious Meme, thanks for giving so

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short of inspirational. Your devotion to teaching and changing the lives of your students is simply amazing. Your Kemp Teaching Award simply validates what so many of us already knew; you are an outstanding instructor! However, it is the impact you have made beyond the classroom that I will treasure the most. After studying creativity intently for the past year, I can honestly say you are one of the most creative individuals I have ever met! Watching you develop an idea or implement a teaching method has been a tremendously positive experience for me. I remember hearing "Rob's an idea guy." Your ideas are amazing. Thanks for sharing your ideas for this dissertation and being willing to travel a difficult and tenuous path. Although the way, you have demonstrated your faith, helped me when mine has been tested, and somehow managed to serve as an example to many. Your physical stature pales only to the height of your Godly character. I am so grateful for the opportunity to work with you!

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ANALYSIS OF CREATIVE AND EFFECTIVE TEACHING BEHAVIORS OF UNIVERSITY INSTRUCTORS

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Robert Terry, Jr., Dissertation Supervisor

ACADEMIC ABSTRACT

The purpose of this study is to explain and predict creative and effective teaching of university instructors. Specifically, the use of student evaluations, self-reported teaching evaluations, and standardized creativity instruments were used to assess instructor creativity. In addition, students' perceptions of their instructor's creativity in teaching were compared with instructor's self-reported creativity in teaching. The creativity of instructors, as assessed by a standardized creativity instrument, was also compared to the perceptions of effective teaching held by their students and the self-reported instructor evaluations.

There were two populations identified for this study. The specific criteria for the first population included instructors teaching all sections of undergraduate courses in the College of Agriculture, Food and Natural Resources (CAFNR) at the University of Missouri (MU), excluding seminar, research and special problems courses, in the 2007 fall semester (N= 44). The list of CAFNR instructors generated by the researcher through the student course selection (myZou) was cross-referenced with the list generated by CAFNR administration. The instructors who were identified as the subjects for the initial segment of the study were also used to establish the frame for the student population.

The population for the student component of the study included all students enrolled in College of Agriculture, Food and Natural Resources (CAFNR) courses being taught by CAFNR instructors who had previously been identified as the population for

the instructor component of this study. Probabilistic sampling was used for the student population. A response rate of fifty percent or a minimum number of 30 was required for each cluster to be included in the population.

This study was descriptive correlational in nature. The use of a time and place sample, as suggested by Oliver and Hinkle (1982), was justified because the instructor population could be considered representative of future populations in CAFNR at MU.

Little relationship was found between instructors' perceived creativity, norm-referenced creativity, and students' perceived creativity; however, both instructors and students agreed that creative teaching behaviors occur in CAFNR courses. Further, students suggested CAFNR instructors are effective teachers. A very high correlation was found between students' perceptions of creative teaching behaviors of instructors and students' perceptions of effective teaching. Creativity, as measured by the (Abbreviated Torrance Test for Adults) ATTA, was substantially higher for participants than for norm-referenced populations.

In addition, little differences were found between disciplines, sex, and teaching experience and the three measures of creativity. Students' perceptions of instructors' creative teaching behaviors, however, were significantly different when compared to students' perceptions of effective and in-effective teachers.

Finally, only 1.9% of the variance in norm-referenced creativity was found to be predicted by the linear combination of age, sex, and teaching discipline. Approximately 12% of the variance in self-perceived creativity could be accounted for by the linear combination of age, sex, and teaching discipline.

These findings suggest much of the variance in creativity is yet to be explained. In addition, the construct of creativity and its relationship to teaching is multifaceted and challenging to measure. Future research efforts may focus on the specific role(s) creativity plays in effective teaching.

CHAPTER ONE

INTRODUCTION

Creativity has been described by such early philosophers as Plato and Aristotle and championed as an important concept of study since John Dewey (Starko, 2005). Plato suggested creativity relied on an external source and involved a mystic quality. However, "Aristotle argued that creative processes must obey understandable natural laws" (Starko, p. 47). John Dewey offered one of "the earliest contemporary models of creativity" (p. 40) through the problem solving model he developed in 1920 (Starko). More recently, Guilford's 1950 presidential address to the American Psychological Association APA) resulted in creativity becoming the focus of considerable psychological research (Bleedorn, 2003, 2005; Cropley, 2001; Fasko, 2000-2001; Mumford, 2003; Runco, 2000-2001).

Despite historic references, defining creativity has been a difficult task (Baker et al., 2001; Friedel& Rudd, 2005; Hocevar, 1981; Marksberry, 1963; Sternberg, 1999; Starko, 2005). In fact, apparent ambiguous definitions of creativity have some researchers concerned (Cropley, 2001; Plucker, Geghetto& Dow, 2004). "The lack of a common definition is a major, debilitating weakness" (Plucker et al., p. 93). Plunker et al. investigated over 90 articles from 2 leading creativity journals and found only 34 (38%) that explicitly defined the term *creativity*. Thirty-seven (41%) offered an implied definition, while 19 (21%) failed to offer any definition. They stated, "unless the definitional problem is addressed, creativity research will continue to be impeded by lack of direction, damaging mythologies and general misunderstanding" (Plunker et al., p. 92).

Torrance (1995), known as a leader in creative research, defined creativity as "the process of forming ideas or hypotheses, testing hypotheses, and communicating the results" (p. 23). Perkins (1988) defined creativity in terms of creative results, which are both original and appropriate. "A creative person – a person with creativity- is a person who fairly routinely produces creative results" (p.13). Maslow (1968) described creativity as "a fundamental characteristic, inherent in human nature, a potentiality give to all or most human beings at birth, which most often is lost or buried or inhibited as the person gets enculturated" (p. 143). Starko (2005) defined creativity as a product or idea that is original or novel to the individual creator. Appropriateness of creativity must take into account the cultural context in which it is displayed (Starko). This is important given the difference of creative expression between cultures, especially between Western and Eastern interpretations (Starko).

Assessments of Creativity

If defining creativity is complex, assessing creativity may be an even greater challenge. In fact, Hocevar (1981) stated, "perhaps no psychological concept has proven to be as difficult to measure as creativity" (p. 450). As a result of numerous complex creativity models, many types of creativity assessments have been developed (Feldhusen & Eng Goh, 1995). Treffingler (1987) suggested creativity assessment is particularly difficult, given test developers lack a single, unifying theory of creativity from which to formulate assessments. Feldhusen and Eng Goh concluded, "most efforts to assess creativity have focused on persons and their cognitive abilities, personality characteristics, motivations or background experiences" (p. 235).

Torrance (1995) suggested creativity is "a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing knowledge, missing elements, disharmonies, and so on" (p. 6). The Torrance Tests of Creative Thinking (TTCT) was created within an educational context (Anastasi, 1976). The TTCT contains 12 tests that are grouped into three specific batteries. The batteries include: Thinking Creatively with Words; Thinking Creatively with Pictures; and Thinking Creatively with Sounds and Words (Anastasi, 1976). Each activity measures components of creativity. For example, Thinking Creatively with Pictures uses drawings to assess fluency, originality, elaboration, abstractness of titles, and resistance to closure.

Researchers have also examined self-reported measures of creativity (Ruscio, Whitney & Amabile, 1998). In fact, Hocevar (1981) suggested, "perhaps the most easily defensible way of identifying creative talent is in term of self-reported creative activities and achievements" (p. 455). Hocevar acknowledged creativity can be valued by society as important in a number of different fields. Self-reported measures may have an additional advantage. The individual can provide the most information about creativity because he or she knows themselves better than teachers, supervisors or peers (Hocevar). "A useful way to measure creativity is to simply ask the subject. This is not a profound position, but yet the procedure is rarely used" (Hocevar, p. 459). In addition, past behavior is considered by some to be the best indicator of future creativity behavior (Hocevar). Barron and Harrington (1981) explored more than 70 studies, finding creativity tests often produced significant correlations with real life creative performances.

As a result, some researchers have suggested multiple methods to assess the creativity construct. “The most condemning problem associated with the measurement of creativity is the lack of convergent validity among different methods. Since each method is purported to be measuring creativity, it is reasonable to predict that they be correlated, thus satisfying a minimum condition of convergent validity” (Hocevar, 1981, p. 457). According to Hocevar, multiple methods of assessing creativity have had mixed results, however, few studies have shown a correlation higher than .30. Therefore, a variety of methods should be used to assess creativity.

Feldhusen and Goh (1995) stated: “Assessment of such a multidimensional construct as creativity requires multiple channels of measurement such as tests and inventories” (p. 240). Feldhusen and Goh also suggested that the three most effective measures of creativity include “measures of ideational fluency, a person’s past creativity achievements and activities, and an evaluation of current products” (p. 240).

Attributes of Creativity

Once thought of as only an artistic quality, creativity is sought after by engineers, executives, and researchers (Anastasi, 1976). The call to investigate creativity was issued through Guilford’s 1950 presidential address to the American Psychological Association (Ai-Girl & Lai-Chong, 2004; Bleedorn, 2003, 2005; Cropley, 2001; Fasko, 2000-2001; Mumford, 2003; Runco, 2000-2001; Sternberg, 2006). According to Marksberry (1963), three basic premises outline conclusions of creativity research. First, there appears to be a positive correlation between creativity and intelligence, although not by those of highest intelligence. Second, there are levels or grades of creativity. Thus, there are some people who are more creative than others, illustrating that creativity lies on a continuum. Third,

creativity is “a constellation of primary attitudes, psychomotor skills, and knowledges which can vary with the different spheres of activity” (Marksberry, p. 7). Attitudes that describe creativity include:

> Curiosity about the environment, open-mindedness, wondering or inquiring about things, objectivity, flexibility, intellectual playfulness and humor, indifference toward conformity to many cultural stereotypes, willingness and eagerness to try new ideas, willingness to work long hours over long periods of time, willingness to be alone physically and figuratively, confidence in one’s own ability, sensitivity to various sensory stimuli in the environment, and strong interests (Marksberry, 1963, p. 7).

Cropley (2001) also suggested that creativity is a characteristic of all people, although to differing degrees.

Some researchers suggest creativity lies on a continuum (Amabile, 1996;Cropley, 2001; Marksberry, 1963) ranging from sublime to everyday creativity (Cropley). Cropleydescribed sublime creativity as those creative products that have been validated and recognized in the world arena. For example, sublime creativity would define those who have won a Nobel Prize, Pulitzer Prize or other such outstanding accomplishment (Cropley). Some researchers believe there is an inclination to investigate these prominent individuals to help explain the creative process (Feldhusen& Eng Goh, 1995). Everyday creativity is a personal characteristic, regardless of creative product outcomes (Cropley). It appears that sublime or everyday creativity can be enhanced and developed with practice and encouragement (Cropley). If creativity can be taught, the need for an educational perspective on creativity becomes apparent.

Creativity in Education

Since the late 1990s, creativity in education has been viewed as globally relevant in ways never seen before (Craft, 2005). Torrance (1995) noted the changes in creativity research and called it "A Quiet Revolution" (p. 3).The *revolution* has created challenges and caused change, including a greater emphasis on promoting creativity of students and rewarding the creativity of teachers (Craft). Focusing on teachers, Torrance called creative teachers great teachers who are "involved in discovery, pushing the limits, taking a step into the unknown" (p. 107), and engaging students in the process. This increased emphasis on creativity, especially in education, can be linked to "*Sputnik*shock," a time after the Russian *Sputnik* spacecraft was launched. Educators in the United States suddenly realized American students were falling behind (Torrance). More specifically, students were being taught to apply only what they had already learned (Cropley 2001; Torrance). As a result of the launching of *Sputnik*, the educational application of creativity and creativity testing exploded onto the research horizon (Craft; Cropley; Gowan, Khatena, & Torrance, 1981; Hocevar, 1981; Torrance).

Theoretical Framework

It is not surprising that creativity has been viewed through differing theoretical lenses, given the complexity of defining creativity. For example, Starko (2005) identified several theoretical frameworks for creativity, including psychoanalytical theories, humanist and developmental theories, behaviorist or associationist theories, cognitive theories and systems theories. Theorists ranging from Freud and Maslow to Guilford and Gardner have developed creativity theories (Starko). Recently, the complexity of

measuring creativity has led some researchers to suggest multiple methods to assess the creativity construct (Feldhusen&Goh, 1995).

Historically, Guilford's (1956) intellect model became a foundation for labeling components of divergent thinking as a means to assess creativity. In turn, divergent thinking has become a major component of many assessments (Guildord; Hocevar, 1981; Torrance, 1995). Three measurements of creativity, using divergent thinking, have been identified as fluency, flexibility, originality, and elaboration (Guilford; Massialas&Zevin, 1967; Plunker et al., 2004; Starko, 2005; Torrance).

The measurement of creativity as a portion of divergent thinking resulted from Guilford's Structure of the Intellect (SOI) model (Starko, 2005). Guilford clearly saw creativity as an intellectual function (Starko). Some researchers have suggested a creative individual should demonstrate attributes of divergent thinking. Therefore, tests for divergent thinking measure creativity (Guildord, 1956; Hocevar, 1981; Torrance, 1995). Basic components to evaluate creativity include novelty and appropriateness (Starko, 2005). Many researchers suggest creativity is comprised of three factors, including: novel, effective for others, and ethical or of some good for society (Cropley, 2001; Fox, J., & Fox, R., 2000; MacKinnon, 1962; Torrance).

The educational impact of creativity has been championed by many researchers (Anderson, 2002; Bleedron, 2003, 2005; Chambers, 1973; Crockenberg, 1972; Cropley, 1967, 2001; Esquivel, 1995; Fasko, 2000-01; Fox, J., & Fox, R., 2000; Gowan et al., 1967; Hocevar, 1981; MacKinnon, 1962; Massialas&Zevin, 1967; Plunker et al., 2004;Renzulli, 1992; Ruscio et al., 1998;Starko, 2005; Sternberg, 2006; Tan & Law, 2004;Torrance, 1995). More specifically, the connection between creativity and effective

teaching has been suggested by many researchers (Anderson, 2002; Bain,2004; Bleedron, 2003, 2005; Chambers, 1973; Croply, 1967, 2001; Davidovitch&Milgram, 2006; Esquivel, 1995; Fasko, 2000-01; Milgram, 1979; Newcomb, McKracken and Warmbrod, 1993; Renzulli, 1992; Torrance, 1981, 1995).

Need for the Study

Renzulli (1992) postulated a developmental theory suggesting teachers are a key component of developing creativity, both as mentors and role models. Fasko (2001) summarized Renzulli's cautions by suggesting, "Renzulli's major concern was in how educators can promote a disposition for creative production" (p. 322). Chambers (1973) found college teachers could encourage creativity in students and that "students viewed these teachers as being more accessible to them, committed to their field, enthusiastic, and intellectually challenging" (Fasko, p. 322). However, can we identify these teachers as creative teachers? If creative teaching is linked to effective teaching, can identifying creative teachers identify effective teaching? And, if students identify creative teachers as effective teachers, do instructors believe they are creative teachers?

Future creativity research in education has many possibilities. Sternberg (2006) recently suggested, "… to the extend that creativity is in the interaction of person with context, we need to concentrate as well on the attributes of the individual and the individuals' work relative to the environmental context" (p. 95). In addition, Mumford (2003) posed this question: "Exactly what are the effects of creativity on the individual, the people around him or her and the broader social system" (p. 117)? Esquivel (1995), exploring the context of creativity and teaching, posed the question, "Do teachers need to be creative themselves in order to be creative teachers" (p. 190)?

Research addressing these types of creativity questions appears to be lacking in educational research, particularly in subject specific areas such as agricultural education. Although a few preliminary creativity studies have been conducted in agricultural education, (Aschenbrener et al., 2007; Baker et al., 2001; Friedel& Rudd, 2005), a research gap still exists. One model of possible research is illustrated in Figure 1.

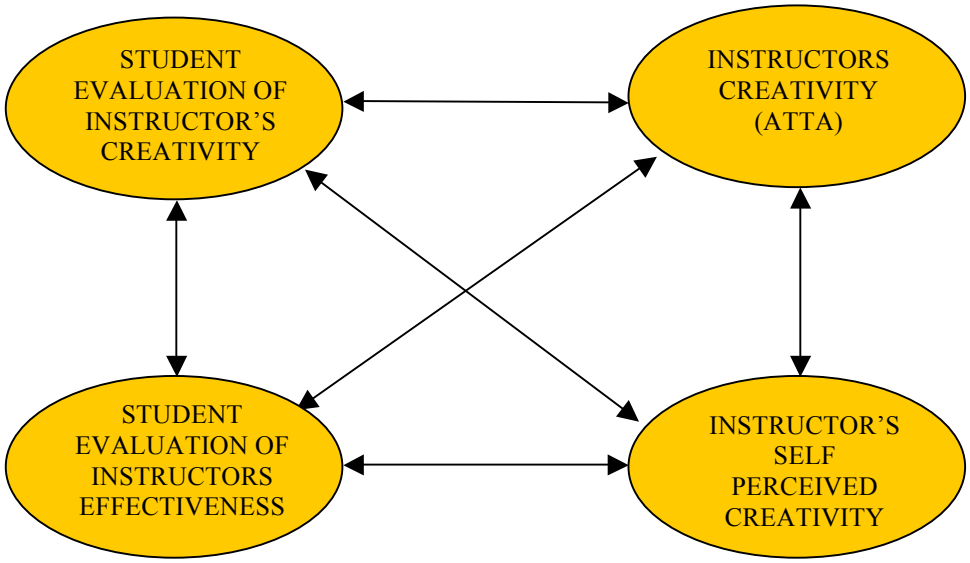

Figure 1. Measures of instructor creativity.

Statement of the Problem

Cropley (2001) stated, "Creativity offers classroom approaches that are interesting and thus seems to be a more efficient way of fostering learning and personal growth of the young. *Creativity helps children learn and develop*" (p. 28). Although creative instructors may positively impact the student-learning environment, little research has focused on teachers' creativity. While some may suggest creative teaching is effective teaching (Anderson, 2002; Bain, 2004; Bleedron, 2003, 2005; Chambers, 1973; Croply, 1967, 2001; Davidovitch&Milgram, 2006; Esquivel, 1995; Fasko, 2000-01; Milgram,

1979; Newcomb et al., 1993; Renzulli, 1992; Torrance, 1981, 1995), concrete measures that define creative teachers appear to be lacking. Finally, research about creativity in subject-specific areas such as agricultural education is also lacking.

Purpose of the Study

The purpose of this study was to explain and predict creative and effective teaching of university instructors. Specifically, student evaluations, self-reported teaching evaluations, and standardized creativity instruments were used to assess instructor creativity. In addition, the students' perceptions of their instructor's creativity in teaching were compared with instructor's self-reported creativity in teaching. The creativity of instructors, as assessed by a standardized creativity instrument, was also compared to the perceptions of effective teaching held by their students and the self-reported instructor evaluations.

Research Questions and Hypotheses

The following research questions and hypotheses guide this study and identify creativity specifically in the context of instruction and teaching:

1. What are the demographic characteristics of College of Agriculture, Food and Natural Resources (CAFNR) undergraduate instructors, including sex, years of teaching experience, age, and teaching discipline?
2. What is the self-perceived level of creative teaching effectiveness of CAFNR instructors?
3. What is the level of creativity (fluency, originality, elaboration and flexibility) as measured by the ATTA, of CAFNR instructors?

4. What is the level of creative behaviors exhibited by CAFNR instructors, as perceived by their students?
5. What is the level of teaching effectiveness of CAFNR instructors, as perceived by their students?
6. What is the relationship between creative behaviors of CAFNR instructors, as perceived by students, and effective teaching behaviors, as perceived by students, instructors' perceived creativity, and instructors' norm-referenced creativity?
7. What is the relationship between CAFNR instructors teaching effectiveness, as perceived by students, and instructors' perceived creativity, and instructors' norm-referenced creativity?
8. What is the amount of variance in instructors' creativity, as measured by the ATTA, that is accounted for by their age, sex, teaching experience, and discipline?
9. What is the amount of variance in instructors' self-perceived creativity teaching behaviors that is accounted for by their age, sex, teaching experience, and discipline?

Hypotheses

1. H_o: There is no difference between instructors' discipline (natural/physical science or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between discipline (natural/physical or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{1\cdot1.2.3}: \mu_{xy1.2.3} \neq 0$$

2. H_o: There is no relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0\cdot1.2.3}: \rho_{xy1.2.3} = 0$$

H_1: There is a relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{2\cdot1.2.3}: \rho_{xy1.2.3} \neq 0$$

3. H_o: There is no difference between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0\cdot1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{3\cdot1.2.3}: \mu_{xy1.2.3} \neq 0$$

4. H_o: There is no difference between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{4 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

Definitions

Appropriate: The product of creativity must be useful and valued by society.

Consequence: Used in creativity research assessments, such as Torrance tests. Participants are scored on the number and complexity of the answer to questions such as "what would the consequence be if…"

Convergent thinking: Thinking of the correct answer.

Creativity: The intentional use of novel and original (to the creator) ideas to create functional (appropriate) production of unique material with a corresponding cause (reason), which is communicated to the external world.

Creative Thinking: the process of forming ideas or hypotheses, testing hypotheses, and communicating the results

Divergent thinking: Thinking of multiple possible answers/ solutions to a specific question.

Domain: Specific area of knowledge.

Effectiveness: Successfully working; achieving some end (aesthetic, artistic, spiritual,

winning, profit, etc.) (Cropley, 2001)

Elaboration: Ability to expand on an idea; adding details to clarify meaning.

Ethicality: Product, idea or action must not be destructive in behavior or selfish.

Natural/physical science: Those areas of study in the College of Agriculture, Food and Natural Resources (CAFNR) at the University of Missouri (MU) that focus on subjects that can be freely manipulated in experimental research Novelty: "A creative product, course of action or idea necessarily departs form the familiar" (Cropley, 2001, p. 6).

Flexibility: The ability to consider a situation from different points of view or to produce numerous categories of responses.

Fluency: Thinking of countless ideas.

Novelty: "A creative product, course of action or idea necessarily departs form the familiar" (Cropley, 2001, p. 6)

Originality: Novel responses.

Social science: Those areas of study in the College of Agriculture, Food and Natural Resources(CAFNR) at the University of Missouri (MU) that focus on the behaviors, organizations, institutions, societies and social interactions of human subjects.

Uses: Used in creativity assessments such as those by Torrance. Participants indicate the use of a particular item and are scored on the number and complexity of their answers.

Assumptions

Creativity can be observed in a wide variety of fields and applied to different contextual environments. For this study, it is assumed that creativity is applied only to the context of instruction/ teaching. It is assumed that participants in this study answered honestly and accurately reflected the creativity they evaluated. It is also assumed that students possess enough knowledge of their instructors and general teaching effectiveness to evaluate their instructors' performance in the classroom. It is also assumed that instructors provided accurate assessment of their own creative teaching behaviors.

Limitations

This study can only be applied to creativity measured and observed in the specific context of instruction/ teaching. Additionally, limitations exist in the assessment of creativity. It is important to identify the specific types of creativity tests used to measure creativity as a domain of divergent thinking and self-perception. Given the complexity of defining creativity, it is necessary to identify the limitations of applying findings to indicate all creativity can be measured. In addition, the results of this study cannot be generalized to any other group beyond CAFNR undergraduate instructors.

CHAPTER TWO

REVIEW OF LITERATURE

Chapter two is a review of literature related to creativity in teaching and effective teaching. The review is organized into the following sections: Definitions of Creativity, Convergent versus Divergent Thinking, Theories about Creativity, Assessments of Creativity, Challenges for Assessing Creativity, Ways to Enhance Creativity, Barriers to Creativity, Research, and Teaching Effectiveness.

Definitions of Creativity

Although research on the topic of creativity has existed for decades, concretely defining creativity has been a difficult task (Baker et al., 2001; Friedel& Rudd, 2005; Hocevar, 1981; Marksberry, 1963; Sternberg, 1999; Starko, 2005). Plucker et al. (2004) investigated over 90 articles from two leading journals related to the study of creativity and found that 34 (38%) explicitly defined the term *creativity*. Thirty-seven (41%) offered an implicated definition, while 19 (21%) failed to offer any definition of the term. Cropley (2001) suggested creativity must contain three primary elements, including:

1. Novelty (a creative product, course of action or idea necessarily departs from the familiar);
2. Effectiveness (it works, in the sense that it achieves some end- this may be aesthetic, artistic or spiritual, but may also be material such as winning or making a profit);
3. Ethicality (the term 'creative' is not usually used to describe selfish or destructive behavior, crimes, warmongering and the like). (p. 6)

However, to fully comprehend the theoretical frameworks that have been applied to creativity requires a basic understanding of convergent and divergent thinking.

Convergent Versus Divergent Thinking

Guilford's address to the American Psychological Association in 1950 is credited for establishing the distinction between divergent and convergent thinking, especially as the constructs apply to creativity (Cropley, 2001). According to Croply, convergent thinking aligns with historic definitions of intelligence while divergent thinking suggests novel and varied thought processes. While convergent thinking seeks the "single best" answer to a given question and relies upon familiar, established techniques for acquiring the "right" answer, divergent thinking requires examination of perspectives, multiple answers and production of novel solutions (Cropley).

Hocevar (1981) stated that divergent thinking is the most common approach to examining creativity. Although these tests are similar to traditional intelligence testing, divergent thinking tests require multiple responses instead of a single correct answer (Hocevar). Cognition also creates distinctions in creativity research. While researchers have sought to determine the cognitive style that accounts for creativity, "There is no single cognitive processing strategy that is uniquely favorable for creativity. The relationship has come to be seen not as a matter of which strategies lead to it and which do not, but rather of how various styles and strategies are connected to creativity" (Cropley, 2001, p. 43). Cropley (1997) summarized the factors impacting creativity as the "interaction of cognitive, affective, motivational and social/ personal factors" (p. 99). Croply (1997) further outlined this interaction with the following statement:

> Exposure to a rich variety of information lead not to anxiety and avoidance, but to increased interest and desire for more information; information is not blindly accepted (assimilated) and later regurgitated, but causes a reevaluation of the situation in question and the formation of expanded or enriched configuration (i.e., accommodation). Fascination, openness, and a "nose" for the incongruous lead to ways of coming to grips with the situation that are marked by attention to peripheral aspects of the information in question, willingness to try the unexpected, search for the novel and so on. Possession of a fund of knowledge in the area allows the individual to "feel" that a solution is near, to recognize a good solution, and to experience the satisfaction of solving a problem (the problem might be technical, scientific, philosophical, artistic, commercial, or whatever, depending on the area in which creative is occurring). Self-confidence yields the courage to present the solution in a form understandable to the teacher and classmates in the hope of convincing them and receiving recognition. Ultimately, in the ideal case, the whole process culminates in the creator experiencing the satisfaction of creative achievement (p. 101).

Theories about Creativity

The distinction between divergent thinking and convergent thinking may impact the application of many theoretical frameworks. In fact, creativity has been viewed through many different theoretical frameworks, including behaviorism, constructivism and social constructivism (Starko, 2005).

Behaviorist Theories

Behaviorist such as Skinner (1972) viewed human actions to be the results of stimulus and responses. Truly unique or original behaviors or ideas occur only as inevitable products of an individual's experience (Skinner). Skinner suggested artists create because of the response or consequence of their action. Skinner also suggested "certain kinds of consequences are said to "reinforce" in the sense that they make it more likely to occur" (p. 335).

Behaviorists believe creativity is the product of reinforcement. The more reinforcement, the more creative products should occur (Skinner, 1972; Starko, 2005). Mednick (1962) also viewed creativity through stimulus and responses. Mednick viewed experience and network of stimulus associations as the process of creativity andsuggested that creativity is the result of remote, unrelated ideas that are connected to produce creative ideas. Mednick used word-associations to illustrate his theory that creativity resulted fromconnecting unrelated ideas, finding individuals who had diverse prior experience with a stimulus were more likely to connect remote ideas about the stimulus.

Humanist and Developmental Theories

Humanist and developmental theorists have also addressed the concept of creativity. Maslow (1968), Rogers (1962) and Gowan (1972) all saw creativity as part of successful human development. Maslow (1954) suggested self-actualization as the top level of his hierarchy of human needs, and postulated self-actualization should be achieved by fully functioning human beings. Maslow further theorized there were two types of creativity, the first being special talent creativity, which occurs "independent of goodness or health of character" (p.35) and self-actualizing creativity. Maslow suggested

self-actualizing creativity resulted from good mental health and in the process of acquiring self-actualization. One of Maslow's famous statement on the subject of creativity suggested "a first-rate soup is more creative than a second-rate painting… cooking or parenthood or making a home could be creative while poetry need not be; it could be uncreative" (Maslow, p. 136). However, Maslow believed people would do everything creatively if they had a high level of self-actualization.

Rogers (1962) also saw creativity as the result of healthy growth of human beings. His behaviorist approach suggested creativity resulted when novel products emerged from the interaction of an individual and the environment. Rogers identified three characteristics associated with creativity that allow interaction between the individual and the environment. The first characteristic, referred to as openness to experience, suggested an individual's willingness to consider new ideas, tolerate ambiguity and view experiences beyond conventional categories. Rogers also identified the internal locus of evaluation, or the ability to rely on an individual's own judgment, especially in evaluating creative yields. Rogers's third creativity included one's ability to play with ideas or concepts and imagine impossible combinations.

Gowan (1972) suggested additional cognitive stages that consisted of three-stage cycles. Gowan saw creativity as the result of cognitive growth and identified creativity as stage sixth of his cognitive stages.

Researchers have supported developmental theories of creativity (Vygotsky, 1960; Renzulli, 1992). Like Rogers (1962) and Maslow (1968), Vygotsky used three stages to distinguish creativity. Vygotsky suggested the three stages occur during: (1) childhood, where creative imagination begins; (2) adolescence, where imagination and

thought are brought together; and (3) adulthood, where mature creativity is controlled and used in a purposeful manner. Formal schooling, inner speech, and thinking in concepts influence the development of mature creativity, according to Vygotsky.

Vygotsky'developmental theory suggested creative imagination begins in children's figurative play. More specifically, Vygotsky proposed children's symbolic play was the catalyst to development of imagination. In addition, Vygotsky believed creativity was a consciously developed mental function that requires adults to alter and merge ideas in specific environments to generate creative products such as art, inventions or scientific discoveries. Similar in some ways to the development approach, creativity research has also been viewed through a systems theory.

Systems Theories

One possible theory that may approach this desired holistic approach could be a systems approach. Systems approaches suggest creativity cannot be identified in a vacuum, but rather as an interaction between the environment and the person (Starko, 2005). Although most systems approaches to creativity focus on extraordinary creativity, the concept can be applied in a variety of situations. In general, systems theories suggest there is interaction between cognitive, affective, motivational, and social/personal factors (Cropley, 1997).

Systems theories also suggest the impact of the environment upon creative output and inevitably involve human interaction (Starko, 2005). The environment can determine the type of novelty produced and thus is an active recipient of what creative people offer (Cropley, 2001). "Creativity cannot be properly understood in isolation from the social

context, for creativity is a special form of personal influence: The effective creator profoundly alters the thinking habits of other human beings" (Simonton, 1988, p. 421).

Csikszentmihaly (1988) developed a systems model of creativity that included three aspects: the person, the domain, and the field. Thus, creativity is an interaction between product, person and environment (Starko, 2005). The field includes people who can affect the structure of a domain (Starko). Creative products must be viewed by the field as unique, but not too extreme to be considered a creative expression (Starko). Individuals are judged and formed by the field (Starko). Gardner (1993) built upon Csikszentmihaly's model created his own theory of multiple intelligences.

Gardner (1993) suggested individuals are creative, but they create in a specific field. "The creative individual is a person who regularly solves problems, fashions products, or defines new questions in a domain in a way that is initially considered novel but that ultimately becomes accepted in a particular cultural setting" (Gardner, p. 35). Perhaps teaching can also be viewed through this setting. The teacher may be evaluated by the field, which could include student evaluations, educational theories, and administrative approval. Can teaching be considered a particular domain where creativity can occur?

Systems approaches to creativity focus on the role of the environment (Starko, 2005), where creativity results from the interaction between an individual and their surrounding environment (Csikszentmihalyi, 1996). Csikszentmihalyi (1988) created a model of creativity where intellectual activity is considered creative achievement (Plunker et al., 2004). Individuals create in a specific domain (Starko), and interact with the environment, and product (Csikszentmihalyi, 1996). The environment determines the

types of novel, creative products that can be accepted and social settings determine the level of innovation or acceptance of new ideas that may deviate from the norm.

The systems approach is further explained by Cropley (2001) who suggested that creative thinking can be guided by the social setting and can be a reaction of the motivations of the environment. However, the environmental influence on creativity is not always acknowledged in creativity research (Plucker et al., 2004) despite some aspects of environment having been positively related to creativity (Amabile, 1996; Csikszentmihalyi, 1996; Plucker et al.). One environment researchers have explored is the field of education.

The classroom, as a part of a student's culture, is one environment that may foster creativity if the environment can tolerate non-traditional and alternatives from the status quo (Marksberry, 1963). Marksberry suggested the physical environment can also impact creativity. A cheerful, colorful, challenging, and stimulating environment that invites experimentation represents a creativity environment. Marksberry also suggested the psychological safety found in the classroom environment is needed to foster creativity. In addition, Marksberry stated that this requires the development of unconditional self-worth. Students should have a more permissive environment, where movement is encouraged and materials can be selected at will. The focus in a creative environment is upon individual improvement instead of competition (Marksberry). Environment, including within the classroom, has been a platform to observe creativity from an intelligence perspective.

Relationship Between Creativity and Intelligence

Creativity has an interesting relationship with intelligence. Creativity has been found to have a strong, positive correlation with intelligence (Cropley, 2001; Starko, 2005). These findings suggested the more intelligent one is, the higher the level of creativity (Starko). However, this strong relationship is seen only for those who met the minimum level of intelligence and up to approximately an IQ of 120 according to Runco(1990) andStarko, or 130, according to Cropley. Interestingly, extremely intelligent individuals may only display a moderate level of creativity and the relationship between creativity and intelligence becomes somewhat weaker (Carson, Peterson, & Higgins, 2005; Crockenberg, 1972; Cropley; Starko). The concept of a threshold relationship between intelligence and creativity is perhaps the most widely accepted theory in the field of creativity research (Starko).

Intellectual abilities can also be viewed through Bloom's (1956) Taxonomy of the Cognitive Domain, including comprehension, application, analysis and evaluation (Marksberry, 1963). Bloom stated that synthesis is one of the five skills needed for reflection, critical thinking, or problem solving thinking. In addition, he called synthesis the "category in the cognitive domain, which most closely provides for creative behavior" (as cited in Marksberry, p. 8). Because no line can be drawn between analysis and evaluation, critical thinking and creative thinking differ only slightly (Marksberry). Psychomotor skills refer to the product created by effectively suing material and tools (Marksberry).

Creativity also appears to require extensive knowledge of both general areas as well as specific fields (Marksberry, 1963). Gardner (1993) applied his own theory of

multiple intelligences to creativity, finding people are creative in domain-specific ways (Starko, 2005). Gardner viewed creativity not as a personality characteristic, but rather as creative function in a specific area (Starko). Gardner identified seven intelligences, including linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal and intrapersonal intelligences.

Motivation

Sternberg (2006) established a basic understanding for the role motivation plays in creativity by stating: "Creativity is as much a decision about and an attitude toward life as it is a matter of ability" (p. 93). In addition, Sternberg suggested creativity can be seen in all people, but is frequently obvious in young children. Creativity "may be harder to find in older children and adults because their creative potential has been suppressed by a society that encourages intellectual conformity" (p. 93). Fasko (2000-2001) suggested the effects of intrinsic and extrinsic motivators upon creativity can be applied to any classroom and any grade level. Runco and Chand (1995) suggested motivation is needed for creative thinking. Further, problem solving could assist intrinsic motivation in individuals (Runco & Chand). From an educational perspective, Fasko suggested students would be more motivated when choosing their own tasks. Intrinsic motivation favors creativity and creative people complete a task because of their intrinsic motivation (Fasko; Runco & Chand; Ruscio, Whitney & Amabile, 1998). Sternberg (2006) suggested "people rarely do truly creative work in an area unless they really love what they are doing and focus on the work rather than the potential rewards" (p. 89). Runco and Chand proposed motivation to be an important component for creative thinking.

More specifically, the Runco and Chand (1995) model suggested problem finding would encourage intrinsic motivation and therefore students would be more motivated if they chose their own tasks. Hennessey and Amabile (1987) suggested intrinsic motivation is subjective to situational events. "Situational events in one's environment (e.g. school) may affect one's motivation on a task (e.g. problem solving)" (Fasko, 2000-2001). Davis (1991) stated it is "important to help student metacognitively understand the topic of creativity" (pg. 220). This "increased understanding of creativity would increase creativity consciousness, demystify creativity and increase creative ideas and products" (Fasko, p. 318).

There have also been cautions regarding creativity and motivation. For example, Fasko(2000-2001) stated "educators must be aware that, if they implement an extrinsic reward structure with these students, this will undermine their intrinsic motivation (p. 326). Given the focus on creativity and intrinsic motivation (Sternberg &Lubart, 1991; Ruscio et al.; Hennessey &Amabile, 1996), Fasko concluded, "schools need to improve their capacity for improving students' intrinsic motivation" (p. 323). The connection between student motivation and creativity is not the only educational application of creativity research.

Teacher Role

Much of the educational research on creativity appears to focus on increasing and analyzing the potential for student creativity; however, the teacher plays an integral role in the development of student creativity. Several sources suggest a need for increased teaching of creativity in schools, and especially in teacher education (Mack, 1987). Sternberg (2006) suggested, "When student are taught in a way that fits how they think,

they do better in school. Children with creative or practical abilities, who are almost never taught or assessed in a way that matches their pattern of abilities, may be at a disadvantage in course after course, year after year" (p. 94). Sternberg and Lubart (1991) advised teachers to give more long-term assignments to encourage and increase students' tolerance for ambiguity. They further suggested teachers implore students to take more risks with their new skills.

Torrance (1981) found increased motivation, concentration, curiosity, alertness, and achievement could be observed when creative learning occurred. "Thus, creative teaching can enhance learning" (Fasko, 2000-2001). In fact, Karnes, McCoy, Zehrbach, Wollersheim, Clarizio, Costin, and Stanley (1961) found creativity was significantly related to educational achievement. In addition, Karnes et al. suggested teachers were most effective in stimulating creativity of their students when they, as teachers, modeled divergent thinking.Cropley (2001) also suggested "creativity offers classroom approaches that are interesting and thus seems to be a more efficient way of fostering learning and personal growth in the young. *Creativity helps children learn and develop*" (p. 28). Creative teachers tend to provide more support for creative students (Cropley, 1997). Interestingly, Milgram (1979) found correlations between the level of creativity of teachers and their students.

Creative Outcomes

Several researchers have focused on the creative outcome as defining creativity and thus the creative product a measurement of creativity (Amabile, 1987; Carson et al., 2005; Hasse, 2001; MacKinnon, 1962). The essence of creativity is found in the outcome or product. Plucker et al. (2004) stated: "The criteria of a perceptible outcome is useful

because without observable and measurable evidence of some act, idea, or performance, it is difficult to determine whether creativity has occurred" (p. 91). In addition, these authors argued the presence of creativity can be inferred and evaluated through producing, identifying and examining documentable artifacts, such as behaviors, ideas or products (Plucker et al.). Carson et al. postulated, "creative achievement may be defined as the sum of creative products generated by an individual in the course of his or her lifetime" (p. 37). In addition, Carson et al. suggested creative products must meet two basic criteria; products must be both novel and useful. However, other researchers suggested creativity can best be explained as a process.

Process and Problem Solving

Marksberry (1963) suggested that creativity could be measured by how an individual approaches a problem, not by the outcome. The creative process could thus be divided into four stages: (1) preparation; (2) incubation; (3) insight, illumination or inspiration; and (4) verification, elaboration, perfecting and evaluation (Marksberry). The preparation period may vary in length, but in general, it begins when there becomes a strong desire to begin an activity. In includes all life experiences and it may include intense times of trial and error to solve a problem (Marksberry). Incubation is the time when "deep" thinking searches for solutions. It is unconscious activity, which is often frustrating and may require changes in activity (Marksberry). During the period of insight, inspiration or illumination occurs when the solution is discovered and begins to be captured. The final stage can be defined as verification, elaboration, perfecting or evaluation. This stage checks and re-checks the solution to the problem. In reality, these

stages often overlap and may occur many times in the creative process (Marksberry). The creative process can occur at any time during the problem-solving process (Marksberry).

Problem solving has been tied to creativity since Guilfords's research in the 1950's (Cropley, 2001). Dewey's 1920 model of problem solving was one of the earliest models of creativity. "Dewey described the process of problem solving in five logical steps: (a) a difficulty is felt, (b) the difficulty is located and defined, (c) possible solutions are considered, (d) consequences of these solutions are weighted and (e) one of the solution is accepted" (as cited in Starko, 2005, p. 25). Wallas (1926) also supported the Dewey model, but added unconscious processing, or the "aha!" moment. Wallas identified preparation, incubation, illumination (the "aha" moment), and verification. Ai-Girl & Lai-Chong (2004) suggested the creative process consists of three stages, including hypothesis formation, hypothesis testing, and communication of results. The Torrance model (1995) also described logical stages, including:

1. Identifying problems and challenges
2. Recognizing and stating the important problem
3. Producing alternative solutions
4. Evaluating alternative solutions
5. Planning to put solutions into use (p. 236)

Theaction stage included in the Torrance model was noticeably absent from the Dewey and Wallas models (Starko). However, this suggests something must be accomplished or put into action to be considered creative (Starko).

Multiple theoretical frameworks have been applied simultaneously to the study of creativity. Indeed, divergent thinking alone is too simple of an approach to creativity

(Cropley, 1997). In fact, Cropley stated "…affective, motivational, personal, and social factors in creative behavior … has implied and supported a holistic approach, holistic both with regard to the psychological elements of creativity and also with regard to the stages of the creative process" (p. 98).

With such a wide array of theoretical backgrounds, it may be important to find similarities between creativity theories offered by decades of researchers. Creativity appears to demand time, persistence, motivation, and a knowledge base. Although some theorists believed insight is a requirement of the creative person, others disagree (Starko, 2005). However, "most theorists do postulate strategies, processes, or habits of mind that make creative ideas more likely. These may include generating analogies, defining problems, or looking for multiple solutions. It is possible that such strategies can be taught and improved"(Starko, p. 66).Thus, there are some basic foundations within creativity research which allow one to move beyond definitions and theories to creativity assessment.

Assessments of Creativity

Creativity assessments seek to identify the creative person. Cropley (2001) calls this an "exciting adventures" (p. 52) in creativity research. However, Hocevar (1981) suggested creativity is the most difficult psychological concept to measure. This identification occurs through calculating scores on instruments believed to assess creative potential, or by "demonstrated creative behavior" (Cropley, p. 52). Creativity tests may have appeared as early as 1915, and many more were developed between World War I and World War II (Cropley, 1997). Following Guilford's 1950 address, some psychologists developed tests of divergent thinking (Croply, 1997). The Alternative Uses

test, Product Improve test and Consequences test became well know assessments in the 1950s and 1960s. Torrance integrated all of these tests into what is today referred to as the Torrance Tests of Creative Thinking (TTCT) (Cropley, 1997). "To this day, the Torrance Tests of Creative Thinking remains the most widely used assessments of creative talent" (Sternberg, 2006, p. 87). The Torrance tests became a prototypical assessment that measured divergent thinking, or thinking that deterred from more conventional approaches and created unusual answers (Cropley). These tests asked participants to identify uses, consequences, product improvement, fluency, flexibility and originality, based on simple situations (Cropley). However, not all researchers animatedly support creativity testing. A number of concerns and criticisms of creativity tests have arisen during the past few decades of creativity research.

Multiple methods of measuring creativity have allowed assessments to be classified as test oriented, personality oriented or product oriented (Dacey, 1989). In addition, Amabile (1996) further defined creativity test-oriented assessments as personality tests, biographical tests, and behavioral assessments.

Personality Oriented Assessment

Personality inventories are one example of creativity assessments. Amabile (1996) suggested there are two basic types of personality inventories. The first type created creativity scales, such as Gough's (1979) Creative Personality Scale. Gough's Adjective Check List resulted after 18 of 30 adjectives were positively correlated to creativity. The second type of personality assessments, according to Amabile, focus only on identification of "traits characteristic of creative individuals" (p. 22). The "What Kind of Person Are You?" test developed by Torrance and Khatena (1970) is an example of

the second type of personality assessment. This type of assessment was "specifically designed to assess creativity" (Amabile, p. 23) and requires participants to selected appropriate self-described adjectives in a forced choice format (Amabile).

Biographical Assessments

According to Amabile (1996), biographical inventories were developed on "intuitive basis and refined thorough testing samples of individuals rated high in creativity and those rated low or average" (p. 23). Childhood, interests, hobbies, experiences, family history, educational history, leisure activities, physical characteristics are some examples biographical inventories have sought to identify (Amabile). Biographical assessments have been developed based on the assumption that past experiences determine current behavior (Hocevar, 1981). While assessments have been developed for industrial settings (Hocevar), it appears biographical assessments have limited applications in past creativity educational research.

Behavioral Assessments

Perhaps the most well known of all types of creativity assessments, behavioral assessments are the "typical creativity test" identified in creativity research (Amabile, 1996 p. 24). While most creativity tests are similar to the TTCT in content, administration, form and scoring, questions still arise to the meaning of creativity tests (Amabile). Amabile suggested:

> Creative performance emerges from three necessary components, from combinations of innate skills, learned abilities, and task attitudes. Any given creativity test might tap one or more of those abilities or dispositions, but it is

most unlikely that a single test will tap all the elements of the three components in a general way (p. 25).

It is also important to note that extraneous influences may impact test performance. For example, several studies found participant scores on creativity tests improved merely by telling them they were taking a creativity test (Amabile, 1996). Wallach and Kogan (1965) proposed tests should be given in a less restrictive, even game-like manner without time constraints (Amabile; Cropley, 1997; 2001). Finally, it must be noted that creativity tests measure more than established differences in individual creative abilities and attitudes. In fact, performance may also include social and contextual factors (Amabile).

Product Oriented Assessment

Assessing the creative product is another approach to measuring creativity. While the concept of assessing the creative product is appealing in theory, few researchers have ventured into this direction (Amabile, 1996). Product oriented assessment becomes challenging because it is difficult to quantify what determines a creative product. Indeed, several researchers suggest the creative product may be initially rejected before becoming valued by society (Cropley, 1997; 2001). Experts or judges may also be used to assess creative products (Amabile). While this may be subjective in nature, the process of selecting *experts*has produced interesting results. MacKinnon (1962) asked a panel of experts, composed of five professors of architecture, to rate and nominate the 40 most creative architects in the United States. Although the panel could potentially nominated 200 different individuals, only 86 were nominated. This showed substantial agreement among experts. MacKinnon also requested 11 editors of the top architectural journals to

rate the creativity of the 64 nominated architects. The same architects were asked to rate themselves and the additional 63 architects in the study. MacKinnon suggested:

> Since the editors' ratings of the creativity of the architects correlated +.88 with the architects' own ratings, it is clear that under certain conditions and for certain groups it is possible to obtain remarkable agreement about the relative creativeness of individual member of a profession and thus meet the first requirement for an effective study of creative person (p. 486).

Hocevar (1981) cautioned "the judges in product studies vary from experts to non-experts, and the criteria vary from diverse definitions of creativity to social recognitions (i.e. rewards, publications, etc.). Further, subjective judgments are usually made on what products to choose and in what situation they will be obtained" (p.454).

As a result, creativity products are represented by very specific samples of behavior (Hocevar, 1981). MacKinnon (1962) suggested successfully determining traits of highly creative individuals in a specific field requires sampling a wide range of individuals within the profession and a wide variety of distinguishing characteristics. Thus, a "range of talent sufficiently wide to be fairly representative of the profession as a whole" (MacKinnon, p. 487) can be identified. Product assessments have also been examined through self-reported assessments.

Self-reported Assessments

Self-reported instruments are yet another method of creativity assessments. Hocevar (1981) suggested, "A useful way to measure creativity is to simply ask the subject. This is not a profound position, but yet the procedure is rarely used" (p. 459).

Perkins (1981) suggested immediate self-reports, or descriptions by the creators during the creative process, or immediately after, are a more reliable method to understand the creative process. According to Perkins, the process of creativity is not as important as the purpose. People create for a purpose (Starko, 2005). Because past behavior appears to be the best indicator of future behavior (Hocevar, 1981), it would appear past creative behavior can predict future creative endeavors.

To measure self-reported past creative achievement, Carson et al.(2005) created the Creative Achievement Questionnaire (CAQ). Believing that creative accomplishments are best assessed in a domain-specific manner, the CAQ identified several specific creative endeavors (Carson et al.).

Perhaps Hocevar (1981) stated it best: "despite the voluminous literature on the measurement of creativity, a simple and straightforward inventory of creative achievement and activities appears to be more defensible that the more commonly used methods" (p. 459). Although self-reported assessments, have illustrated appropriate face validity (Hocever), these measures may face the challenge of determining which activities and accomplishments qualify as creative. However, assessing creativity may have many such challenges.

Challenges for Assessing Creativity

There are a number of challenges associated with creativity assessment. For example, the subjective nature of scoring creativity tests becomes a concern for the validity of creativity assessments (Amabile, 1996). "For some scoring procedures, results must depend on the test scorer's intuitive assessment of what is creative, and not according to objective criteria of novelty, appropriateness, satisfyingness, and so on"

(Amabile, p. 28). Croply (1997) pointed out many creativity tests have been challenged on their low face validity. Construct validity has been questioned by empirical research and creates a greater concern because many creativity instruments are validated against one another (Amabile). Inter-rater reliability can be questioned when different judges are used to assess creativity (Hocevar, 1981). In addition, discriminate validity of judgments may provide a challenge for creativity research (Hocevar). In other words, judges may struggle to "distinguish creativity from other constructs such as intelligence, achievement, competence, etc." (Hocevar,p. 456).

Testing for creativity is not without its critics. Some research has suggested that"many of the creativity tests assess such narrow ranges of abilities that it is inappropriate to label a particulate test performance as generally indicative of *creativity*" (Amabile, 1996, p. 27). Further, judges may struggle to discern dimensions of creativity (Hocevar, 1981). These type of assessments do not measure what we think of as creativity (Hocevar) and "because they seem to have little in common with the kind of mental activities involved in painting the *Mona Lisa* or writing, for example, *Gone with the Wind*" (Cropley, 1997, p. 104).

Yet another challenge with creativity assessments is the lack of differentiation among creative performances (Hocevar, 1981). "Intuitively, it is plausible that a person who is creative in one area has neither the time, ability, nor the motivation to be creative in other areas" (Hocevar, p. 457). This is compounded by the challenge of predicting creativity in diverse areas, which feasibly would require different instruments (Hocevar). According to Hocevar, the greatest problem with creativity measurement is the absence of convergent validity among assessment methods. Individuals have been ranked

differently when multiple methods of assessing creativity have been employed (Hocevar). Carson et al. (2005) suggested: "many measures rely on subjective ratings from either expert or non-expert judges" (p.39). Because multiple raters are usually required to establish validity, the training and compensation can be both lengthy and costly (Carson et al.).

Despite these challenges, Hocevar (1981) suggested recent creativity research recognizes both divergent thinking and convergent thinking are required for creative production. The result has led to many new creativity assessments (Cropley, 1997). Amabile (1996) cautioned that creativity tests were designed to detect individual differences and are appropriate for these purposes. Amabile suggested, however, that while some creativity tests have been criticized, assessments based on creative accomplishments and creative products are more appropriate to measure creativity.

Ways to Enhance Creativity

Plucker et al. (2004) suggested that potential applications of creativity are well documented in research spawning over many decades. However, the prospective applications are seldom fulfilled. "Our knowledge of creativity- and thinking and learning in general- has advanced over the past several decades, but our strategies for enhancing creativity have changed very little" (Plucker et al., p. 83). Weisberg's (1988) research offered two methods to enhance creativity: (1) develop expertise by allowing experiences to draw upon past experience; and (2) boost determination and commitment, which is accomplished by allowing repeated attempts after initial failure.

In the education field, Cropley (1997) suggested teachers should "consider information, special ways of thinking about it, inventiveness in finding solutions, ability

to evaluate ideas, ability and willingness to communicate solution to others, and evaluation of solutions in the context of the real world" (p. 89). More specifically, Cropley identified 10 conclusions on the relationship between cognition and creativity and suggested teachers should encourage the following:

1. Possession of a fund of general knowledge
2. Knowledge of one or more special fields
3. An active imagination
4. Ability to recognize, discover, or invent problems
5. Skill at seeing connections, overlaps, similarities, and logical implications (convergent thinking)
6. Skill at making remote associations, bisociating, accepting primary process material, forming new gestalts, etc (divergent thinking)
7. Ability to think up many ways to solve problems
8. A preference for accommodating rather than assimilating
9. Ability and willingness to evaluate their own work
10. Ability to communicate their results to other people. (p. #)

The ability to enhance creativity of teachers has also been the focus of some research (Milgram, 1979; Davidovitch&Milgram, 2006). In fact, Davidovitch and Milgram suggested that determining the creativity of pre-service and in-service educators and enhance the creative thinking of these teachers is a worthwhile endeavor. However, to accomplish this goal, it may be necessary to identify barriers to creativity, which must be overcome.

Barriers to Creativity

Decades of research on creativity have resulted since Guilford's 1950 address. Creativity has been driven by a wide array of theories and models. Assessment of creativity has been attempted for almost 60 years, and yet, researchers cannot agree on one concept or definition of creativity. Hocevar (1981) suggested the most apparent challenge associated with measuring creativity is the absence of convergent validity among the multiple assessments methodologies. Hocevar also suggested creativity assessments should be correlated in order to establish convergent validity. According to Hocevar, multiple methods of assessing creativity have had mixed results, however, few studies have shown a correlation higher than .30. This suggests the need to assess creativity using a variety of methods and correlate creativity measures.

Research of teacher creativity appears to be limited. While some may suggest that creative teaching is effective teaching (Anderson, 2002; Bain, 2004; Bleedron, 2003, 2005; Chambers, 1973; Croply, 1967, 2001; Davidovitch&Milgram, 2006; Esquivel, 1995; Fasko, 2000-01; Milgram, 1979; Newcomb et al., 1993; Renzulli, 1992; Torrance, 1981, 1995), concrete measures that define creative teachers appear to be lacking in the literature.

Cropley (2001) stated: "Creativity offers classroom approaches that are interesting and thus seems to be a more efficient way of fostering learning and personal growth of the young. *Creativity helps children learn and develop*" (p. 28). Identifying characteristics of creative behavior of instructors is needed to establish the impact of creativity in the classroom environment. In addition, creativity research in subject-

specific areas such as agricultural education appears to be lacking. The call to continue creativity research is evident, however.

Future Creativity Research

Sternberg (2006) stated "… to the extent that creativity is in the interaction of person with context, we need to concentrate as well on the attributes of the individual and the individual's work relative to the environmental context" (p. 95). With this in mind, perhaps education offers the greatest potential for creativity research. Researchers such as Cropley (2001) suggested, "since all people are capable of developing their abilities, knowledges, skills, attitudes, and personal properties in a creative direction…" (p. 28) "What is more desperately needed is a shift of focus from research and testing to a broader application of actual teaching strategies that stimulate interest in a creative use of the mind as a motivator to the learning of content " (Swartz and Parks, 1994).

In addition, Bleedron (2005) suggested that acquiring knowledge and information is valuable, however, not the only criterion. Education also provides "positive self-concepts, creative problem-solving skills, capacities for higher-order thinking, responsibility, empathy for differences, talents for teamwork, independent judgment and whatever contributes to effective, engaged citizenship" (p. 26). "Teacher education courses need to equip teachers with skills for teaching course content through creative exercise of the mind. Enlightened teachers do it well as an automatic practice of their profession. All teachers need to be well schooled in the art" (Bleedron, p.26). Thus, the need for effective teachers becomes paramount.

Effective Teaching

Effective teaching has been the subject of considerable research (Buchanan, 1997; Miller et al., 1989; Newcomb et al., 1993; Nicholls, 2002; Reid and Johnstone, 1999; Roberts & Dyer, 2004; Rosenshine&Furst, 1971; Westmeyer, 1988). Effective teaching has been the focus of considerable research with great reason. As Buchanan (1997) stated: "great professors profoundly affect those they teach way beyond their college years; their contribution often resonate throughout the entire course of their students' lives" (p. xviii). However, similar to creativity, effective teaching may be difficult to define, perhaps due to the multiple perspectives which comprise effective teaching (Young, & Shaw, 1999).

Reid and Johnstone (1999) identified six components to good teaching, including approachability, clarity, depth of knowledge, interaction, interest and organization. However, Reid and Johnstone found differences between the order of these six components when examined from student and instructor perspectives. Specifically, students ranked interest above depth of knowledge, but instructors reversed this ranking (Reid &Johnstone). In addition, students ranked approachability above interaction while instructors ranked interaction above approachability. Further, students ranked clarity higher and thus more important than did instructors.

Similarly, Feldman (1976) found clarity and stimulating student interest were highly related to good teaching. Feldman also suggested effective instructors were knowledgeable about their content, prepared and organized for class and were enthusiastic. Young and Shaw (1999) investigated over nine hundred university students in an attempt to define effective teachers. They found "effective communication, a

comfortable learning atmosphere, concern for student learning, student motivation, and course organization were found to be highly related, as a group, to the criterion measure of teacher effectiveness" (Young & Shaw, p. 682). However, students also indicated the value of the course was a strong predictor of teacher effectiveness (Young & Shaw). In fact, Young and Shaw found the "worth of a course for the university students was the most important predicator of teacher effectiveness" (p. 683). These researchers suggested that regardless of course content, effective teachers assumed the responsibility for making the course valuable for the students. Further, Young and Shaw concluded that students rated effective teachers high on important variables of their study (value of the course, effective communication, a comfortable learning atmosphere, concern for student learning, student motivation, and course organization). However, students did not rate instructors equally high on all of the important characteristics. "It appears that effective teacher can compensate for deficiencies in one or two areas by demonstrating outstanding skills in other areas" (p. 683).

Nicholls (2002) also outlined specific criteria to determine the quality of teaching. These include:

> Lecturers have clear aims and learning outcomes for their teaching session; students are aware of these aims and learning outcomes; lecturers have a secure command of the subject matter being taught; teaching sessions have suitable and achievable content; teaching activities are well chosen an dare focused on promoting learning outcomes; and teaching task are presented in ways that engage, motivate and challenge all students, allowing individual learning and progress to be made (p. 145).

In addition, Nicholls outlined elements of effective teaching in higher education.He suggested teaching must have:

> A clear purpose and a strategy for achieving it; is firmly structured with a beginning, a middle and end, yet with the possibility of being varied to take account of opportunities which arise unexpectedly; takes account of students' prior learning; takes account of differences in students' ability; offers a variety of teaching strategies; challenges students' perceptions and ways of thinking; generates a dynamic and motivating atmosphere which allows students to become involved and achieve; demands high standards; and provides a learning environment that encourage students to participate and actively learn (p. 146).

However, these components of effective teaching are not new. In fact, Rosenshine and Furst (1971) outlined many of the same principles.

Rosenshine and Furst (1971) studied eleven variables that described effective teaching. The first five variables identified had the most conclusive results. Rosenshine and Furst found the top five variables associated with effective teaching included clarity, variability, enthusiasm, task-oriented and/or businesslike behavior, and student opportunity to learn criterion material.

Clarity was addressed as the clarity of a teacher's presentation. Specifically, Rosenshine and Furst (1971) described effective teachers who demonstrated clarity "spent less time answering student questions, phrased questions so that they were answered the first time without additional information or additional questions interspersed before the student responded, or used fewer vagueness word such as 'some',

'many', 'of course' and 'a little'" (p. 44). Clarity may be similar to organization, which has demonstrated positive relationships with student achievement (Rosenshine&Furst).

Effective teachers use variability, or a variety of teaching methods during lessons. Rosenshine and Furst (1971) suggested variability can be observed through "a teacher's flexibility in procedure, weather the teacher was adaptable or inflexible, and the amount of extra equipment, books, displays, resource materials, and student activities" (p. 45). Correlational studies have indicated a positive relationship between student achievement and variety of instruction occur (Rosenshine&Furst).

While enthusiasm may be difficult to describe, Rosenshine and Furst (1971) suggested enthusiastic teachers are those who use movement, gestures and voice inflections. Task-oriented behavior may best be described as achievement oriented teachers "concerned that students learn something rather than that students enjoy themselves" (p. 47).

Rosenshine and Furst (1971) also indicated effective teachers are those who provide students the opportunity to learn the material. The relationship between the material covered in the class and class criterion scores were examined to define students' opportunity to learn criterion material (Rosenshine& Furst). "Overall, the correlations between measure of opportunity to learn and student achievement are positive, significant and consistent" (p. 48).

Newcomb et al. (1993) identified thirteen principles of effective teaching. The first principle suggested that "the subject matter to be learned possesses meaning, organization, and structure that is clear to students, learning proceeds more rapidly and is

retained longer" (p. 26). Newcomb et al. suggested that meaning, sequencing, structure and clarity are addressed in this first principle.

The second principle suggested by Newcomb et al. (1993) was "readiness is a prerequisite for learning" (p. 29). The "subject matter and learning experiences must be provided that begin where the learner is" (p. 29). Newcomb et al. suggested effective teachers who demonstrate this principle "go to great links to learn about their students" (p. 29), such as learning about student interests, dreams, prior knowledge in the subject matter, and parental expectations. Further, a concern for students and their ability or readiness to learn new material requires instructors to know students on an individual basis.

Several effective teaching principles suggested by Newcomb et al. (1993) involve motivation. Effective teaching principles identified by Newcomb et al. which address motivation include principles three through six, including: "students must be motivated to learn and learning activities should be provided that take into account the wants, needs, interests, and aspirations of students" (p. 30); "success is a strong motivating force" (p. 32); and "students are motivated when they attempt tasks that fall in a range of challenge such that success is perceived to be possible but not certain" (p. 33). Simply put, effective teachers are those who motivate students to achieve in the learning environment. Newcomb et al. suggested student motivation is directly tied to teacher enthusiasm and the interest teachers create for a subject. Teacher enthusiasm has been positively associated with student achievement and can be observed through a teacher's "movements, gestures, and voice inflections" (Newcomb et al., p. 31). According to

Newcomb et al., student interest can be achieve in a variety of ways, but must be directed by the teacher.

The seventh through ninth principle suggested by Newcomb et al. (1993) addressed reward and reinforcement. Principle seven, "when students have knowledge of their learning process, performance will be superior to what it would have been without such knowledge" (Newcomb et al., p. 33) addressed the need to provide feedback for students. Principle eight, "behaviors that are reinforced (rewarded) are most likely to be learned" (Newcomb et al., p. 34) suggested behavioral skills can best be learned "if the correct performance of the skills is rewarded" (Newcomb et al., p. 35). Principle nine states: "to be most effective (reinforcement) must follow as immediately as possible the desired behavior and be clearly connected with that behavior by the student" (Newcomb et al., p. 36). An effective teacher must help students make the connection between behavior and the mastery of skills or knowledge (Newcomb et al.).

Newcomb et al. (1993) also identified techniques of teaching as components of the principles of teaching and learning, including principles ten through thirteen. Principle ten suggested "directed learning is more effective than undirected learning" (Newcomb et al., p. 36). Thus teachers must assume the responsibility for the teaching and learning process (Newcomb et al.). The eleventh principle shared byNewcomb et al. suggested "to maximize learning, students should 'inquire into' rather than 'be instructed in' the subject matter. Problem-oriented approaches to teaching improve learning" (p. 37). While teachers must direct and supervise the learning environment, effective teachers allow students to use their own activities and study to retain knowledge (Newcomb et al., 1993).

Newcomb et al. also suggested the importance of variability as a component of student inquiry. In addition, problem-oriented instruction requires students to inquire into the subject matter and requires effective teachers to use questioning techniques to facilitate student inquires (Newcomb et al.). Principle twelve suggested"students learn what they practice" (Newcomb et al., p. 39). Practice is defined as application of cognitive and attitudinal skills, as well as psychomotor skills (Newcomb et al.). However, Newcomb et al. cautioned students can practice error instead of success. Thus, it is imperative that effective teachers monitor student learning to achieve the desired outcomes. Finally, Newcomb et al. suggested "supervised practice that is most effective occurs in a functional educational experiment" (p. 40) as their thirteenth principle. Teachers may optimize student learning by creating opportunities for students to practice in real-life or closely simulated situations (Newcomb et al.).

Student Evaluation of Effective Instructors

While researchers have generated many ideas of effective teaching, student evaluations may provide the most accurate measure of teacher effectiveness (Young & Shaw, 1999). Student evaluations have received considerable research attention (Cohen, 1981; Feldman, 1989; Young & Shaw). "Overall, the research on teacher effectiveness indicates a moderate positive relationship between student ratings of instructors and student achievement" (Young & Shaw, p. 672). In addition, McKeachie (1983) suggested "students will continue to be those most affected by teaching. Therefore, student ratings will continue to be useful" (p. 1224). If student ratings can identify effective teacher characteristics, can students also identify creative instruction?

Creative teaching

One component of effective teaching may well be viewed as creative teaching. Some researchers have suggested "the study of the teacher's role in creative teaching may be subsumed under the broad category of the 'teacher effectiveness' research, which documents the impact that teacher have on student learning in general" (Esquivel, 1995). However, Milgram (1979) stated, "although few studies of the relationship exist, creative teacher behavior probably makes for more effective teaching" (p. 125). Torrance (1995) suggested the "great creative teacher is an interesting and important phenomenon and deserves serious study and discussion" (p. 58). In addition, Torrance believed the intention of creative teaching is to create a responsible environmentthat captures teacher enthusiasm, and supports appreciation of individual differences. While reflecting on great teachers, Anderson (2002) suggested, "the most fundamental risk these teachers accept is found in their willingness to confront both success and failure in the interest of teaching better. They risk themselves in being responsible for their work. In this way, they are not so different from creative artist in other arenas" (p. 35). In addition, Torrance (1981) suggested signs that creative learning has occurred include increased motivation, awareness, inquisitiveness, concentration, and accomplishment. However, Torrance also suggested creative teachers are relatively unstudied.

Chambers (1973) suggested college teachers could encourage the creativity of their students. In addition, "students viewed these teachers as being more accessible to them, committed to their field, enthusiastic, and intellectually challenging" (Fasko, p. 322). Beidler (1997) reflected on many years in the professoriate and offered personal characteristics of good teachers, including the following: desire to be good teachers; take

risks; have positive attitudes; devote time to their students; personally care for students; seek to increase the confidence of their students; challenge themselves and their students; motivate students; do not trust student evaluations; and listen to their students.

In addition, Croply (1967) referred to creative teachers as "resourceful, flexible and willing to get off the beaten track" (p. 96). Croply also suggested creative teachers are able to form positive relationships with students, including highly creative students. Torrance (1995) stated that creative teachers were great teachers who involved students in the process of learning. Creative teachers involve students in the discovery of knowledge and encourage students to push limits and explore the unknown (Torrance). According to Torrance, the truly creative teacher does not desire to become principal or superintendent, because this type of teacher does not work for status or power. Instead, the creative teacher "works in order to live with himself: the freedom to create is his greatest reward" (Torrance, p. 14).

Torrance (1995) also suggested the creative teacher may offer alternative ideas that differ from other teachers and from some traditional educational beliefs. The creative teacher is often unlikely to change their opinion easily, and may be challenging for an administrator (Torrance). In fact, Torrance suggested creative teachers "may be difficult to hold to routine and become restless under conventional restraint" (p. 14). Creative teachers often work best when given a difficult, challenging problem or when they can become deeply engrossed in a specific project (Torrance). However, the creative teacher may disregard protocol and may even try a new idea without seeking official permission (Torrance).

Bleedron (2005) stated "teachers of excellence and insight who go beyond the established curricula are likely to recognize special creative-thinking talents in students and provide opportunities for their recognition and reward. Such teachers will be the ones who will be remembered for a student's lifetime, with gratitude for their mentoring" (p. 26).

Fasko (2000-01) postulated, "creative teaching can enhance learning" (p. 320). How can creative teaching influence learning? A few examples can be found when comparing effective teaching theories with creativity theories. For example, Newcomb et al. (1993) suggested "effective teaching involves more than what the teacher does in the classroom and the laboratory. Teaching that is creative, interesting, and challenging to students and results in students achieving a high level of masterly begins with a course of study that make sense to students" (p. 26). Anderson (2002) suggested creative work requires passion, just like teaching. "A teacher's passion is infectious and easily engenders the student's interest. When a teacher's passion for his subject matter is genuine and committed, it shows itself and transforms students; they too become believers in its importance" (p.47).

Fasko (2000-2001) suggested students would be more motivated if they choose their own tasks, making the task meaningful for the learner. This is similar to Newcomb et al.'s (1993) first principle of teaching and learning which suggested "subject matter to be learned possesses meaning…" (p. 26). In addition, Fasko suggested educators "devote more time to problem-finding skills to communicate to student that this ability is as important as problem solving" (p. 318). Similarly, Newcomb et al. suggested students should inquire into learning. "To maximize learning, students should inquire into rather

that be instructed in the subject matter. Problem-oriented approaches to teaching improve learning" (Newcomb et al., p. 37).

Student interest can be "created or strengthened by developing suspense, using the novel or unexpected and using humor" (Newcomb et al., 1993, p. 31). Could this teaching practice be directly related to the originality construct identified as a key component of creativity? What does creative teaching look like? Anderson (2002) cautioned creative teaching does not mean a teacher may do anything they please. In fact, creative classroom teaching requires an understanding of successful practices and a historical understanding of the disciple. "Teachers can be more genuinely creative when they are familiar with both traditional pedagogical practices and the skills, methods, and histories of their disciplines" (Anderson, p. 37). Anderson further cautioned that creative teachers must assume a heavy responsibility and know when their approaches are failing as well as when they are succeeding.

Effective teaching has also been linked to student creativity. Chambers (1973) studied individuals who had completed doctoral programs and given evidence of highly creative research. After being nominated as creative scholars, participants assessed their former teachers who both facilitated and hindered their creative development. Chambers found teachers who facilitated the creative development of students were more likely to encourage students to contribute to the topics covered in the class, welcomed different or unorthodox views in the classroom, and rewarded student creativity.

In addition, instructors sited by participants as fostering creative development were usually well prepared for class, did not rely on assigned texts for lecture content, and were considered more available to students outside of the classroom (Chambers,

1973). Students also suggested these instructors "strongly encouraged student participation in class discussions" (Chambers, p. 330), seemed primarily concerned that general principles were understood, and "appeared to be greatly concerned with stimulating students to want to learn more on their own and they encouraged students to do independent study" (Chambers, p. 330). Perhaps as a result, students appeared to regard creativity facilitating instructors as outstanding scholars who possessed prominent national research reputations. Finally, facilitating teachers were considered to be highly enthusiastic about their subject as well as about learning and "demonstrated their own originality and creativity" (Chambers, p. 330).

Perhaps Anderson (2002) summarized the need for effective and creative teachers the best when he stated "as a culture we need to develop a genuine respect for the art of teaching and to develop a demand for the kinds of creative teaching we have enjoyed" (p. 47).

Summary

While creativity has been a difficult construct to define, it has been the topic of considerable research. The challenge of defining creativity results in difficulty assessing creativity. However, creativity has been viewed through a wide range of theoretical frameworks. Researchers from many theoretical backgrounds have supported the application of creativity in education. Student motivation, student achievement and students' creative products have been explored. It appears the creativity tests created by Torrance are still a standard within educational creativity research. In addition, multiple methods of evaluating creativity may be the best approach to evaluating creativity. Creativity may be evaluated through the teaching and learning process. Creative teaching

is often considered a component of effective teaching. Effective teaching may be viewed through the characteristics described by Rosenshine and Furst (1971). In addition, student evaluations of effective teaching have been the focus of educational research. Some researchers suggest student evaluations may provide the most accurate measure of teacher effectiveness (Young & Shaw, 1999).

CHAPTER III

METHODOLOGY

This chapter is a presentation of the methodology used to collect and analyze data. Specifically, the research design, population and sampling are addressed. In addition, instrumentation, including validity and reliability, are discussed. Finally, a summary of the data analysis for each research question is presented.

Purpose of the Study

The purpose of this study was to explain and predict creative and effective teaching of university instructors. Specifically, student evaluations, self-reported teaching evaluations, and standardized creativity instruments were used to assess instructor creativity. In addition, the students' perceptions of their instructor's creativity in teaching were compared with instructor's self-reported creativity in teaching. The creativity of instructors, as assessed by a standardized creativity instrument, was also compared to the perceptions of effective teaching held by their students and the self-reported instructor evaluations.

Research Questions and Hypotheses

The following research questions and hypotheses guide this study and identify creativity specifically in the context of instruction and teaching:

1. What are the demographic characteristics of College of Agriculture, Food and Natural Resources (CAFNR) undergraduate instructors, including sex, years of teaching experience, age, and teaching discipline?
2. What is the self-perceived level of creative teaching effectiveness of CAFNR instructors?

3. What is the level of creativity (fluency, originality, elaboration and flexibility) as measured by the ATTA, of CAFNR instructors?
4. What is the level of creative behaviors exhibited by CAFNR instructors, as perceived by their students?
5. What is the level of teaching effectiveness of CAFNR instructors, as perceived by their students?
6. What is the relationship between creative behaviors of CAFNR instructors, as perceived by students, and effective teaching behaviors, as perceived by students, instructors' perceived creativity, and instructors' norm-referenced creativity?
7. What is the relationship between CAFNR instructors teaching effectiveness, as perceived by students, and instructors' perceived creativity, and instructors' norm-referenced creativity?
8. What is the amount of variance in instructors' creativity, as measured by the ATTA, that is accounted for by their age, sex, teaching experience, and discipline?
9. What is the amount of variance in instructors' self-perceived creativity teaching behaviors that is accounted for by their age, sex, teaching experience, and discipline?

Hypotheses

1. H_o: There is no difference between instructors' discipline (natural/physical science or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

   $$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

   H_1: Differences exist between discipline (natural/physical or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

   $$H_{1 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

2. H_o: There is no relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

   $$H_{0 \cdot 1.2.3}: \rho_{xy1.2.3} = 0$$

   H_1: There is a relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

   $$H_{2 \cdot 1.2.3}: \rho_{xy1.2.3} \neq 0$$

3. H_o: There is no difference between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

   $$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{3 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

4. H_o: There is no difference between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{4 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

Research Design

This study was descriptive-correlational in nature. "Correlational research seeks to examine the strength and direction of relationships among two or more variable" (Ary, Jacobs, &Razavieh, 2002, p. 25) and are widely used in educational research. "The degree of relationship is expressed as a correlation coefficient" (Gay &Airasian, 2000). Ary et al. suggested "information gained from such correlational studies is especially useful when trying to understand a complex construct or to build a theory about some behavioral phenomenon" (p. 25). Variables used for this type of research must be chosen after a careful review of the literature and based upon theory, prior research or the researcher's personal observations (Ary et al.). Caution should also be taken to ensure the appropriate indicators of constructs are explored and that instruments have appropriate validity and reliability to address the constructs (Ary et al.). Error may occur if

correlations are considered causation (Ary et al.). Although a correlation is necessary for causation, correlations cannot be considered causation (Ary et al.). Additional limitations occur through interpretation. Interpretation must include sample size, magnitude of the correlation coefficient, and both the statistical significance as well as the practical significance (Ary et al.).

Population and Sampling

Population

Two populations were identified for this non-experimental study. Two populations were needed to represent both instructors and students as specified in the research questions.

Instructors

The specific criteria for the instructor population included instructors teaching all sections of CAFNR undergraduate courses, excluding seminar, research and special problems courses, during the 2007 fall semester (N= 44). Instructors teaching multiple courses or multiple sections of the same course were randomly selected to represent one section of each specific course. For the population of instructors, selection error, or the error resulting from selection of participants, was addressed by confirming participants who met the desired criteria through the CAFNR administration. The list of CAFNR instructors generated by the researcher through the student course selection (myZou) was cross referenced with the list generated by CAFNR administration to further prevent selection error. Instructors who were identified as the subjects for the initial segment of the study were also used to establish the frame for the student population.

Students

The population for the student component of the study included all students enrolled in CAFNR courses being taught by CAFNR instructors who had previously been identified as the population for the instructor component of this study. Specifically, all students enrolled in undergraduate courses taught by CAFNR instructors during the fall, 2007 semester at the University of Missouri, excluding seminar, topics or problems courses, were selected as the student population. Selection error was addressed by securing students enrolled in CAFNR courses through the official University of Missouri registration system (myZou) to prevent selection error.

External validity

Ary et al. (2002) suggested external validity "refers to the generalizability or representativeness of the findings" (p. 296). Threats to external validity, including frame error, were addressed. Dillman (2007) suggested that challenges can be faced when developing a frame using electronic mail because certain individuals may not have an internet address or an individual may have many e-mail accounts. In addition, Dillman suggested e-mail addresses have not been developed in a standardized way, making the potential for greater frame error to occur. To address these concerns, the frame for both populations included electronic mail accounts assigned by MU for students and faculty members. In addition, to ensure participants chosen for this study included all CAFNR faculty who met the criteria for subject selection, the frame was selected from a list of all faculty and instructors provided by the CAFNR dean's office. This list was considered reliable for the purpose of constructing a potential frame for the study because the dean's office had the most accurate and current list of faculty.

The use of a cluster sampling for this study also limited the possibility of selection error. All students in the courses taught by participating instructors were accessed through MU's registration system, known asmyZou. This system was considered to be both accurate and reliable to develop the frame for the student population, thus reducing the potential of frame error.

Sampling

Instructors

A time and place sample was conducted for instructors teaching undergraduate CAFNR courses during the Fall 2007 semester. The use of a time and place sample, as suggested by Oliver and Hinkle (1982), was justified as the instructor population could be considered representative of future populations in CAFNR at the University of Missouri. The time and place sample resulted in 44 instructors who met the criteria. Because all members of the population were included in the study, sampling procedures were not imposed. As a result, the treat of sampling error was not a consideration in this study.

Students

Probabilistic sampling was used for the student population. Because students were considered an intact group, cluster sampling was considered appropriate for this population. "Individuals constitute a cluster insofar as they are alike with respect to characteristics relevant to the variables of the study" (Ary et al., 2002, p. 168). As suggested by Ary et al., all members of each cluster were included in the sample. Attempting to equate members within each cluster, courses were selected where the cluster represented a minimum of twenty-five students. Because many CAFNR students had multiple CAFNR instructors, there was a need to eliminate duplicate representation.

Therefore, students were arranged by cluster and assigned to a specific cluster. Students with multiple classes were placed into clusters based upon class size. An effort was made to assign students with multiple classes to the cluster with the lowest student enrollment. This was done to preserve as many clusters as possible. Students were only allowed to be a member of one cluster and could only complete the questionnaire on one CAFNR instructor. After duplicate classes and students were removed, a minimum number of 15 students were then required for the cluster to be included in the student population of this study. This procedure resulted in 44 qualifying classes. To ensure the accepting sample approximated members of each cluster, a response rate of fifty percent or a minimum number of 30 was required for each cluster to be included in the population. Cluster sampling was utilized for the student population. All students identified as in-tact groups of CAFNR instructors were included in the sample. As a result, the threat of sampling error was eliminated in this study.

Instrumentation

Two separate data collection instruments were used to assess the creativity of instructors in the CAFNR at the MU. The Abbreviated Torrance Test for Adults was used as an established, standardized measure of creativity. Due to copyright restrictions, a copy of the Abbreviated Torrance Test for Adults is not contained in the appendices. A researcher developed questionnaire (Appendix A) was used to assess the teaching effectiveness and creative teaching of instructors, as perceived by students. A researcher developed questionnaire (Appendix B) was used to assess instructors' self-perceived creative teaching behaviors. Finally, demographic data was collected directly from the instructor population.

Abbreviated Torrance Test for Adults (ATTA)

The ATTA is comprised of "four norm-referenced abilities and fifteen criterion-referenced creativity indicators" (Goff & Torrance, 2002, p. 1). The norm-referenced areas included fluency, originality, elaboration, and flexibility. The criterion-referenced creativity indicators included the following (Goff & Torrance, p. 2): verbal responses, which included richness and colorfulness of imagery, emotions and feelings, future orientation and humor, conceptual incongruity and provocative questions; and figural responses, which included openness and resistance to premature closure, unusual visualization and different perspectives, movement and/or sound, richness and/or colorfulness of imagery, abstractness of titles, context or the environment for object and articulateness in telling story, combination and synthesis of two or more figures, internal visual perspective, expressions of feelings and emotions, and fantasy.

Raw scores from the four norm-referenced measures were converted to normalized scaled score, allowing the "assessment of the four measures on a comparable score scale" (Scholastic, p. 2). The resulting scaled score is a 9-point scale, ranging from 11 through 19. Table 1(Goff & Torrance, 2002) shows the percentage of adults who are identified by each score.

Table 1

Normative Data for the Abbreviated Torrance Test (ATTA)

Scaled Score	Percentage of Adults
19	4
18	6
17	13
16	17
15	20
14	17
13	13
12	6
11	4

Each of the fifteen criterion-referenced indicators received a score ranging from 0 to 2. The sum of the criterion-referenced indicators was then added to the norm-referenced scaled score to create the creativity index (CI). Due to the complexity of interpreting the creativity index, the ATTA utilizes a seen point scaled score to clarify analysis. "The creativity index, with the interpretive aids-creativity level, verbal assessment, and percentage of adults in level-perhaps provides the best single overall indicator of creative ability for the individual being tested" (Scholastic Testing Manual, 2002, p. 29). Table 2 suggests the scaled score for the Creativity Index, the percentage of adults described by each score, and the interpretive meaning of the score.

Table 2

Abbreviated Torrance Test for Adults Scoring

Scaled Score	Percentage of Adults	Meaning
7	4	Substantial
6	12	High
5	20	Above Average
4	26	Average
3	20	Below Average
2	12	Low
1	4	Minimal

Creative and Effective Teaching Assessment

An exhaustive review of literature revealed no measuring instruments for identifying the creative teaching of instructors. Therefore, the researcher developed an instrument, called the Creative and Effective Teaching Assessment (CETA). The CETA was used to assess student perceptions of creativity teaching behaviors and effective teaching behaviors of university instructors. A shortened version of the Creative and Effective Teaching Assessment was used to assess the self-perceived creativity in teaching of university instructors.

The CETA consisted of two sections. The first component addressed students' perceptions of the creativity exhibited by instructors in their teaching. Four constructs were identified from the Torrance creativity test. These four areas included fluency, originality, elaboration and flexibility. For each construct, four questions were constructed. "A Likert scale (summated rating scale) assesses attitudes toward a topic by

presenting a set of statements about the topic and asking respondents to indicate for each whether they strongly agree, agree, are undecided, disagree, or strongly disagree" (Ary et al. , 2002, p. 224). Each response was given a numeric value to be summated to create a total scale score (Ary et al.). "This total score represents the individual's attitude toward a topic" (Ary et al., p. 224). The 16 items were measured on a seven point Likert scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Undecided; 5 = Slightly Agree; 6 = Agree; and 7 = Strongly Agree.

The second component of the questionnaire assessed teaching effectiveness of the instructors, as perceived by his/her students. This component of the questionnaire consisted of fifteen statements designed to assess the first five characteristics of effective teachers identified by Rosenshine and Furst (1971). These characteristics include clarity, variability, enthusiasm, task-oriented and business-like behavior, and opportunity to learn criterion material.

The CETA was developed as an Internet web questionnaire. According to Dillman (2007):

> Web surveys … provide survey capabilities far beyond those available for any other type of self-administered questionnaire. They can be designed so as to provide a more dynamic interaction between respondents and questionnaire than can be achieved in e-mail or paper surveys" (p. 354).

As Dillman (2007) noted, many individuals do not have access to computers and/or e-mail addresses. "Certain populations, such as university professors, federal government employees, worker in many companies and corporations, and members of some professional organizations, generally have Internet addresses and access. For these

populations, e-mail and Web surveys may have only minor coverage problems" (p. 356). Given both populations for this study required computer access from the University of Missouri, the potential of coverage error (Dillman) was not considered relevant for this study and thus the on-line survey was conducted.

Demographic Data

Demographic data, including years of teaching experience, sex, and identification of disciple (natural/physical or social science) were collected by the researcher. The researcher obtained the data from the instructors in personal conversations.

Validity and Reliability

Potential for measurement error did exist in this study. Measurement error is the threat of either reliability or validity of the instrument. To ensure the threat of measurement error was addressed, each instrument was assessed independently for validity and reliability. The use of a carefully composed electronic letter, appropriate details and directions, and appropriate layout and design of the instruments also contributed to minimizing the potential for measurement error.

Validity

Validity is the assumption that instruments truly measure what they are intended to measure (Ary et al., 2002). Validity is "the most important consideration in developing and evaluation measuring instruments" (Ary et al., p. 242). In addition, validity requires both face and content validity. Face validity suggests the instruments "appear valid for its intended purpose" (Ary et al., p. 409). Content validity suggests that the questionnaire measures what it purports to measure. Validity is the assumption that the indented measurement was indeed measured by the instrument. According to the Classical Test

Theory, validity attempts to minimize the systematic, non-random error. The validity of this study was enhanced by the use of a standardized instrument.

Abbreviated Torrance Test for Adults (ATTA)

The Torrance Tests of Creative Thinking (TTCT) "is the most widely used and most researched creativity test" (Goff & Torrance, 2002, p. 36). The ATTA was developed from the TTCT and both content and face validity have been established by the Scholastic Testing Service (Goff & Torrance). Although some research suggests the validity of the Torrance tests may be in question, (Amabile, 1996; Cropley, 1997, 2001; Runco, 2005), longitudinal studies suggest validity isnot a concern (Cropley, 1997, 2001; Torrance, 1995).

Creative and effective teaching assessment

Validity for the CETA was established by a panel of experts (Appendix C) to refine and validate the instrument. The panel of experts was composed of four individuals including two content experts and two instrumentation experts. The panel was asked to review the online questionnaire for both content and construct validity. Specifically, the panel of experts reviewed the 16 statements on the questionnaire which addressed the four constructs identified by Torrance as measurements of creativity and assess the statements for clarity. In addition, the panel viewed the second part of the questionnaire to ensure the clarity of the effective teaching characteristics. Finally, the panel reviewed the on-line questionnaire for face validity. Each item on the instrument was reviewed for validity and suggestions for grammatical changes from the panel were incorporated into the questionnaire.

Reliability

Reliability was also established for the instruments used in this study. Reliability is "concerned with the extent to which the measure would yield consistent results each time it is used" (Ary et al., 2002, p. 227). "Test reliability relates to the consistency with which a test actually measures what it is assessing" (Scholastic Testing Manual, 2002, p. 33). Reliability suggests an instrument offers consistent measurement (Ary et al., 2002) "Test reliability relates to the consistency with which a test actually measures what it is assessing" (Scholastic Testing Manual, p. 33). Error can be either random or systematic (non-random). Random error consists of any factors that randomly affect the measurement of the variable. This type of error results from pure chance and cannot be controlled (Ary et al., 2002). Conversely, non-random error occurs through factors that systematically affect measurement of the variable. Non-random error refers to irrelevant variance that can be controlled (Ary et al.). In accordance with recommendations of Salant and Dillman (1994), reliably was not determined for demographic characteristics because demographic characteristics produce little measurement error.

Abbreviated Torrance Test for Adults (ATTA)

The ATTA was used as a standardized instrument to measure creativity. The ATTA instrument is considered more reliable when used to determine individual differences in creativity (Amabile, 1996). Ary et al. (2002) suggested the need to establish intra-rater reliability when ratings are made by an individual researcher. In addition, Ary et al. suggested an inter-rater reliability coefficient of .70 or higher is considered acceptable for rating scales" (p. 232). According to the Scholastic Testing Manual (2002), reliability for the ATTA was derived by using the Kuder-Richardson 21

(KR21) reliability coefficient. The KR21 reliability coefficients for the ATTA were: "fluency = .45; originality = .38; elaboration = .84; flexibility = .38 and total creativity indicators = .69" (Goff & Torrance, p. 35). Addressing the reliability coefficients of the ATTA, the ATTA scoring manual (Goff & Torrance) stated: "abbreviated administration (a short assessment) was given precedence over increased reliability of part-scores, i.e. more time and activities generally increase reliability" (p. 34).

Creative and effective teaching assessment

To address and account for non-random error, reliability was estimated by conducting a pilot test of the CETA instrument. Gall, Gall, and Borg (2003) suggested the following:

> The pilot test should include a sample of individuals from the populations from which you plan to draw your respondents. Also, the pilot-test form of the questionnaire should provide space for respondents to make criticisms and recommendations for improving the questionnaire (p. 230).

Therefore, in accordance with recommendations from Gall et al. (2003), the questionnaire was administered to a sample of 47 students at MU who had similar characteristics as the population, but not selected to participate in the study. In addition, the pilot test version of instrument included a question designed to solicit feedback about the instrument. The instructor pilot was conducted by university faculty from colleges of agriculture across the nation. This population was selected because it closely resembled the population of CAFNR instructors.

Cronbach's alpha was computed to determine the internal reliability of the instrument for both the instructor and student pilot tests. Cronbach's alpha was selected

for the reliability estimate, as the CETA consisted of summated scale (Ary et al., 2002). Sample size differed for the two groups due to missing data, resulting in a minimum of 36 student responses and a minimal of 28 instructor responses for the respected pilot tests. The student pilot test resulted in a Cronbach's alpha level of .97 (n = 37) for the entire instrument. The internal reliability for the instructor effectiveness construct measure by the student pilot was .92 (n = 38). The student pilot for the four creativity constructs resulted in a Cronbach's alpha of .96 (n = 38). Each of the four creativity constructs was evaluated for reliability (see Table 3). The Cronbach's alpha for fluency (α = .81; n =39), flexibility (α = .87; n = *40*), originality (α = .89; n =38), and elaboration (α = .89; n = *40*) were each deemed acceptable reliability levels. For the instructor pilot test, the Cronbach's alpha for the four creative constructs was .84 (n = 28), which suggested the instrument offered internal consistency in measuring the intended variables. Each individual construct was also examined (see Table 3). The reliability coefficient for the instructor pilot included fluency (α = .46; n = 30), flexibility (α = .74; n = 28), originality (α = .77; n = 29), and elaboration (α = .68; n = 29). Ary et al. suggested an inter-rater reliability coefficient of .70 or higher is considered acceptable for rating scales" (p. 232). However, Nunnally (1962) suggested reliability estimates of .50-.60 may be high enough in the early stages of research.

Table 3

Cronbach's Alpha Reliability Coefficients for CETA Pilot Test

	Student Pilot		Instructor Pilot	
	n	α	*n*	α
Fluency	39	.81	30	.46
Flexibility	40	.87	28	.74
Originality	38	.89	29	.77
Elaboration	40	.89	29	.68
Creative Teaching Behaviors	38	.96	29	.84
Clarity	39	.74	28	
Enthusiasm	39	.90		
Variability	39	.86		
Task Oriented	38	.76		
Opportunity to Learn	39	.76		
Effective Teaching	38	.92		
CETA	37	.97	28	.84

Data Collection

Following suggestions by Dillman (2007), the selected subjects for this study were contacted through electronic mail from the researcher. Responses from participants were coded to facilitate a higher response rate. "All sampled individuals should receive an individual e-mail message that contains the questionnaire" (Dillman, 2007, p. 368). This recommendation was followed and personalized e-mail messages were sent to each participant to protect the confidentiality of participants and to increase response rate. In

addition, six $25 gift certificates were used to encourage participation. Dillman (2007) suggested the time between contacts should be "shorted from one week to two or three days in order to increase the likelihood that the recipient will connect the memory of the first contact with the second" (p. 368).

Population of Instructors

The initial contact with population of instructors was through electronic mail. The first correspondence and invitation to participate in the study was sent on January 8, 2008. A total of 44 instructors were identified in the population. One instructor left for sabbatical and was unable to participate in the study. Of the remaining 43 instructors, 22 responded to the first correspondence. A follow-up invitation, as well as the invitation to participate in the standardized instrument component of the study, was sent on January 14, 2008. A third and final follow-up electronic mailing was sent on January 18, 2008. The instructors were invited to attend one of five meetings to complete the ATTA assessment. Refreshments and a drawing for CAFNR apparel were given to increase attendance. Personal follow-up was made with instructors who did not attend the scheduled assessment times. Through these procedures, data were collected from 40 instructors, yielding a response rate of 91%.

Population of Students

The population of students was first contacted through electronic mail on December 18, 2007 with a request to participate in the study. The electronic letter was personalized to increase response rate and included a direct link to the questionnaire. In addition, the course instructor was listed and the students were assigned a personal code number, which was also indicated in the contact letter. Students were asked to access the

direct link to the questionnaire, enter their code and complete the instrument based upon the instructor indicated in the electronic contact letter. A total of 1674 students were contacted and 350 responded after the first request. A second request to participate in the study was sent to the students on December 21, 2007. A total of 252 students responded following the second contact. A third request for participants was sent on January 2, 2008. A total of 268 students responded to the third contact. Finally, participants from clusters which had less than 30 or less than 50% response rate were identified and a forth contact was made. Total students responses (n = 921) yielded 40 student clusters. A final response rate of 55% was recorded. However, 15 student electronic mail boxes were full and failed to receive the invitations to participate. The adjusted response rate was 73.8%.

Data were collected through the use of an on-line survey instrument given to students at the conclusion of the fall, 2007 semester. Students were invited to participate in the study through an electronic letter. Gall et al. (2003) suggested "the major problem with anonymous questionnaires is that follow-ups to improve the return rate are impossible" (p. 227). One solution is to incorporate a code for each student and check off each participant after they respond (Gall et al.). For this reason, participants within each cluster were coded to match the instructor evaluated by the student and to allow follow-up to reduce non-response error. Clusters for each class were used to generate a summative evaluation for each instructor. Specifically, the four construct areas of creativity measured by the first part of the questionnaire were summated and a creativity score for each instructor was created. In addition, the second portion of the questionnaire was summated to indicate the total effectiveness of instructors, as perceived by their students.

The instructors also completed the ATTA, which was administered following the directions included in the test manual of the standardized instrument. The test consisted of three timed activities. As directed by the administration manual, the participants were given three minutes to complete each component of the ATTA. The instruments were coded for later use. Scoring of the ATTA followed procedures outlined in the ATTA test manual. The researcher had prior experience in scoring the ATTA (Aschenbrener et al., 2006). In addition, intra-rater reliability was addressed by having only one person score the ATTA. Each of the three activities was assessed for fluency, originality, elaboration and flexibility.

Data Analysis

Data from the instructors were analyzed using Statistical Package for the Social Sciences (SPSS) for Windows. Correlations were conducted between instructor creativity, as measured by the ATTA. In addition, these scores were correlated with data from the student population.

According to Ary et al. (2002), "Pearson coefficient is appropriate for use when the variables to be correlated are normally distributed and measure on an interval or ration scale" (p. 358). Correlations were calculated between and among the four constructs identified in the first part of the questionnaire. Correlations were also calculated between the summated creativity score of the instructors and the student's perceive instructor teaching effectiveness. Finally, the perceived effectiveness of the instructors and the perceived creativity of instructors were correlated with the ATTA.

Abbreviated Torrance Test for Adults (ATTA)

The summated scores for each of the creativity constructs comprising the ATTA were recorded and converted to a scaled score, as directed by the ATTA manual. The ATTA scoring guide facilitated collecting the verbal responses, figural responses, and norm-referenced measures. Finally, a Creativity Index for each participant was calculated after summating the scores on the ATTA instrument. This allowed a norm-referenced assessment of instructor's creativity to be established.

CETA

Miller (1998) suggested "the most common analysis is conducted with the Pearson product moment correlation coefficient (*r*) because it is used when both variables are interval or ration in scale or measurement" (p. 4). However, Miller cautioned that two assumptions must be met before Pearson's correlation should be implemented. Data should be analyzed to assure linearity and access homoscedasticity (Miller). The alpha level was set a priori at .05. Davis (1971) conventions were used to evaluate the correlations. The magnitude of the correlation (*r*) of 1.0 is considered perfect, .70-.99 is considered very high, .50 - .69 is substantial, .30-.49 is moderate, .10-.29 is low and .01-.09 is considered negligible (Davis). Data analysis for each research question was conducted depending on the type of data and nature of the question.

Research question one sought to determine the demographic data of instructors, including sex, years of teaching experience, age, and teaching discipline. Basic descriptive statistics were used to summarize these data.

Research question two sought to determine the self-perceived level of creative teaching effectiveness of instructors. Summated, interval data from the CETA were

described using a grand mean representative of the 16 items. Standard deviations were used to describe the range and variance of the measure.

Research question three sought to determine the level of norm referenced creativity (fluency, originality, elaboration and flexibility, as measured by the ATTA) of instructors. Data were scored using the standardized assessment procedures indicated in the ATTA manual (Goff & Torrance, 2002). Summated, interval data from the ATTA were described using a grand mean representative of the four constructs. Standard deviations were used to describe the range and variance of the measure.

Research question four sought to determine the level of creative behaviors exhibited by instructors, as perceived by their students. Summated, interval data from the CETA were described using a grand mean representative of the 16 items. Standard deviations were used to describe the range and variance of the measure

Research question five sought to determine the level of effectiveness of instructors, as perceived by their students. Summated, interval data from the CETA were described using a grand mean representative of the 16 items. Standard deviations were used to describe the range and variance of the measure.

Research question six sought to determine the relationship between creative teaching behaviors of instructors, as perceived by students, and effective teaching behaviors, as perceive by students, instructors' perceived creativity, and instructors' norm-referenced creativity. Because all data were considered interval in nature, Pearson product moment correlations were used to analyze these data.

Research question seven sought to determine the relationship between instructor effectiveness, as perceived by students, and instructors' perceived creativity, and

instructors' norm-referenced creativity assessments. The data, being interval in nature, were analyzed using Pearson's correlation.

Research questions eight sought to determine the amount of variance in norm referenced creativity, as measured by the ATTA, accounted for by age, sex, experience, and discipline. A simple linear regression model was calculated to determine the amount of variance in the dependent variable, norm referenced creativity, which could be accounted for by the independent variables of age, sex, experience, and discipline.

Research questions nine sought to determine the amount of variance in self-perceived creative teaching behaviors, as measured by the CETA, accounted for by age, sex, experience, and discipline. A simple linear regression model was calculated to determine the amount of variance in the dependent variable, self-perceived creative teaching behaviors, which could be accounted for by the independent variables of age, sex, experience, and discipline.

The null hypothesis for the first hypothesis was there was no difference between discipline in which the instructor taught, classified as either natural/biological science or social science, and level of creativity as measured by student perceptions, instructor's perceptions, and a norm referenced assessment. The researcher created a forced dichotomy by evaluating the content of the class to make the determination between natural/biological and social science. Because this hypothesis compared nominal data with interval data, a point biserial coefficient was calculated, in accordance with recommendations by Miller (1998).

The null hypothesis for hypothesis two was that no differences existed between experience and level of creativity (student perception, instructor's perceived, and norm

referenced). Instructor experience, which was nominal data, was and forced into a dichotomy containing experienced (five years of teaching or greater) and novice (less than five years of teaching). Five years of teaching experience was chosen to distinguish between novice and veteran teaching experience because that is the experience level at which CAFNR classifies faculty for its annual teaching awards. CAFNR classifies novice instructors as those with five years or less of experience. Therefore, this study followed CAFNR's distinction between novice and veteran instructors and forced teaching experience into a dichotomous variable to examine hypotheses two. Levene's Test for equality of variances was conducted. Then, independent samples *t*-test was conducted to determine if there was a significant difference between experience and creativity (as measured by student perceptions of instructor's level of creativity, instructor's self-perceived level of creativity and instructor's norm referenced level of creativity).

Null hypothesis three stated that no differences existed between sex and level of creativity as measured by student perceptions, instructor's perceptions, and norm referenced assessment. Levene's test for equality of variances was conducted to assure equal variances could be assumed. Finally, independent *t*-tests were conducted to determine if differences existed.

Null hypothesis four stated that no relationship existed between effective teaching as perceived by students and level of creativity as measured by student perception, instructor's perception, and a norm referenced assessment. All summated data for this research question were considered interval in nature. Student responses to the effective teaching component of the CETA were forced into a dichotomy to allow differences to be tested. Instructors identified as effective teachers (coded 0) scored 5.0 or higher on the

seven-point Likert scale, indicating students agreed or strongly agreed on the summated effective teaching component of the CETA. Arguably, scores indicating students agree or strongly agree where chosen to represent effective teaching and thus scores below five were considered reflective of ineffective teaching, as perceived by students. After evaluating Levene's Test for equality of variances, independent samples *t*-tests were conducted to assess differences.

CHAPTER FOUR

FINDINGS

This chapter presents the results of the data analyzed to accomplish the purpose of this study and addresses the nine research questions and four hypotheses.

The purpose of this study was to explain and predict creative and effective teaching of university instructors. Specifically, student evaluations, self-reported teaching evaluations, and standardized creativity instruments were used to assess instructor creativity. In addition, instructors' creative teaching behaviors, as perceived by students were compared with instructors' self-reported creative teaching behaviors. The creativity of instructors, as assessed by a standardized creativity instrument, was also compared to the perceptions of effective teaching held by students and instructors' self-perceived creative teaching behaviors.

Research Questions and Hypotheses

The following research questions and hypotheses guide this study and identify creativity specifically in the context of instruction and teaching:

1. What are the demographic characteristics of College of Agriculture, Food and Natural Resources (CAFNR) undergraduate instructors, including sex, years of teaching experience, age, and teaching discipline?
2. What is the self-perceived level of creative teaching effectiveness of CAFNR instructors?
3. What is the level of creativity (fluency, originality, elaboration and flexibility) as measured by the ATTA, of CAFNR instructors?

4. What is the level of creative behaviors exhibited by CAFNR instructors, as perceived by their students?
5. What is the level of teaching effectiveness of CAFNR instructors, as perceived by their students?
6. What is the relationship between creative behaviors of CAFNR instructors, as perceived by students, and effective teaching behaviors, as perceived by students, instructors' perceived creativity, and instructors' norm-referenced creativity?
7. What is the relationship between CAFNR instructors teaching effectiveness, as perceived by students, and instructors' perceived creativity, and instructors' norm-referenced creativity?
8. What is the amount of variance in instructors' creativity, as measured by the ATTA, that is accounted for by their age, sex, teaching experience, and discipline?
9. What is the amount of variance in instructors' self-perceived creativity teaching behaviors that is accounted for by their age, sex, teaching experience, and discipline?

Hypotheses

1. H_o: There is no difference between instructors' discipline (natural/physical science or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between discipline (natural/physical or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{1 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

2. H_o: There is no relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \rho_{xy1.2.3} = 0$$

H_1: There is a relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{2 \cdot 1.2.3}: \rho_{xy1.2.3} \neq 0$$

3. H_o: There is no difference between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{3 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

4. H_o: There is no difference between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{4 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

Findings Related to Research Question One

The first research question asked the demographic characteristics of the accepting sample of instructors (n = 40). Specifically, participants' age, years of teaching, sex, and discipline received were examined using appropriate statistical measures to determine measures of central tendency and variability (see Table 4). Frequencies and percentages were reported for nominal data, including sex and award recipients. Means and standard deviations were reported for ordinal data, including discipline. Interval or ratio data, such as age, and years of teaching experience, were analyzed and means, modes, and standard deviations reported.

Table 4

Demographic Characteristics of Instructors (n = 40)

Characteristic	*f*	%	Mode	Mean	*SD*	Range
Age			51	47.05	10.48	25 - 77
Years of Teaching			10	15.95	10.98	1 - 47
Sex						
Male	27	67.50				
Female	13	32.50				
Discipline						
Natural/physical	25	62.50				
Social	15	37.50				

The accepting sample (n = 40) averaged 47 years of age and the most frequently occurring age was 51. The range of ages was from 25 to 77 years. The sample averaged slightly less than 16 years of teaching experience and was predominately male (68%). However, the range in teaching experience was one to 47 years, resulting in a standard deviation of 10.98. In addition, roughly two-thirds (62.5%) of the instructors taught in natural/physical science areas.

Findings Related to Research QuestionTwo

Research question two sought to determine the self-perceived level of creative teaching behaviors of instructors. The four constructs comprising the creative teaching assessment included originality, frequency, flexibility and elaboration. The interval and data were analyzed and means, standard deviations and ranges reported (see Table5).

Table 5

Summated Scores for Instructors' Self-Perceived Level of Creative Teaching Behaviors (n = 40)

Construct	Mean	*SD*	Mode	Range
Summated Self - Perceived Creative Teaching Behavior	5.73	.72	6.06	3.00 - 6.89
Elaboration	6.18	.61	6.25	5.00 - 7.00
Frequency	5.81	.87	5.25	3.00 - 5.00
Flexibility	5.58	.93	6.00	2.75 - 7.00
Originality	5.35	1.15	5.75	1.00 - 6.92

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

The highest summated mean score for the four areas assessed by the CETA for the accepting sample (*n = 40*) was the elaboration construct (*M* = 6.18; *SD* = .61). Originality had the lowest mean score (*M* = 5.35; *SD* = 1.15) and thegreatest range in scores. The self-perceived level of creative teaching behaviors held by instructors was 5.73 (*SD* = .72) on the seven point Likert scale. Overall, instructors indicated they slightly agreed to agreed(*M* = 5.73) they demonstrate creative teaching behaviors in the learning environment, as illustrated in Figure 2.

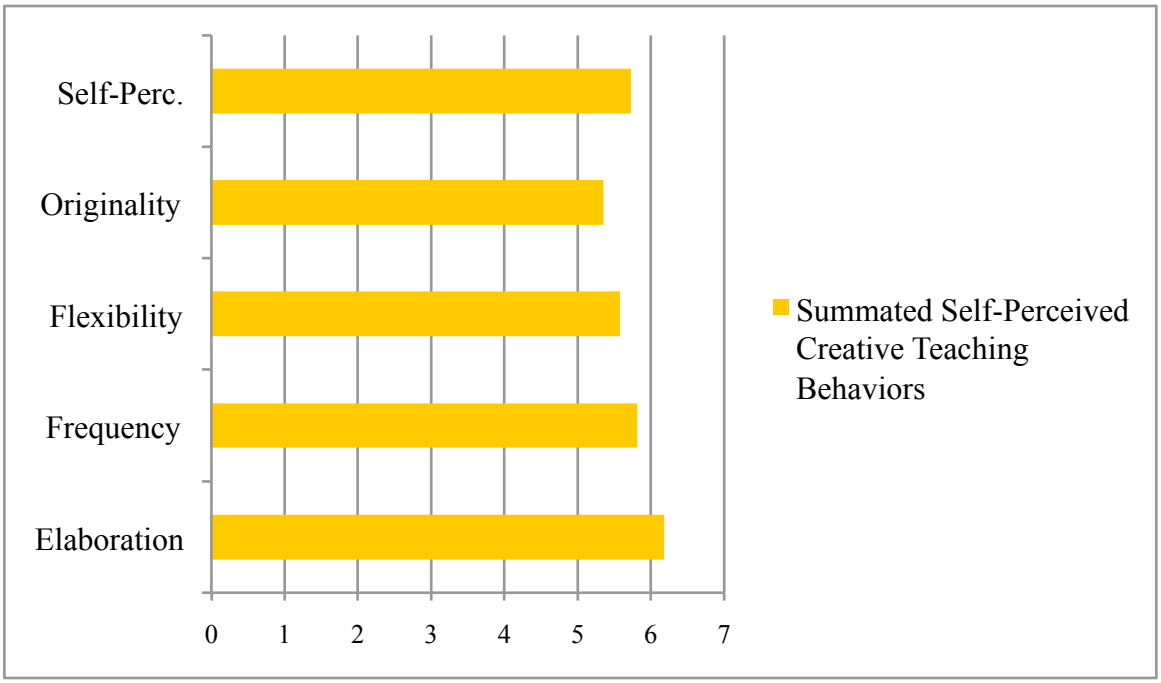

Figure 2.Self-perceived creative teaching behaviors of CAFNR instructors.

Findings Related to Research QuestionThree

Research question three sought to describe the norm referenced creativity, as measured by the ATTA, of the participants. The four constructs of the ATTA (originality, frequency, flexibility and elaboration) were scored and converted to scaled scores, as prescribed by the ATTA testing manual (Scholastic, 2001). Additionally, the criterion referenced creativity was scored as a component of the ATTA. Finally, the summated scaled scores for all four constructs were added to the criterion referenced score to determine the creative index of the ATTA. The interval data were analyzed and the means, standard deviations, and ranges reported (see Table 6).

Table 6

Summated Norm Referenced Creativity (n = 40)

Construct	Mean	*SD*
Creative Index (ATTA)	79.70	7.89
Scaled Elaboration	17.62	2.85
Scaled Originality	16.72	2.69
Scaled Frequency	16.21	2.27
Scaled Flexibility	15.18	2.74
Criterion Referenced	13.82	3.31

Elaboration was the highest individual construct, with a mean score of 17.62 (*SD* = 2.85). The lowest construct was flexibility (*M* = 15.18; *SD* = 2.74). The summated criterion referenced creativity had a mean of 13.82 (*SD* = 3.31). The overall, summated creativity index of participants was 79.70 (*SD* = 7.89). The creativity level measured by the ATTA ranged in scores from 61 to 97.None of the participants scored in the minimal or low category, according to the Scholastic Testing Service (Goff & Torrance, 2001). While norm-referenced data for the ATTA suggested 20% of the population scored below average, only 1.90 % of CAFNR instructors scored in the below average category. Eight (20%) of the participants scored in the average range of the ATTA, compared to 26% of the norm-referenced population. Five percent of the participants scored above average, compared to20% of the norm-referenced population. Fifteen (37.50%) participants scored in the high category, while 12% of the norm-referenced population scored in the high category on the ATTA. Finally, 30% of participants scored in the substantial category of

the ATTA, compared to four percent for the norm-referenced data. These data are displayed graphically in Figure 3.

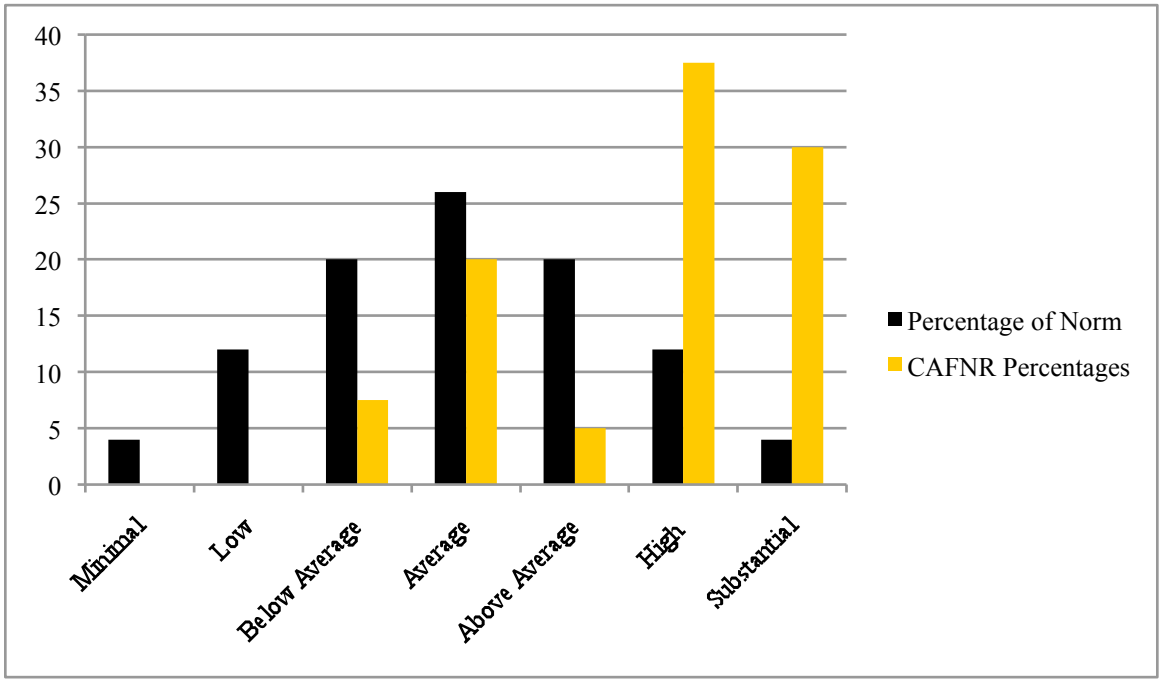

Figure 3. Comparison of standardized, norm-referenced scores of the ATTA to CAFNR instructors' ATTA scores.

Findings Related to Research QuestionFour

The purpose of research question four was to determine the level of creative teaching behaviors exhibited by instructors, as perceived by their students. Cluster sampling of students was used to develop summated scores on the four constructs of creative teaching behaviors, as measured by the CETA. After duplicate classes were removed, a minimum number of 15 students were required for the cluster to be included in the student population of this study. To be confident the accepting sample approximated members of each cluster, a response rate of 50%, or a minimum number of 30, was required for each cluster to be included in the population. Student clusters were

matched with their instructors by using coded information. Means, standard deviations, modes and ranges were computed for the interval data (see Table7).

Table 7

Summated Scores for Students Perceived Creative Teaching Behaviors of Instructors (n = 40)

Construct	Mean	*SD*	Mode	Range
Summate Creative Teaching Behaviors	5.43	.75	3.32	3.32 - 6.67
Elaboration	5.72	.72	5.53	5.00 - 7.00
Frequency	5.41	.73	3.86	3.00 - 7.00
Flexibility	5.31	.80	2.98	2.75 - 7.00
Originality	5.29	.84	4.56	1.00 - 6.74

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Summated data from the student clusters found the highest mean score for the construct of elaboration (M = 5.72; SD = .72). The construct of originality reported the lowest mean score (M= 5.28; SD = .84). The summated mean score for creative teaching behaviors, as perceived by students, was 5.43 (SD = .75), as illustrated in Figure 4.

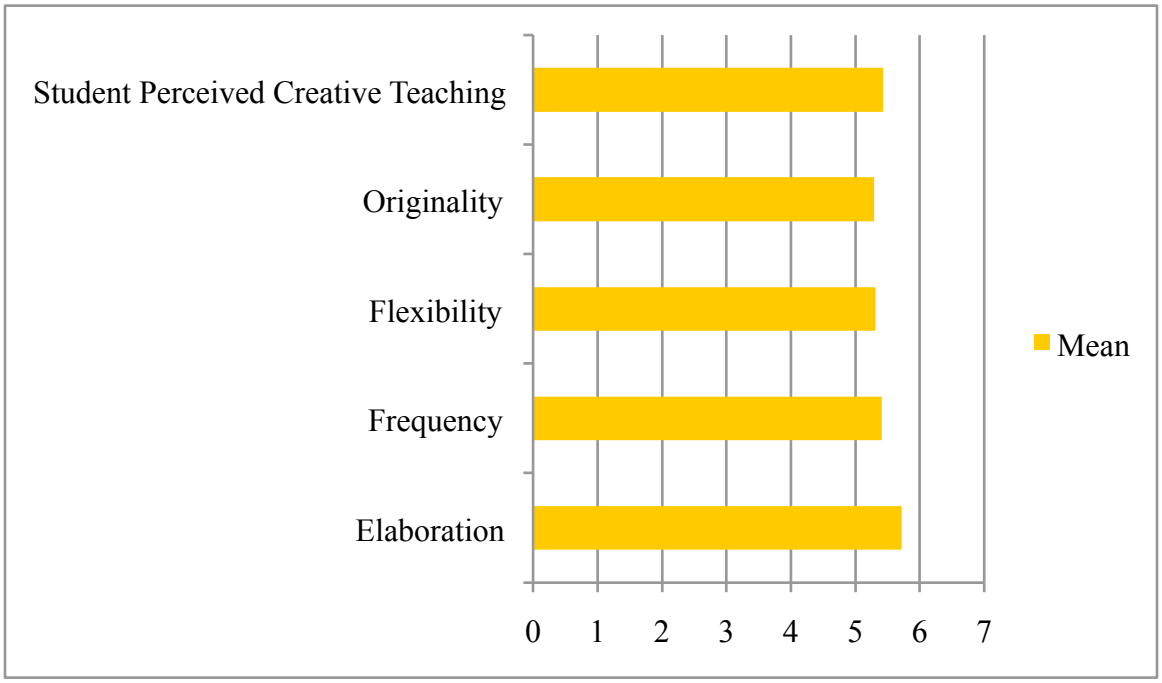

Figure 4.Students Perceived Creative Teaching Behaviors of CAFNR Instructors

Findings Related to Research QuestionFive

Research question five sought to describe students' perceptions of the four constructs comprising effective teaching on the CETA. The interval data were analyzed and the means, standard deviations and ranges reported (see Table 8).

Table 8

Summated Scores for Students' Perceived Effective Teaching (n = 40)

Construct	Mean	*SD*	Mode	Range
Self- Perceived Effective Teaching	5.64	.69	3.80	3.80 - 6.82
Enthusiasm	5.87	.71	4.27	4.27 - 6.90
Task Oriented	5.83	.53	5.38	4.47 - 6.79
Opportunity to Learn	5.64	.70	6.48	3.53 - 6.88
Clarity	5.58	.85	6.43	3.37 - 6.88
Variability	5.23	.90	3.07	3.07 - 6.81

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Students rated enthusiasm to be the most frequently occurring construct of effective teaching (M = 5.87; SD = .71). Variability reported the lowest mean score (M = 5.23; SD = .90) for effective teaching, as perceived by students. Overall, students slightly agreed to agreed CAFNR instructors were effective teachers (M = 5.64; SD = .69). Students slightly agreed to agreed that CAFNR instructors effectively demonstrated each of the five effective teaching characteristics.

Findings Related to Research QuestionSix

Research question six sought to describe the relationship between creative teaching behaviors of instructors, as perceived by students, and students' perceptions of effective instructors, instructor's perceived creativity, and instructors' norm referenced creativity. Data were considered interval in nature, thus Pearson product moment

correlations were used to analyze the data (see Table9). Relationships were classified using Davis (1971) conventions for describing magnitude of correlation coefficients.

Table 9

Pearson Product Moment Correlations for Students' Perceived Creative Teaching Behaviors (n = 40)

Variable	Student Perceived Creative Teaching Behaviors	*p* - value
Student Perceived Effective Teaching	.91*	.01
ATTA	-.06	.74
Instructor Perceived Creative Teaching	-.08	.61

* $p \leq .05$.

A very high, positive and significant correlation was found between students' perceived effective teaching and students' perception of creative behaviors of instructors ($r = .91$; $p < .05$). A negativeand low relationship was found between students' perceived effective teaching and the instructors' norm referenced creativity, as measured by the ATTA ($r = -.10$; $p > .05$). A negative,low and non-significant relationship was found between students' perceive effective teaching and instructors' perceived creative teaching, as measured by the CETA ($r = -.10$; $p > .05$).

Findings Related to Research QuestionSeven

Research question seven sought to determine the relationship between instructor effectiveness, as perceived by students, instructors' perceived creativity, and instructors' norm-referenced creativity (see Table 10).

Table 10

Pearson Product Moment Correlations for Students' Perceived EffectiveTeaching (n = 40)

Variable	Student Perceived Effective Teaching (Y)	*p* - value
ATTA	-.10	.56
Instructor Perceived Creative Teaching	-.10	.56

Low, and negative relationships were found between students' perceived effective teaching and instructors' perceived creativity (r = -.10; p>.05). In addition, low, and negative relationships were found between instructor effectiveness, as perceived by students, and instructors' norm-referenced creativity (r = -.10; p>.05).

Findings Related to Research QuestionEight

A simple linear regression analysis was used to assess research question eight. An intercorrelation matrix was generated prior to conducting the simple linear regression analysis to analyze the possibility of multicollinearity (see Table 11). By definition, multicollinearity is a potential violation of the assumption of linearity required to use multiple linear regression. The intercorrelation matrix contained the dependent variables (age, sex, experience, and discipline), and the variable of interest (norm referenced creativity measured by the ATTA). Guidelines offered by Berry and Feldman (1985) to combat multicollinearity were used to analyze these data. More specifically, bivariate correlations between the predictor (independent variable) approaching .8were potential threats and were removed prior to conducting regression analysis. Because age and teaching experience was highly correlated, a variable was removed prior to conducting

the regression to eliminate the threat of multicollinearity. Age had a greatest correlation with the dependent variable than teaching experience, thus teaching experience was removed from prior to the regression.

Table 11

Intercorrelational Matrix for Norm-Referenced Creativity(n = 40)

Variable	X^1	X^2	X^3	X^4	Y
Age (X^1)	1.00	.43	.80	-.11	-.06
Sex (X^2)		1.00	.45	-.10	-.04
Experience (X^3)			1.00	.15	.02
Discipline (X^4)				1.00	.03
Norm Referenced Creativity (Y)					1.00

Table 12 shows approximately 1.90 % of the variance in norm referenced creativity can be explained by the linear combination of age, sex, and discipline ($F_{(3,34)}$ = .89; p>.05). None of the predictor variables, including age, sex, and discipline, had significant regression weights in this model.

Table 12

Simple Linear Regression of Norm Referenced Creativity (n = 40)

Variable	*R*	R^2	*b*	*t-value*	*p- value*
	.14	.02			
Age			-.01	-.04	.97
Sex [a]			-1.42	-.48	.63
Discipline [b]			1.34	.53	.60
ATTA (Constant)			79.40	12.55	.01

Note: Adjusted R^2 = .02.

For Model $F_{(3,34)}$ = .89; p>.05.

[a]Sex coded: females = 0, males = 1; [b]discipline: 0 = social, 1 = natural/physical.

Findings Related to Research QuestionNine

A simple linear regression analysis was calculated to address research question nine. An intercorrelation matrix was generated prior to conducting the regression analysis to analyze the possibility of multicollinearity (see Table13). The intercorrelation matrix contained the dependent variables (age, sex, experience, and discipline), and the variable of interest (instructors' CETA). Guidelines offered by Berry and Feldman (1985) to combat multicollinearity were used to analyze these data. More specifically, bivariate correlations between the predictor (independent variable) approaching .8 were potential threats and were removed prior to conducting regression analysis. Because age and teaching experience was highly correlated, a variable was removed prior to conducting the regression to eliminate the threat of multicollinearity. Age had a greatest correlation

with the dependent variable than teaching experience, thus teaching experience was removed from prior to the regression.

Table 13

Intercorrelational Matrix for Instructors' Self-Perceived Creativity (n = 40)

Variable	X^1	X^2	X^3	X^4	Y
Age (X^1)	1.00	.43	.80	-.12	.12
Sex (X^2)		1.00	.45	-.01	-.10
Experience (X^3)			1.00	.15	-.02
Discipline (X^4)				1.00	-.29
Instructors' Perceived Creative Teaching Behaviors (Y)					1.00

Table 14 shows instructors' perceived creativity was the dependant variable and age, sex, and discipline were the independent variables. Approximately 12 % of the variance in perceived teaching behavior can be explained by the linear combination of age, sex, and discipline ($F_{(3, 34)}$= .22; p> .05). However, none of the regression weights were significant.

Table 14

Simple Linear Regression of Self-Perceived Creative Teaching Behaviors (n = 40)

Variable	*R*	R^2	*b*	*t*- value	*p*-value
	.35	.12			
Age			.01	.90	.38
Sex[(a)]			-.25	-.93	.36
Discipline[(b)]			-.44	-1.85	.07
Instructors' Self-Perceived Creativity Teaching Behaviors (constant)			5.69	9.90	.01

Note: Adjusted R^2 = .04.

For Model $F_{(3, 32)}$ = .22; p>.05.

[a]Sex coded: female = 0, male = 1; [b] discipline: 0 = social, 1 = natural/physical.

Findings Related to Hypothesis One

The null hypothesis for the first hypothesis was there is no difference between discipline (natural/physical or social science) and level of creativity (student perception, instructors' perceived, and norm referenced). A non-directional, independent samples *t*-test was calculated to test the first null hypothesis. Levene's Test for Equality of Variances was conducted and the variances for student perceptions of creative teaching behaviors (p = .38), ATTA (p = .21) and instructors' self-perceived creative teaching behaviors, as measured by the CETA (p = .06) were calculated. Due to non-significant variances (p> .05), equal variances were assumed for each of the variables and evaluated for differences (see Tables 15, 16& 17).

Table 15

Independent Samples t Test of Differences Between Disciplines and Instructors' Perceived Creative Teaching Behaviors

Discipline	*n*	Mean	*SD*	*t*-value	*p*-value
Natural/physical	27	6.00	.40	1.88	.07
Social	13	5.57	.82		

Table 16

Independent Samples t Test of Differences Between Disciplines and Instructors' Norm Referenced Creativity

Discipline	*n*	Mean	*SD*	*t*-value	*p*-value
Natural/physical	25	79.88	7.13	-.18	.86
Social science	15	79.40	9.27		

Table 17

Independent Samples t Test of Differences Between Disciplines and Students' Perceived Creative Teaching Behaviors of Instructors

Discipline	*n*	Mean	*SD*	*t*-value	*p*-value
Natural/physical	25	6.00	.40	1.88	.07
Social science	15	5.57	.82		

Students' perceived creative teaching behaviors of instructors ($p = .32$), instructors' norm-referenced creativity, as measured by the ATTA ($p = .89$) and instructors' self-perceived creative teaching behaviors ($p = .07$) were not statistically

significant. Therefore, the null hypotheses that no differences existed (p> .05) between disciple and level of creativity (student perception, instructors' perceived, and norm referenced), were accepted.

Findings Related to Hypothesis Two

The null hypothesis for hypothesis two was that no differences existed between teaching experience and level of creativity (student perception, instructor's perceived, and norm referenced). A non-directional, independent *t*-test was calculated to test the second null hypothesis. Levene's Test for Equality of Variances was conducted and the variances for student perceptions of creative teaching behaviors (p = .20), ATTA (p = .42) and instructors' self-perceived creative teaching behaviors, as measured by the CETA (p = .45) were calculated. Due to non-significant variances (p> .05), equal variances were assumed for each of the variables and evaluated for differences (see Tables 18, 19, &20).

Table 18

Independent Samples t Test of Differences Between Teaching Experience and Instructors' Perceived Creative Teaching Behaviors

Teaching Experience	*n*	Mean	*SD*	*t*-value	*p*-value
> 5 years	31	5.69	.78	-.66	.52
< 5 years	9	5. 87	.44		

Table 19

Independent Samples t Test of Differences Between Teaching Experience and Instructors' Norm-Referenced Creativity

Teaching Experience	*n*	Mean	*SD*	*t*-value	*p*-value
> 5 years	31	80.90	8.24	1.85	.07
< 5 years	9	75.56	4.90		

Table 20

Independent Samples t Test of Differences Between Teaching Experience and Students' Perceived Creative Teaching Behaviors of Instructors

Teaching Experience	*n*	Mean	*SD*	*t*-value	*p*-value
> 5 years	31	5.56	.65	2.03	.05*
< 5 years	9	5.00	.94		

* $p \leq .05$.

Differences between teaching experience and the three creativity measures revealed differences in teaching experience were not significantly different on two of the three creativity measures. Instructors' norm-referenced creativity, as measured by the ATTA ($p = .07$) was not statistically significant ($p > .05$). Therefore, the null hypotheses that stated no differences existed between teaching experience and instructors' norm-referenced creativity was accepted. Instructors' self-perceived creative teaching behaviors ($p = .52$) was also not statistically significant ($p > .05$). Therefore, the null hypotheses that stated no differences existed between teaching experience and instructors' self-perceived creative teaching behaviors were accepted.

There was a significant difference between creative teaching behaviors of experienced and in-experienced instructors when evaluated by students (p = .05). Therefore, the null hypotheses that stated no differences existed between teaching experience and students' perception of instructors' creative teaching behaviors, was not accepted in favor of the research hypothesis.

Findings Related to Hypothesis Three

Null hypothesis three stated that no differences existed between sex and level of creativity (student perception, instructor's perceived, and norm referenced). A non-directional, independent samples t-test was calculated to test the second null hypothesis. Levene's Test for Equality of Variances was conducted and the variances for student perceptions of creative teaching behaviors (p = 1.0), ATTA (p = .29) and instructors' self-perceived creative teaching behaviors, as measured by the CETA (p = .52) were calculated. Due to non-significant variances (p> .05), equal variances were assumed for each of the variables and evaluated for differences (see Tables 21, 22, & 23).

Table 21

Independent Samples t Test of Differences Between Sex and Instructors' Perceived Creative Teaching Behaviors

Sex	*n*	Mean	*SD*	*t*-value	*p*-value
Female	13	5.83	.58	.62	.54
Male	27	5.68	.78		

Table 22

Independent Samples t Test of Differences Between Sex and Instructors' Norm-Referenced Creativity

Sex	*n*	Mean	*SD*	*t*-value	*p*-value
Female	13	80.15	6.77	.25	.80
Male	27	79.48	8.49		

Table 23

Independent Samples t Test of Differences Between Sex and Students' Perceived Creative Teaching Behaviors of Instructors

Sex	*n*	Mean	*SD*	*t*-value	*p*-value
Male	27	5.51	.76	-.95	.35
Female	13	5.27	.73		

Students' perceived creative teaching behaviors of instructors ($p = .35$), instructors' norm-referenced creativity, as measured by the ATTA ($p = .80$) and instructors' self-perceived creative teaching behaviors ($p = .54$) were not statistically different when compared by sex. Therefore, the null hypotheses that no differences existed between sex and level of creativity (student perception, instructors' perceived, and norm referenced), was accepted.

Findings Related to Hypothesis Four

Null hypothesis four suggested no relationship between effective teaching as perceived by students and level of creativity (student perception, instructor's perceived,

and norm referenced). Using responses to the effective teaching component of the CETA, participants were entered into a forced dichotomy to allow differences to be tested. Instructors identified as effective teachers (coded 0) scored 5.0 or higher on the seven point Likert scale, indicating students agreed to strongly agreed on the summated effective teaching component of the CETA.

A non-directional, independent samples *t*-test was calculated to test the second null hypothesis. Levene's Test for Equality of Variances was conducted and the variances for instructors' self-perceived creative teaching behaviors, as measured by the CETA (p = .88), ATTA (p = .18), and student perceptions of creative teaching behaviors (p = .77and were calculated. Due to non-significant variances (p> .05), equal variances were assumed for each of the variables and evaluated for differences (see Tables24, 25& 26).

Table 24

Independent Samples t Test of Differences Between Effective Teaching and Instructors' Perceived Creative Teaching Behaviors

Teaching	*n*	Mean	*SD*	*t*-value	*p*-value
Effective	32	5.74	.76	.21	.83
Ineffective	8	5.68	.59		

Table 25

Independent Samples t Test of Differences Between Effective Teaching and Instructors' Norm-Referenced Creativity

Teaching	*n*	Mean	*SD*	*t*-value	*p*-value
Effective	32	79.00	8.22	-1.13	.27
Ineffective	8	82.50	6.02		

Table 26

Independent Samples t Test of Differences Between Effective Teaching and Students' Perceived Creative Teaching Behaviors of Instructors

Teaching	*n*	Mean	*SD*	*t*-value	*p*-value
Effective	32	5.68	.57	.5.51	.01*
Ineffective	8	4.4	.55		

* $p \leq .05$.

Effective teaching (as measured by student perceptions on the CETA) was compared to three creativity measures. When forced into a dichotomy, a statistically significant difference ($p = .01$) was found between effective and ineffective instructors when compared to students' perceived creative teaching behaviors. Therefore, the null hypotheses which stated no differences existed between instructors' effective teaching as perceived by students was rejected in favor of the research hypotheses.

However, differences in instructors teaching effectiveness were not significantly different ($p > .05$) when compared to norm-referenced creativity ($p = .27$) and thus the null hypotheses, which stated no differences exist between instructors' effective teaching as

perceived by students and norm-referenced creativity was accepted. In addition, no differences existed ($p > .05$) between effective teaching as perceived by students and instructors' perceived creative teaching behaviors of instructors ($p = .83$). Therefore, the null hypotheses that stated no differences exist between effective teaching as perceived by students and instructors' perceived creative teaching behaviors was accepted.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter is a presentation of the procedures and methodology used to accomplish the purposes of the study. It contains a discussion of the research design, subjects of the study, instrumentation, data collection and data analysis procedures.

Summary

Purpose of the Study

The purpose of this study was to explain and predict creative and effective teaching of university instructors. Specifically, student evaluations, self-reported teaching evaluations, and standardized creativity instruments were used to assess instructor creativity. In addition, the students' perceptions of their instructor's creativity in teaching were compared with instructor's self-reported creativity in teaching. The creativity of instructors, as assessed by a standardized creativity instrument, was also compared to the perceptions of effective teaching held by their students and the self-reported instructor evaluations.

Research Questions and Hypotheses

The following research questions and hypotheses guide this study and identify creativity specifically in the context of instruction and teaching:

1. What are the demographic characteristics of College of Agriculture, Food and Natural Resources (CAFNR) undergraduate instructors, including sex, years of teaching experience, age, and teaching discipline?
2. What is the self-perceived level of creative teaching effectiveness of CAFNR instructors?

3. What is the level of creativity (fluency, originality, elaboration and flexibility) as measured by the ATTA, of CAFNR instructors?
4. What is the level of creative behaviors exhibited by CAFNR instructors, as perceived by their students?
5. What is the level of teaching effectiveness of CAFNR instructors, as perceived by their students?
6. What is the relationship between creative behaviors of CAFNR instructors, as perceived by students, and effective teaching behaviors, as perceived by students, instructors' perceived creativity, and instructors' norm-referenced creativity?
7. What is the relationship between CAFNR instructors teaching effectiveness, as perceived by students, and instructors' perceived creativity, and instructors' norm-referenced creativity?
8. What is the amount of variance in instructors' creativity, as measured by the ATTA, that is accounted for by their age, sex, teaching experience, and discipline?
9. What is the amount of variance in instructors' self-perceived creativity teaching behaviors that is accounted for by their age, sex, teaching experience, and discipline?

Hypotheses

1. H_o: There is no difference between instructors' discipline (natural/physical science or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between discipline (natural/physical or social science) and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{1 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

2. H_o: There is no relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \rho_{xy1.2.3} = 0$$

H_1: There is a relationship between instructors' teaching experience and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{2 \cdot 1.2.3}: \rho_{xy1.2.3} \neq 0$$

3. H_o: There is no difference between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' sex and their level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{3 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

4. H_o: There is no difference between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{0 \cdot 1.2.3}: \mu_{xy1.2.3} = 0$$

H_1: Differences exist between instructors' effective teaching as perceived by students and level of creativity (student perception [y^1], instructors' perceived [y^2], and norm referenced [y^3]).

$$H_{4 \cdot 1.2.3}: \mu_{xy1.2.3} \neq 0$$

Limitations

This study can only be applied to creativity measured and observed in the specific context of instruction. Additionally, limitations exist in the assessment of creativity. It is important to identify the specific types of creativity tests used to measure creativity as a domain of divergent thinking and self-perception. Given the complexity of defining creativity, it is necessary to identify the limitations of applying findings to indicate all creativity can be measured. In addition, the results of this study cannot be generalized to any other group beyond CAFNR undergraduate instructors.

Research Design

This study was descriptive correlational in nature. Correlational research is widely used in education research and "seeks to examine the strength and direction of relationships among two or more variable" (Ary et al., 2002, p. 25). Ary et al. suggested "information gained from such correlational studies is especially useful when trying to understand a complex construct or to build a theory about some behavioral phenomenon" (p. 25). Interpretation of correlations must include sample size, magnitude of the

correlation coefficient, and both the statistical significance as well as the practical significance (Ary et al.).

Population and Sampling

Two populations were identified for this non-experimental study. To establish an accurate frame recommended by Dillman (2007), the frame for both populations included electronic mail accounts assigned by the University of Missouri for students and faculty members. The frame was selected from a reliable list of all faculty and instructors provided by the CAFNR dean's office.

Instructor Population

The specific criteria for the first population included instructors teaching all sections of CAFNR undergraduate courses, excluding seminar, research and special problems courses, in the 2007 fall semester (N= 44). The instructors identified as the subjects for the initial segment of the study were also used to establish the frame for the student population.

Student Population

The population for the student component of the study included all students enrolled in College of Agriculture, Food and Natural Resources (CAFNR) courses being taught by CAFNR instructors who had previously been identified as the population for the instructor component of this study.

Instructor Sampling

A time and place sample was conducted for instructors teaching undergraduate CAFNR courses during the fall, 2007 semester. The use of a time and place sample, as suggested by Oliver and Hinkle (1982) was justified as the instructor population could be

considered representative of future populations in CAFNR at the University of Missouri. The population resulted in 43 instructors who met the criteria. Because all members of the population were included in the study, sampling procedures were not imposed. As a result, the treat of sampling error was not a consideration in this study.

Student Sampling

Probabilistic sampling was used for the student population. Because students were considered an intact group, cluster sampling was considered appropriate for this population. "Individuals constitute a cluster insofar as they are alike with respect to characteristics relevant to the variables of the study" (Ary et al., 2002, p. 168). As suggested by Ary et al., all members of each cluster were included in the sample. To account for cluster size, courses were selected where the cluster represented a minimum of twenty-five students. Students were arranged by cluster and assigned to a specific cluster if they had more than one CAFNR course. To be confident the accepting sample approximated members of each cluster, a response rate of 50% or a minimum number of 30 responses was required for each cluster to be included in the population. All students identified as intact groups of CAFNR instructors were included in the sample, eliminating the treat of sampling error.

Instrumentation

Two separate data collection instruments were used to assess the creativity of instructors in CAFNR at MU. The Abbreviated Torrance Test for Adults (ATTA) was used as an established, standardized measure of creativity. A researcher developed questionnaire (Appendix A) was used to assess the teaching effectiveness and creative teaching of instructors, as perceived by students. A researcher developed questionnaire

(Appendix B) was used to assess instructors' self-perceived creative teaching behaviors. Finally, demographic data were collected directly from the instructor population.

Abbreviated Torrance Test for Adults (ATTA)

The ATTA is comprised of four norm-referenced areas, including fluency, originality, elaboration, and flexibility. In addition, criterion-referenced creativity indicators comprised the ATTA, including verbal responses, and figural responses

After combining the norm-referenced scaled scores with the criterion-referenced creativity indictors, a creativity index was created. The creativity index was then compared to normed data from the Scholastic Testing Service (Goff & Torrance).

Creative and Effective Teaching Assessment

A researcher-developed instrument, called the Creative and Effective Teaching Assessment (CETA) was developed and used to assess students' perceptions of creative and effective teaching behaviors of their university instructors. A shortened version of the CETA was used to assess the self-perceived creative teaching behaviors of CAFNR instructors.

The CETA questionnaire consisted of two sections. The first part addressed students' perceptions of the creativity exhibited by instructors in their teaching. Four constructs were identified from the Torrance creativity test. These four areas included fluency, originality, elaboration and flexibility. For each construct, four questions were constructed. Each response was given a numeric value to be summated to create a total scale score (Ary et al.). The 16 items were measured on a seven point Likert scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Undecided; 5 = Slightly Agree; 6 = Agree; and 7 = Strongly Agree.

The second component of the questionnaire assessed effectiveness of the instructors, as perceived by their students. This part of the questionnaire consisted of 15 questions designed to assess the top 5 characteristics of effective teachers identified by Rosenshine and Furst (1971). These characteristics included the following: clarity; variability; enthusiasm; task-oriented/ businesslike behavior; and opportunity to learn criterion material.The CETA was developed as an Internet web survey. Dillman's (2007) recommendations for online data collection procedures were followed.

Validity and Reliability

Validity is the assumption that instruments measure what they intend to measure (Ary et al., 2002). Validity is "the most important consideration in developing and evaluation measuring instruments" (Ary et al., p. 242). In addition, validity requires both face and content validity. Face validity requires instruments to "appear valid for its intended purpose" (Ary et al., p. 409). Content validity suggests the questionnaire measures what it purports to measure.

The use of a standardized instrument, the ATTA, addressed concerns for validity and reliability. The Scholastic Testing Service (Goff & Torrance, date) previously established both validity and reliability.

Validity and reliability for the CETA were addressed by the use of both a panel of experts and a pilot test group. The CETA questionnaire was examined from the panel of experts (Appendices A &B), who made suggestions and improvements to the instrument. Next, the CETA was administered to a sample of 47 students MU who had similar characteristics as the population. A Cronbach's alpha was computed to determine the internal reliability of the instrument for both the instructor and student pilot tests. For the

student pilot test, a Cronbach's alpha level of .97 (n = 37) was found for the entire instrument. The internal reliability for the instructor effectiveness construct measure by the student pilot was .92 (n = 38). The student pilot for the four creativity constructs resulted in a Cronbach's alpha of .96 (n = 38). The four creativity constructs were evaluated for reliability. The Cronbach's alpha for fluency (α = .81; n =39), flexibility (α = .87; n = *40*), originality (α = .89; n =38), and elaboration (α = .89; n = *40*) were each deemed acceptable reliability levels. The instructor pilot test's Cronbach's alpha for the four creative constructs was .84 (n = 28), which suggested the instrument offered internal consistency in measuring the intended variables. Each individual construct was also examined, including the following: fluency (α = .46; n = 30); flexibility (α = .74; n = 28); originality (α = .77; n = 29); and elaboration (α = .68; n = 29).

Data Collection

Student Population

The student population was first contacted with an electronic mail message on December 18, 2007, with a request to participate in the study (Appendix D). The electronic letter was personalized to increase response rate and included a direct link to the questionnaire. In addition, the course instructor was listed and the students were assigned a personal code number, which was also indicated in the contact letter. Students were asked to access the direct link to the questionnaire, enter their code and complete the instrument based upon the instructor indicated in the electronic contact letter. A total of 1674 students were contacted and 350 responded after the first request. Dillman (2007) suggested the time between contacts should be "shorted from one week to two or three days in order to increase the likelihood that the recipient will connect the memory of the

first contact with the second" (p. 368). Therefore, a second request to participate in the study was sent to the students on December 21, 2007 (Appendix E). A total of 252 students responded following the second contact. A third request for participants was sent on January 2, 2008 (Appendix F). A total of 268 students responded to the third contact. Finally, participants from clusters which had less than 30 or less than 50% response rate were identified and a forth contact was made (Appendix G). Fifty-one students responded to the final contact. A final response rate of 55% was recorded. However, 15 student electronic mail boxes were full and failed to receive the invitations to participate. The adjusted response rate was 73.80 %. The student responses yielded 40 clusters which comprised the final student accepting population.

Instructor Population

The initial contact with instructor population was also through electronic mail (Appendix H). The first correspondence and invitation to participate in the study was sent on January 8, 2008. A total of 44 instructors were identified in the population. One instructor left for sabbatical and was unable to participate in the study. Three instructors did not agree to participate and were removed from the study. Of the remaining 40 instructors, 22 responded to the first correspondence. A follow-up invitation, as well as the invitation to participate in the standardized instrument component of the study, was sent on January 14, 2008 (Appendix I). A third and final follow-up electronic mailing was sent on January 18, 2008 (Appendix J). The instructors were invited to attend one of five meetings to complete the ATTA assessment. Refreshments and a drawing for CAFNR apparel were given to increase attendance. Personal follow-up was made with

instructors who did not attend the scheduled assessment times. Through these procedures, data were collected for 40 instructors.

Data Analysis

The methods used for data analysis for each research question was selected based upon the type of data and nature of the question.

Research question one sought to determine the demographic data of instructors, including sex, years of teaching experience, age, and teaching discipline. Basic descriptive statistics were used to summarize these data.

Research question two sought to determine the self-perceived level of creative teaching effectiveness of instructors. Summated, interval data from the CETA were described using a grand mean representative of the 16 items. Standard deviations were used to describe the range and variance of the measure.

Standard deviations were used to describe the range and variance of the measure for research questions three through five. Research question three sought to determine the level of norm referenced creativity of instructors. Summated, interval data from the ATTA were described using a grand mean representative of the four constructs. Research question four sought to determine the level of creative behaviors exhibited by instructors, as perceived by their students. Summated, interval data from the CETA were described using a grand mean representative of the 16 items. Research question five sought to determine the level of effectiveness of instructors, as perceived by their students. Summated, interval data from the CETA were described using a grand mean representative of the 16 items.

Research question six sought to determine the relationship between creative behaviors of instructors, as perceived by students, effective teaching behaviors of instructors, as perceived by students, instructors' perceived creativity, and instructors' norm-referenced creativity. Pearson product moment correlations were used to analyze the interval data.

Research question seven sought to determine the relationship between instructor effectiveness, as perceived by students, and instructors' perceived creativity, and instructors' norm-referenced creativity. The interval data were analyzed using Pearson's correlation.

Research question eight sought to determine the amount of variance in norm referenced creativity, as measured by the ATTA, accounted for by age, sex, experience, and discipline. A simple linear regression model was calculated to determine the amount of variance in norm referenced creativity accounted for by age, sex, experience, and discipline.

Research question nine sought to determine the amount of variance in self-perceived creative teaching behaviors, as measured by the CETA, accounted for by age, sex, experience, and discipline. A simple linear regression model was calculated to determine the amount of variance in self-perceived creative teaching behaviors accounted for by age, sex, experience, and discipline.

The null hypothesis for the first hypothesis was there was no difference between discipline (natural/physical or social science) and level of creativity (student perception, instructors' perceived, and norm referenced). This hypothesis compared nominal and interval data; therefore, a point-biserial coefficient was calculated.

The null hypothesis for hypothesis two was that no differences existed between experience and level of creativity (student perception, instructor's perceived, and norm referenced). Instructor experience was nominal data and forced into a dichotomy containing experienced (five years of teaching or greater) and novice (less than five years of teaching). Therefore, a point-biserial coefficient was calculated and used to compare student perceptions of instructor's level of creativity, instructor's self-perceived level of creativity and instructor's norm referenced level of creativity.

Null hypothesis three stated that no differences existed between sex and level of creativity (student perception, instructor's perceived, and norm referenced). A point-biserial correlation was calculated to compare the nominal and interval data.

Null hypothesis four suggested no relationship between effective teaching as perceived by students and level of creativity (student perception, instructor's perceived, and norm referenced). A Pearson product-moment correlation was calculated for the summated, interval data.

Findings

Research QuestionOne

Research question one sought to identify demographic characteristics of CAFNR instructors. CAFNR instructors were predominately male and averaged 47 years of age. The participants averaged slightly less than 16 years of teaching experience. However, teaching experienced ranged from one to 47 years. Roughly two-thirds (62.5%) of instructors taught in the natural/biological science disciplines.

Research Question Two

Research question two sought to determine the self-perceived level of creative teaching behaviors used by instructors. The mean for self-perceived creative teaching behaviors of CAFNR instructors was 5.73. Elaboration was the most highly ranted of the four creativity constructs. Originality was the lowest ranked construct, yet it yielded the greatest range.

Research Question Three

Research question three asked the norm-referenced creativity of participants, as measured by the ATTA. Elaboration was the highest individual construct, while the lowest construct was flexibility. The overall, summated creativity index of participants was 79.69, with a range in scores from 61 to 97. This score was higher than the normed score provided by Scholastic Testing Services (Goff &Torrance, 2002).

Research Question Four

Research questionfour determined students' perceptions of creative teaching behaviors of their CAFNR instructors. Data from the creativity component of the CETA was summated and each of the four constructs were analyzed. The perceived creative teaching behaviors held by students resulted in a summated mean of 5.43 on a scale ranging from one to seven. Students rated behaviors associated with the creative construct of elaboration highest, although this construct also had the greatest range. Originality was the construct rated lowest by the students.

Research question four determined students' perceptions of creative teaching behaviors of their CAFNR instructors. Data from the creativity component of the CETA was summated and each of the four constructs was analyzed. The perceived creative

teaching behaviors held by students resulted in a summated mean of 5.43 on a scale ranging from one to seven. Students rated behaviors associated with the creative construct of elaboration highest, although this construct also had the greatest range. Originality was the construct rated lowest by the students.

Research Question Five

Research question five determined students' perception of effective teaching, as measured by the CETA. Students agreed that their teachers used all five of the characteristics of effective teaching evaluated by the CETA. Comparatively, students rated enthusiasm highest and variability lowest.

Research Question Six

The purpose of research question six was to determine the relationship between students' perceptions of their teacher's effectiveness and students' perceptions of their teacher's creative teaching behaviors, norm-referenced creativity and the instructors' perceived creative teaching behaviors. Students' perception of effective teaching and students' perception of creative teaching behaviors were positively and significantly correlated. However, a negative, negligible and non-statistically signification relationship was found between students' perceived effective teaching and the instructors' norm referenced creativity, as measured by the ATTA. Additionally, a negative, negligible and non-significant relationship was found between students' perceive effective teaching and instructors' perceived creative teaching, as measured by the CETA.

Research Question Seven

Research question seven determined the relationship between students' perceptions of instructor effectiveness and instructors' perceived creativity and

instructors' norm-referenced creativity. Negligible and negative relationships were found between students' perceived effective teaching and measures of instructor creativity.

Research Question Eight

Research question eight asked the amount of variance in norm-referenced creativity that could be explained by age, sex, discipline, and teaching experience. Approximately 1.90 % of the variance in norm referenced creativity can be predicted by the variables. However, none of the predictor variables had significant regression weights in this study.

Research Question Nine

Research question nine determined the amount of variance in the instructors' perceived creativity that can be explained by age, sex, discipline, and teaching experience. Approximately 12 % of the variance in perceived teaching behavior can be predicted by these variables. However, the model was not significant, as none of the independent variables had significant regression weights.

Hypothesis One

The null hypothesis for the first hypothesis stated no differences existed between discipline (natural/physical or social science) and level of creativity (student perception, instructors' perceived, and norm referenced). Students' perceived creative teaching behaviors of instructors, instructors' norm-referenced creativity, as measured by the ATTA and instructors' self-perceived creative teaching behaviors were not statistically significant.

Hypothesis Two

The null hypothesis for hypothesis two stated that no differences existed between teaching experience and level of creativity (student perception, instructor perception, and a norm referenced assessment). Instructors' norm-referenced creativity, as measured by the ATTA and instructors' self-perceived creative teaching behaviors were not statistically significant. However, there was a significant difference between creative teaching behaviors of experienced and in-experienced instructors when evaluated by students.

Hypothesis Three

Null hypothesis three stated that no differences existed between sex and level of creativity (student perception, instructor perception, and a norm referenced assessment). Students' perceptions of the creative teaching behaviors of instructors, instructors' norm-referenced creativity, as measured by the ATTA, and instructors' self-perceived creative teaching behaviors were not statistically different when compared by sex.

Hypothesis Four

Null hypothesis four stated no relationship existed between effective teaching as perceived by students and level of creativity (student perception, instructor perception, and a norm referenced assessment). Effective teaching was compared to three creativity measures. When forced into a dichotomy, a statistically significant difference was found between effective and ineffective instructors when compared to students' perceptions of creative teaching behaviors. However, differences were not significantly different between the two groups when compared to norm-referenced creativity and instructors' perceived creative teaching behaviors of instructors.

Conclusions, Recommendations and Implications

The profile of a CAFNR teacher is: a middle-aged male who has taught courses he describes as being in the natural/physical sciences for nearly sixteen years. These characteristics must be taken into consideration when developing and delivering faculty in-service programs intended to enhance the creativity and teaching effectiveness of this group.

Research Question One

Research question one sought to determine demographic data and therefore, no grounds for recommendations are suggested.

Research Question Two

CAFNR instructors believe they are creative in their teaching. Of the four creativity constructs, instructors use elaboration most in their teaching and are least likely to use originality in that same context. Considering the presence of creative teaching behaviors, it can be concluded that instructors value creativity as a component of teaching.

Although instructors believe they use creative teaching behaviors, can we identify specific behaviors of creativity in teaching? Further research should include qualitative methods to observe and record behaviors instructors use related to creativity. In addition, training to help instructors learn to promote and embrace creative teaching practices may be implemented to increase the occurrence of these creative teaching behaviors.

Research Question Three

Overall, CAFNR instructors have a high level of creativity, as measured by the ATTA. It is interesting to note CAFNR instructors scored highest on the elaboration

construct of the ATTA. This conclusion matches the finding yielded from the self-perceived creativity assessment described above. It is also important to note participants did not follow the standardized curve typically seen on the norm-referenced instrument. Rather, CAFNR instructors were screwed to the right, with the majority of participants scored above average, high or substantial on the ATTA (72.50 %).

Another consideration in evaluating the results of the ATTA is that it may not be the most accurate measure of university instructors, due to the lack of variance in the population. Is this due to a higher intelligence of university faculty? While creativity has been found to have a strong, positive correlation with intelligence (Cropley, 2001; Starko, 2005), there does appear to be a drop in creativity scores for highly intelligent individuals. Extremely intelligent individuals may only display a moderate level of creativity (Carson, Peterson, & Higgins, 2005; Crockenberg, 1972; Cropley; Starko). Could the problem solving nature of research account for the difference? Problem solving has been linked to creativity by many researchers (Croply, 2001; Dewey, 1920; Guilford, 1959; Marksberry, 1963; Starko, 2005; Torrance, 1995). In addition, Bain (2004) suggested that teaching is a performance art. If teaching is an art and creativity considered to be a critical component of art (Bain), does this suggest teachers should be creative? Could the difference in ATTA scores be accounted for by the creative nature of teaching?

Research Question Four

In general, students perceive that CAFNR instructors demonstrate creative teaching behaviors. However, the range in scores indicates that students varied considerably in their perceptions of instructor creativity in the classroom. Considering the

range of scores associated with student perceptions of instructors' use of creative teaching behaviors, it is apparent that students are capable of evaluating creativity in the classroom. This conclusion is a valuable step in research about creativity of teachers. Documentation of students' perceptions of creative teaching does not appear to be available in previous literature.

In addition, students agreed with their instructors regarding the presence of creative teaching behaviors. Elaboration, frequency, flexibility, and originality constructs are rated in the same order for both instructors' perceived and students' perceived creative teaching behaviors. Instructors' reported slightly more agreement with the frequency of creative behaviors than did students. This suggests a slight difference in perception between the two populations. Would qualitative data support these finding? The CETA could be expanded to include qualitative data designed to determine instructor behaviors that impact student perceptions of creative teaching.

Research Question Five

Students believe their instructors are effective teachers. Students agreed that their instructors displayed clarity, variability, opportunity to learn, task oriented, and enthusiasm in their teaching. Enthusiasm was the most frequently reported effective teaching construct demonstrated by CAFNR faculty while variability was least observed by students. These findings suggest that students generally believe their teachers demonstrate enthusiasm in the classroom. The ranking of the variability construct suggests students may not be exposed to a variety of instructional methods.

While students agreed that CAFNR instructors demonstrated effective teaching characteristics, the range in scores also suggests students vary in their perceptions of

instructors. This indicates students can discern between effective and in-effective instruction. If students can, in fact, differentiate between effective and in-effective instructors, what behaviors do they identify as most important to effective teaching? It is also interesting to note student perceptions of clarity demonstrated in the learning environment. Variability and clarity had the greatest range in scores, which again suggests students are capable of distinguishing when effective teaching behaviors occur. Could high levels of agreement with some constructs, such as enthusiasm, actually reduce other areas, such as clarity? Additional research should be conducted to determine which methods instructors use in the learning environment. Defining and identify teaching methods which improve clarity should also be the focus of future research. Finally, faculty development programs should be designed to address increasing variability and clarity in the learning environment.

Research Question Six

Students consider creative instructors to be effective instructors. The strong, positive correlation between these two variables found in this study supports previous findings comparing creative and effective teachers (Anderson, 2002; Bain, 2004; Bleedron, 2003, 2005; Chambers, 1973; Croply, 1967, 2001; Davidovitch & Milgram, 2006; Esquivel, 1995; Fasko, 2000-01; Milgram, 1979; Newcomb et al., 1993; Renzulli, 1992; Torrance, 1981, 1995).

Hocevar (1981) suggested that the most effective method to evaluate creativity is to ask the subjects. However, instructors' perceived creativity did not produce a strong correlation with effective teaching. Therefore, these findings appear to contradict previous research.

Creative teaching behavior constructs should be compared to each characteristic of effective teaching to provide more specific methods to improve effective teaching.

Research Question Seven

There is not a relationship between students' perceptions of effective teaching and instructor creativity. The negligible and negatively correlated relationships found between these variables suggest differences exist between perceptions of effective teaching held by students and instructors. If students perceive that creative teaching is effective teaching, then identifying instructor creativity becomes paramount. Increasing the creative teaching behaviors of instructors could thus lead to more effective teaching in the eyes of the students.

This research should be replicated to determine if effective teaching, as perceived by students, consistently differs from the self-perceived creative teaching behaviors of university instructors. What methods do effective teachers, as perceived by students, employ in the classroom and are these methods recognized by instructors? Can instructors become more effective for students by increasing their creative approach to teaching? Research should also be conducted to determine instructor's perceptions of effective teaching.

There is not a relationship between the ATTA and perceptions of creative teaching behaviors. Thus, the ATTA is not an accurate measure of creative teaching behaviors. Interesting, the ATTA was negatively correlated with both student and instructor perceptions. The lack of agreement suggests there is little support for continued use of the ATTA to measure creative teaching behaviors. While the ATTA has been documented to support overall creativity, it appears creative teaching may be a more

difficult construct to measure. Hocevar (1981) and Feldhusen and Goh (1995) suggested multiple methods to examine creativity. "Since each method is purported to be measuring creativity, it is reasonable to predict that they be correlated, thus satisfying a minimum condition of convergent validity" (Hocevar, p. 457). However, findings from this study did not support the convergent validity suggested by Hocevar.

Research Question Eight

The negative correlation between age and norm-referenced creativity conflicts with data that suggests creativity typically decreases around kindergarten, but usually increases later in life (Starko, 2005). Also surprising is the negative relationship between teaching experience and award recipients. This finding suggests instructors may not become more effective in the classroom by simply increased experience. Thus, there is additional support for faculty training that addresses the teaching and learning process.

Little variance in the ATTA could be accounted for by demographic data. Well over 90 % of the variance in norm-referenced creativity remains unaccounted for and should be considered the topic of future research.

Research Question Nine

While only 12% of the variance in instructors' perceive creative teaching behaviors could be explained by the demographic data, more variance was accounted for than by the ATTA. What other factors might account for the variance in ATTA scores? These findings are surprising, given the vast research on the ATTA instrument (Torrance, 1995). The majority of the variance remains unexplained and should be the subject of future research.

Hypothesis One

Creativity does not appear to vary between natural/physical and social science disciplines. Therefore, the null hypotheses that no differences existed between disciple and level of creativity (student perception, instructors' perceived, and norm referenced), was accepted.

All three measures of creativity failed to show significant differences, suggesting disciple is not a factor to consider when addressing creativity of university instructors. Perhaps due to the research environment found in both natural/physical and social sciences within CAFNR, creativity does not appear to differ. It would appear appropriate to address all instructors, regardless of discipline, in future research. In addition, educational opportunities to enhance creativity may be appropriately targeted to both natural/physical and social science disciplines.

The consistency of creativity across disciplines may also provide new areas for understanding between the vastly different disciplines. In addition, the ability to enhance effective teaching by increasing creative teaching behaviors should be examined. Do differences in effective teaching occur between disciplines? If creativity does not appear to vary between disciplines, would measures to enhance creative teaching behaviors be effective in both disciplines?

Hypothesis Two

Teaching experience does not impact the self-perceived or norm-referenced creativity of CAFNR instructors. It would seem appropriate to consider all instructors in future efforts to enhance creativity. However, there was a significant difference between students' perceived creative teaching behaviors of CAFNR instructors and the experience

of these instructors. Therefore, the null hypotheses that no differences existed between teaching experience and level of creativity was rejected.

Students suggest instructors with more than five years of teaching experience exhibit more creative teaching behaviors. Because students are the ultimate consumer of education offered by instructors, this is an important finding. Further research should address what specific behaviors experienced instructors demonstrated in the classroom which led to the significant differences in student perceptions of creative teaching behaviors. Again, it is important to consider the differences between instructors' perceptions and students' perceptions. Additionally, would student perceptions of creative teaching be consistent with creative behaviors identified by instructors? Additional qualitative and quantitative research may shed light on these behaviors.

Hypothesis Three

Creativity does not appear to differ between sex. Therefore, the null hypotheses that no differences existed between sex and level of creativity was accepted. Sex does not appear to be a significant factor when examining creativity of CAFNR instructors. The apparent absence of a gender gap suggests both groups could be addressed by similar professional development opportunities regarding creativity. It is important to note that sex and teaching disciples are the only areas where the three creativity measures appear to have similar rankings for the creativity constructs. However, does effective teaching differ by sex? Would female students differ in their perceptions of effective teaching than their male counterparts? Further research should address the differences between sex and effective teaching.

Hypothesis Four

Effective instructors, as perceived by students, do not appear to differ when compared to instructors' self-perceived creative teaching behaviors and norm-referenced creativity. However, because there was a significant difference between students' perceived creative teaching behaviors of effective and ineffective instructors. Therefore, the null hypothesis was rejected in favor of the research hypothesis. This finding suggests the creativity of effective instructors, as perceived by students, cannot be linked to instructors' perceived creative teaching behaviors or the ATTA. Thus, neither of these instruments would be suggested to evaluate effective teaching.

However, the creative teaching behaviors of CAFNR instructors, as perceived by students, did differ between effective instructors. This suggests students were capable of identifying effective instructors and supports the previous findings that effective teaching is closely related to creative instruction. This finding also supports the value students place upon creativity. If effective teaching is directly related to creative teaching, then more creative instructors may be more effective for students. Replication of this research should be conducted to support the findings between student perceptions of creative teaching behaviors demonstrated by instructors and student perceptions of effective teaching.

REFERENCES

Ai-girl, T.,& Lai-Chong, L. (2004). *Creativity for teachers.* Singapore: Marshall Cavendish International.

Amabile, T. (1996). *Creativity in context.* Boulder, CO: Westview Press Harper Collins Publishers.

Amabile, T. (1987). The motivation to be creative. In S.Isaksen, *Frontiers in creativity research: Beyond the basics* (pp. 223-254). Buffalo, NY: Bearly Limited.

Anastasi, A. (1976). *Pychological testing.* New York: Macmillan Publishing.

Anderson, D. (2002). Creative teachers: Risk, responsibility and love. *Journal of Education, 183* (1), 33-48.

Ary, E., Jacobs, L.C., & Razavieh, A. (2002). *Introduction to research in education* (6th ed.). Belmont, CA: Wadsworth/Thomson Learning.

Aschenbrener, M.A., Terry, R., Torres, R.M., & Smith, A.R. (2007). Creativity and job satisfaction. *American Association of Agricultural Educators National Research Conference.* Minneapolis, MN.

Bain, K. (2004). *What the best college teachers do.* Massachusetts: Harvard University Press.

Baker, M., Rudd, R., & Pomeroy, C. (2001). Relationships between critical and creative thinking. *Journal of Southern Agricultural Education, 51(1), 173-188*.

Beidler, P. (1997). What makes a good teacher. In J. Roth, *Inspiring teaching. Carnegie professors of the year speak* (pp. 2-12). Bolton, MA: Anker Publishing Company.

Berry, W.D.,& Feldman, S. (1985). *Multiple regression in practice.* Newbury Park, CA: SAGE Publications.

Bleedorn, B. (2003). *An educational track for creativity & other quality thinking processes.* Lanham, Maryland: The Scarecrow Press, Inc.

Bleedron, B. (2005). *Education is everybody's business.* Lanham, Maryland: Rowman & Littlefield Education.

Bloom, B. (1956). *Taxonomy of educational objectives: The classification of educational goals handbook I: Cognitive domain.* New York: Longmans, Green & Co.

Buchanan, P. (1997). *Inspiring teaching.* (J. Roth, Ed.) Bolton, MA: Anker Publishing Company, Inc.

Carson, S H., Peterson, J.B., & Higgins, D.M. (2005). Reliability, validity and factor structure of the creative achievement questionnaire. *Creativity Research Journal, 17* (1), 37-50.

Chambers, J. (1973). College teachers: Their effect on creativity of students. *Journal of Educational Psychology, 65* (3), 326-334.

Craft, A. (2001). *An analysis of research and literature on creativity in education.* Report prepared for the Qualifications and Curriculum Authority.

Craft, A. (2005). *Creativity in schools: Tensions and dilemmas.* New York: Routledge.

Crockenberg, S. (1972). Creativity tests: A boon or boondoggle for education. *Review of Educational Research, 42* (1), 27-45.

Cropley, A. (1967). *Creativity.* London: Longmans, Green & Co LTD.

Cropley, A. (2001). *Creativity in education & Learning.* Bodmin, Cornwall: RoutledgeFalmer.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* New York: Harper Collins.

Csikszentmihalyi, M. (1988). Society, culture, and person: A systems view of creativity. In R. S. (Ed.), *The nature of creativity* (pp. 325-339). New York: Cambridge University Press.

Dacey, J. (1989). *Fundementals of creative thinking.* Lexington, MA: Lexington.

Davidovitch, N., & Milgram, R.M. (2006). Creative thinking as a predictor of teacher effectiveness in higher education. *Creativity Research Journal, 18* (3), 385-390.

Davis, J. (1971). *Elementary survey analysis.* Englewood, New Jersey: Prentice-Hall.

Dillman, D. (2007). *Mail and internet surveys: The tailored design method* (2 ed.). Hoboken, New Jersey: John Wiley & Sons, Inc.

Esquivel, G. (1995). Teacher behaviors that foster creativity. *Educational Psychology Review, 7* (2), 185-202.

Fasko, D. J. (2000-2001). Education and creativity. *Creativity Research Journal, 13* (3 & 4), 317-327.

Feldhusen, J.F., & Goh, E. E. (1995). Assessing and accessing creativity: An integrative review of theory, research, and development. *Creativity Reserach Journal, 8* (3), 231-147.

Feldman, K. (1976). The superior college teacher from the student's view. *Research in Higher Education, 5*, 243-288.

Foster, J. (1971). *Creativity and the teacher.* London: Macmillam Ed. LTD.

Fox, J.,& Fox, R. (2000). *Exploring the nature of creativity.* Dobuque, IA: Kendall/Hunt Publishers.

Friedel, C.,& Rudd, R. (2005). Creative thinking and learning styles in undergraduate agriculture students. *National AAAE Reserach Conference*, (pp. 199-211).

Gall, M.D., Gal, J.P., & Borg, W.R. (2003). *Educational Research: An introduction* (7th ed.). Boston: Pearson Education.

Gardner, H. (1993). *Multiple intelligences. The theory in practice.* New York: Basic Books.

Gay, I.R., & Airasian, P. (2000). *Competencies for analysis and application* (Sixth ed.). Upper Saddle River, New Jersey: Prentice-Hall, Inc.

Goff, K.,& Torrance, E.P. (2002). *Abbreviated Torrance test for adults manual.* Illinoise: Scholastic Testing Service.

Gough, H. (1979). A creative personality scale for the adjective check list. *Journal of Personality and Social Psychology, 37* (8), 1398-1405.

Gowan, J. (1972). *Development of the creative individual.* San Diego, CA.: R.R. Knapp.

Gowan, J.C., Khatena, J.,& Torrance, E.P. (1967). *Creativity: Its educational implications.* Dubuque, Iowa: Kendall/Hunt Publishing Company.

Guilford, J. (1950). Creativity. *American Psychologist*, 444-454.

Hasse, C. (2001). Institutional creativity: The relational zone of proximal development. *Culture & Psychology, 7* (2), 199-221.

Hennessey, B.A.,& Amabile, T.M. (1987). *Creativity in learning.* Washington D.C.: NEA Professional Library.

Hocevar, D. (1981). Measurement of creativity: Review and critique. *Journal of Personality Assessment, 45* (5), 450-464.

Karnes, M.B., McCoy, G.F., Zehrbach, R.R., Wollersheim, J.P., Clarizio, H.F., Costin, L., & Stanley, L.S. (1961). *Factors associated with underachievement and overachievement of intellectually gifted children.* Champaign, IL: Champaign Community Unit Schools.

Mack, R. (1987). Are methods of enhancing creativiity being taught in teacher education programs, as perceived by teacher educators and students? *Journal of Creative Behavior, 21*, 22-23.

MacKinnon, D. (1962). The nature and nurture of creative talent. *American Psychologist, 17*, 484-95.

MacKinnon, D. (1962). The nature and nurture of creative talent. *American Psychologis, 17*, 484-495.

Marksberry, M. L. (1963). *Foundations of creativity.* New York: Harper & Row.

Maslow, A. (1968). *Towards a psychology of being* (2nd ed.). Princeton, New Jersey: Van Nostrand.

Massialas, B.G., & Zevin, J. (1983). Mulabar, Florida: Robert E. Krieger Publishing Company.

McKeachie, W. (1983). The role of faculty evaluation in enhancing college teaching. *National Forum, 63* (1), 37-39.

Mednick, S. (1962). The associative basis of the creative process. *Psychological Review, 69* (3), 220-232.

Milgram, R. (1979). Perceptions of teacher behavior in gifted and nongifted children. *Journal of Educational Psychology, 71* (1), 125-128.

Miller, L.E. (1998). Appropriate analysis. *Journal of Agricultural Education*, 39 (2), 1-10.

Miller, W.W., Kahler, A. A., & Rheault, K. (1999). Profile of the effective vocational agriculture teacher. *Journal of Agricultural Education, 30* (2), 33-40.

Mumford, M. (2003). Where have we been, where are we going? Taking stock in creativity research. *Creativity Research Journal, 15* (2), 107-120.

Newcomb, L.H., McCracken, J.D., & Warmbrod, J.R. (1993). Danville, Illinois: Interstate Publishers.

Nicholls, G. (2002). *Developing teaching and learning in higher education.* New York: Routledge Falmer.

Oliver, J.,& Hinkle, D. (1982). Occupational educational research: Selecting statistical procedures. *Journal of Studies in Technical Careers, 4* (3), 199 - 207.

Perkins, D. (1994). Creativity: Beyond the Darwinian paradigm. In M. B. (Ed.), *Dimensions of creativity* (pp. 119-142). Cambridge, MA: MIT Press.

Perkins, D. (1981). *The mind's best work.* Cambridge, MA: Harvard University Press.

Perkins, D. (1988). The possibility of invention. In R. S. (Ed.), *The nature of creativity* (pp. 362-385). New York: Cambridge University Press.

Plucker, J.A., Beghetto, R.A., & Dow, G.T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational Psychologist, 39* (2), 83-96.

Reid, D.J.,& Johnstone, M. (1999). Improving teaching in higher education: Student and teacher perspectives. *Educational Studies*, 269-281.

Renzulli, J. (1992). A general theory for the development of creative productuvuty through the pursuit of ideal acts of learning. *Gifted Child Quarterly, 36*, 170-182.

Roberts, T.G & Dyer, J. E. (2004). Characteristics of effective agriculture teachers. *Journal of Agricultural Education, 45* (4), 82-95.

Rogers, C. (1962). Toward a theory of creativity. In S. P. Harding, *A source book for creative thinking.* New York: Scribner's.

Rosenshine, B. & Furst, N. (1971). Research on teacher performance criteria. In O. S. (Ed.), *Research in Teacher Education* (pp. 37-72). Englewood Cliffs, NJ: Prentice Hall.

Runco, M. A. (1997). *The Creativity research handbook* (Vol. 1). Cresskill, New Jersey: Hampton Press.

Runco, M.A., & Chand, I. (1995). Cognition and creativity. *Educational Psychology Review, 7*, 243-267.

Ruscio, J., Whitney, D.M., & Amabile, T.M. (1998). Looking inside the fishbowl of creativity: verbal and behavioral predictors of creative performance. *Creativity Research Jouranl, 11* (3), 243-263.

Salant, P. & Dillman, D.A. (1994). *How to conduct your own survey: Leading professionals give you proven techniques for getting reliable results.* New York: John Wiley.

Simonton, D. (1988). Creativity, leadership, and chance. In R. (Ed.), *The nature of creativity* (pp. 386-426). New York: Cambridge University Press.

Skinner, B. (1972). *Cummulative record. A selection of papers* (3rd ed.). New York: Meredith Corporation.

Skinner, B. (1972). *Cumulative record: A selection of papers* (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Starko, A. (2005). *Creativity in the classroom: Schools of curious delight* (third ed.). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Sternberg, R. (1999). *Handbook of creativity.* (R. Sternberg, Ed.) New York: Cambridge University Press.

Sternberg, R. (2006). The nature of creativity. *Creativity Research Journal, 18* (1), 87-98.

Sternberg, R.J.,& Lubart, T.I. (1991). An investement theory of creativity and its development. *Human Development, 34*, 1-32.

Swartz, R.,& Parks, S. (1994). *Infusing the teaching of critical and creative thinking into content instruction: A lesson design handbook for the elementary grades.* Pacific Gove, CA: Critical Thinking Press and Software.

Tan, A.G., & Law,L.C. (2004). *Creativity for teachers.* Singapore: Marshall Cavendish International.

Torrance, E. (1981). Creative teaching makes a difference. In J. K. J.C. Gowan, *Creativity: Its educational implications* (2nd ed., pp. 99-108). Dubuque, IA: Kendall/Hunt.

Torrance, E. (1995). *Why fly? A philosophy of creativity.* Norwood, New Jersey: Ablex Publishing Corporation.

Torrance, E.P.,& Khatena, J. (1970). What kind of person are you? *Gifted Child Quarterly, 14*, 71-75.

Vygotsky, L. (1960). Imagination and its development in childhood. In L. V. (Ed.), *The development of higher mental function* (pp. 327-362). Moscow: Izdatel'stvo Academii Pedagogicheskikh Nauk RSFSR .

Wallach, M.S., & Kogan, N. (1965). *Modes of thinking in young children: A study of the creativity - intelligence distinction.* New York: Holt, Reinhart & Winston.

Wallas, G. (1926). *The art of thought.* New York: Harcourt Brace.

Weisberg, R. (1986). *Creativity: Genius and other myths.* New York: Freeman.

Weisberg, R. (1988). Problem solving and creativity. In R. S. (Ed.), *The nature of creativity* (pp. 148-176). New York: Cambridge University Press.

Westmeyer, P. (1988). *Effective teaching in adult and higher education.* Springfield, Illinois: Charles C. Thomas.

Young, S.,& Shaw, D.G. (1999). Profiles of effective college and university teachers. *The Journal of Higher Education, 70* (6), 670-686.

APPENDICES

APPENDIX A

Creative and Effective Teaching Assessment Student Instrument

Page 1 of 5

Student Assessment of CAFNR Instructors

Please complete the following questionnaire. Your input is greatly valued!

***1)** Please enter the identification number included in the email.

***2)** Please type in the name of the CAFNR instructor included in the email.

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Click Here to Conduct Your Own Survey

Page 2 of 5

Student Assessment of CAFNR Instructors

As you think about the instructor of this class, please indicate your level of agreement with the following statements.

***3)** My instructor...

	Strongly Disagree 1	Disagree 2	Slightly Disgree 3	Undecided 4	Slightly Agree 5	Agree 6	Strongly Agree 7
frequently used illustrations to teach course content.	○	○	○	○	○	○	○
taught using novel ideas about course content.	○	○	○	○	○	○	○
provided original solutions to content discussed during this class.	○	○	○	○	○	○	○
used unique methods to teach course content.	○	○	○	○	○	○	○
frequently provided multiple solutions to issues presented in the course content.	○	○	○	○	○	○	○
used multiple methods to teach course content.	○	○	○	○	○	○	○
used unique student activities to teach course content.	○	○	○	○	○	○	○

frequently provided multiple ideas about the content presented in class.	○	○	○	○	○	○	○

Next Page

Page 3 of 5

Student Assessment of CAFNR Instructors

***4)** My instructor...

	Strongly Disagree 1	Disagree 2	Slightly Disagree 3	Undecided 4	Slightly Agree 5	Agree 6	Strongly Agree 7
adjusted course content based on students' interest.	○	○	○	○	○	○	○
elaborated on course content while teaching this class.	○	○	○	○	○	○	○
provided more than one method to solve problems for concepts presented in this class.	○	○	○	○	○	○	○
welcomed input from students during class.	○	○	○	○	○	○	○
adjusted teaching when logical approaches did not work.	○	○	○	○	○	○	○
provided examples to reinforce course content.	○	○	○	○	○	○	○
explained new content presented in this class.	○	○	○	○	○	○	○
provided vivid details when explaining course content.	○	○	○	○	○	○	○

Next Page

explained course content in a way I could understand. ○ ○ ○ ○ ○ ○ ○

Submit

Click Here to Conduct Your Own Survey

Page 4 of 5

Student Assessment of CAFNR Instructors

***5)** My instructor...

	Strongly Disagree 1	Disagree 2	Slightly Disagree 3	Undecided 4	Slightly Agree 5	Agree 6	Strongly Agree 7
displayed concern for my learning.	○	○	○	○	○	○	○
provided sufficient time for me to comprehend course content.	○	○	○	○	○	○	○
had high expectations for students in this class.	○	○	○	○	○	○	○
instruction remained on-task while teaching this class.	○	○	○	○	○	○	○
communicated specific goals for lessons taught in this class.	○	○	○	○	○	○	○
was animated while teaching this class.	○	○	○	○	○	○	○
assessed what was taught in class.	○	○	○	○	○	○	○

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APPENDIX B

Creative and Effective Teaching Assessment Instructor Instrument

Page 1 of 3

Instructor Assessment

Please enter the prefix and number of the course designated in the email in the appropriate text box. Then, enter the code indicated in the email in the appropriate text box.

*1) Please enter the code provided in the email:

*2) Please enter the course prefix and number of the course you are evaluating:

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Click Here to Conduct Your Own Survey

Page 2 of 3

Instructor Assessment

As you reflect upon teaching this course, please indicate your level of agreement with the following statements.

*3) In this course, I ...

	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Undecided	5 Slightly Agree	6 Agree	7 Strongly Agree
frequently used illustrations to teach course content.	○	○	○	○	○	○	○
taught using novel ideas about course content.	○	○	○	○	○	○	○
provided original solutions to content discussed during this class.	○	○	○	○	○	○	○
used unique methods to teach course content.	○	○	○	○	○	○	○
frequently provided multiple solutions to issues presented in the course content.	○	○	○	○	○	○	○
used multiple methods to teach course content.	○	○	○	○	○	○	○
used unique student activities to teach course content.	○	○	○	○	○	○	○
frequently provided multiple ideas about the content presented in this class.	○	○	○	○	○	○	○

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Page 3 of 3

Instructor Assessment

*4) In this course, I ...

	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Undecided	5 Slightly Agree	6 Agree	7 Strongly Agree
adjusted course content based on students' interests.	○	○	○	○	○	○	○
elaborated on course content while teaching this class.	○	○	○	○	○	○	○
provided more than one method to solve problems for concepts presented in this class.	○	○	○	○	○	○	○
welcomed input from students during class.	○	○	○	○	○	○	○
adjusted teaching when logical approaches did not work.	○	○	○	○	○	○	○
provided examples to reinforce course content.	○	○	○	○	○	○	○
explained new content presented to students in this class.	○	○	○	○	○	○	○
provided vivid details when explaining course content.	○	○	○	○	○	○	○

Submit

APPENDIX C

Panel of Experts

Panel of Experts Consisted of:

Dr. Bryan Garton, Data Analysis

Dr. Rob Terry, Content Expert

Dr. Robert Torres, Data Analysis

Dr. Jonathan Ulmer, Content Expert

APPENDIX D

First Student Electronic Mail Contact

Dear «Student_Name»:

The College of Agriculture, Food and Natural Resources is committed to providing Mizzou students with high quality instruction. As a CAFNR student, you have the opportunity to provide feedback on the teaching effectiveness of your CAFNR instructors.

What are we asking? We would like you to complete a short (less than 10 minute) questionnaire on «Instructors_Name»and your experience in the «Course».

At the bottom of this email there is a **code number** that you will use on the questionnaire. The number will not be used to match you with your responses to the questionnaire beyond this initial contact. Your responses to this study will remain *completely* confidential. Only summated, group data will be reported. Please respond to each question openly and honestly without reservation. While you are not obligated to participate in this study, your responses are very important. You may contact me if you desire a copy of the results of this research.

Your participation in this study is strictly voluntary and you may choose not to participate. If you wish not to participate in this study please respond back to this email with "not participating" in the subject line. Your refusal to participate will involve no penalty or loss of benefits to which you might otherwise be entitled. However, if you choose to participate, **you will be entered in a drawing to win one of three $50 Visa Cash Cards** that can be used wherever you like! If you should have any questions about this research project please feel free to contact me at msaq54@mizzou.edu or (573) 673-1887. You may also contact Dr. Rob Terry at (573) 884-7375. For additional information

regarding human participation in research, please feel free to contact the University of Missouri - Columbia Campus IRB Office at (573) 882-9585.

Thank you for your interest in this important study and I look forward to receiving your responses. Now, please go to the link provided below which will direct you to the questionnaire.

http://FreeOnlineSurveys.com/rendersurvey.asp?sid=5wmkkj985e8r92e376160

Code number: «Code»

Mollie Aschenbrener
CAFNR Graduate Teaching Assistant

APPENDIX E

Second Student Electronic Mail Contact

Dear *student name*
Happy holidays!

I hope you are enjoying the holiday season and the break from school. A few days ago I asked you to complete a questionnaire regarding your CAFNR instructor. Your participation is needed for the successful completion of this research.

Here's all you have to do. Please take a few minutes to complete a questionnaire about**Instructor** and your experience in **course**.
You will find a link to the questionnaire at the bottom of this email. Please use the following code number on the questionnaire:**code**. Be assured that your response to will remain confidential and your participation is voluntary. Remember, if you do participate, you will be entered in a drawing to win one of six $25 Visa Cash Cards that can be used wherever you like!

If you have any questions about this research project please contact me at msaq54@mizzou.edu or (573) 882-2200 or contact Dr. Rob Terry at RobTerry@Missouri.edu or (573) 884-7375.

Simply go to the link below to complete the questionnaire as soon as possible.
http://FreeOnlineSurveys.com/rendersurvey.asp?sid=5wmkkj985e8r92e376160

Mollie Aschenbrener
Department of Agricultural Education
University of Missouri

APPENDIX F

Third Student Electronic Mail Contact

Dear Student Name
Happy New Year!

I hope you are enjoying the holiday season and the break from school. Last week I asked you to complete a questionnaire regarding one of your CAFNR instructors. Your insight is extremely valuable and your participation is vital for our study.

Here's all you have to do. Please take a few minutes to complete a questionnaire about**Instructor**and your experience in **Course**
You will find a link to the questionnaire at the bottom of this email. Please use the following code number on the questionnaire:**100**. Be assured that your response to will remain confidential and your participation is voluntary. Remember, if you do participate, you will be entered in a drawing to **win one of six $25 Visa Cash Cards** that can be used wherever you like!

If you have any questions about this research project please contact me at msaq54@mizzou.edu or (573) 882-2200 or contact Dr. Rob Terry at RobTerry@Missouri.edu or (573) 884-7375.

Simply go to the link below to complete the questionnaire as soon as possible.
http://FreeOnlineSurveys.com/rendersurvey.asp?sid=5wmkkj985e8r92e376160

Mollie Aschenbrener
Department of Agricultural Education
University of Missouri

APPENDIX G

Final Student Electronic Mail Contact

I realize this is a very busy time of year, but if you could please complete the on-line questionnaire as well, I would greatly appreciate your help!

The on-line instrument can be accessed at the web site listed below. Please confine your reflect to your teaching in **Ag Journ 3210**as you complete the questionnaire.

Please enter the following code when you begin the questionnaire: **108.** Of course you are not obligated to participate and no penalties will result should you choose not to participate. However, your support is greatly appreciated!

If you have any questions, please contact Mollie Aschenbrener at msaq54@mizzou.edu or 882-2200 or Dr. Rob Terry at RobTerry@missouri.edu or 884-7375.

Thank you for your interest in this important study. We look forward to your completed response by **Friday, January 11, 2008**. Please go to the web link provided below which will direct you to the questionnaire.

http://FreeOnlineSurveys.com/rendersurvey.asp?sid=5t8kviqn80tx3er380613

Mollie Aschenbrener
Graduate Researcher
University of Missouri

IRB Disclosure:
Your participation in this study is voluntary. If you choose not to participate, please reply to this email and type "not participating" in the subject line. Your refusal to participate will result in no penalty or loss of benefits to which you might otherwise be entitled. For additional information regarding human subjects research, contact the University of Missouri Campus IRB Office at (573) 882-9585.

APPENDIX H

First Instructor Electronic Mail Contact

Dear (name)

Happy New Year!

A few weeks ago, Dr. Vaughn and I contact you regarding a CAFNR instructor study we are trying to complete. At this time, I would again request your assistance.

What do we need? About 15 minutes of your time. The first component of the study is an on-line questionnaire which will require about 5 minutes. The second component will require ten minutes to complete a standardized instrument.

The on-line instrument can be accessed at the web site listed below. Simply enter this code when you begin the questionnaire: (code). Of course you are not obligated to participate and no penalties will result should you choose not to participate. However, your support is greatly appreciated!

Please contact Mollie Aschenbrener if you have any questions (msaq54@mizzou.edu or 882-2200) or Dr. Rob Terry (RobTerry@missouri.edu or 882-).

APPENDIX I

Second Instructor Electronic Mail Contact

Good morning (name)!

Recently I contacted you regarding the CAFNR instructor study I am working on with Dr. Vaughn. Will you please participate in the second component of the study?

The standardized creativity instrument will require ten minutes, and I will provide **refreshments** and the opportunity to **win CAFNR merchandise**! I can meet with you individually, or you can join us for refreshments at any of the following times and locations:

Location:	**Date:**	**Time:**
Natural Resources, room	Tuesday, January 15th	9:30 a.m.
Ag 2-30	Thursday, January 17th	10:00 a.m.
Ag Econ		
Animal Science	Wednesday, January 16th	2:00 p.m.
AE 213	Wednesday, January 16th	9:30 a.m.
Ag Building		
Eckles Hall		

I realize this is a very busy time of year, but if you could please complete the on-line questionnaire as well, I would greatly appreciate your help!

The on-line instrument can be accessed at the web site listed below. Please confine your reflect to your teaching in **Ag Journ 3210**as you complete the questionnaire.

Please enter the following code when you begin the questionnaire: **108.** Of course you are not obligated to participate and no penalties will result should you choose not to participate. However, your support is greatly appreciated!

If you have any questions, please contact Mollie Aschenbrener at msaq54@mizzou.edu or 882-2200 or Dr. Rob Terry at RobTerry@missouri.edu or 884-7375.

Thank you for your interest in this important study. We look forward to your completed response by **Friday, January 11, 2008**. Please go to the web link provided below which will direct you to the questionnaire.

http://FreeOnlineSurveys.com/rendersurvey.asp?sid=5t8kviqn80tx3er380613

Mollie Aschenbrener
Graduate Researcher
University of Columbia

IRB Disclosure:
Your participation in this study is voluntary. If you choose not to participate, please reply to this email and type "not participating" in the subject line. Your refusal to participate will result in no penalty or loss of benefits to which you might otherwise be entitled. For additional information regarding human subjects research, contact the University of Missouri Campus IRB Office at (573) 882-9585.

APPENDIX J

Final Instructor Electronic Mail Contact

Good morning (name)!

Recently I contacted you regarding the CAFNR instructor study I am working on with Dr. Vaughn. Will you please participate in the second component of the study?

The standardized creativity instrument will require ten minutes, and I will provide **refreshments** and the opportunity to **win CAFNR merchandise**! I can meet with you individually, or you can join us for refreshments at any of the following times and locations:

Location:	**Date:**	**Time:**
Natural Resources, room	Tuesday, January 15th	9:30 a.m.
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Ag Econ		
Animal Science	Wednesday, January 16th	2:00 p.m.
AE 213	Wednesday, January 16th	9:30 a.m.
Ag Building		
Eckles Hall		

Thank you again for your willingness to participate!

Mollie Aschenbrener
Graduate Researcher
University of Missouri

VITA

Mollie Aschenbrener is a native of Pendleton, Oregon and spent most of her childhood involved in the agricultural industry. Mollie was an active 4-H and FFA member and served the Oregon FFA Association as State Secretary in 1988-89. Mollie thanks her grandparents and parents for instilling a love of agriculture and fostering her devotion to the agriculture community. Mollie attended California Polytechnic State University in San Luis Obispo, California, where she obtained a bachelors degree in agriculture business, certification as a secondary agricultural instructor and a masters degree in agricultural science.

After college, Mollie served as an agricultural science instructor and FFA advisor at Paso Robles High School in Paso Robles, California for eleven years. She left the high school classroom to pursue a doctoral degree at the University of Missouri (MU) in Columbia, Missouri. While at MU, Mollie served as an instructor in both the College of Education and Department of Agricultural Education. Mollie received her Ph.D. in Agricultural Education from the University of Missouri in 2008.