

AN EXPERIMENT IN FACILITATING CREATIVE THINKING IN SECOND
DEGREE ACCELERATED NURSING STUDENTS

by

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DEDICATION

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LIST OF ABBREVIATIONS

Abbreviation	Description
TTCT	Torrance Test of Creative Thinking
RN	Registered Nurse
AONE	American Organization of Nurse Executives
AACN	American Association of Colleges of Nursing
ANOVA	Analysis of Variance
MANCOVA	Multivariate Analysis of Covariates
SA	Age Related Score
SS	Grade Related Score
STAT	Sternberg Triarchic Abilities Test
DLPFC	Dorsolateral Prefrontal Cortex
TOP	Temporal, Parietal and Occipital Lobes
NCLEX-RN	National Council Licensure Examination for Registered Nurses

ABSTRACT

Challenges and rapid changes in the nursing profession and healthcare in general necessitate that nurses graduate with the ability to reason creatively, a key component to critical reasoning, and a skill imperative to safe and excellent nursing practice. The purpose of this study was to examine whether the implementation of specific interventions to facilitate creativity in a group of second degree nursing students led to an increase of either the age related or grade related creative index score on the Torrance Test of Creative Thinking (TTCT). Sixty students were randomly assigned to a Solomon IV design to prevent threats to internal validity of pretest/posttest sensitivity using the TTCT Figural Form A as the pretest and the TTCT Figural Form B as the posttest. Fifty-one students completed the study. The intervention group participated in a class on creative thinking, a card to remind them of the techniques they learned in the creative thinking class, and prompts to facilitate creative thinking before every group work exercise over two semesters. The main research question was, “Does providing explicit instruction on creative thinking and providing creative thinking strategies improve the creative thinking scores as measured by the Torrance Test of Creative Thinking (TTCT) in second degree nursing students when these interventions are applied over two semesters of nursing school?”. H_1 stated there would be an increase of the scores on the TTCT in the intervention group. H_0 stated there would be no change in scores.

H_1 was not supported. All students showed a decrease in scores on the TTCT posttest. Those experiencing the interventions showed a smaller decrease but this difference did not reach statistical significance. Limitations to the study, barriers to educating nurses to become creative thinkers, possible differences between the form of creativity measured by the TTCT and that needed in nursing practice, as well as recommendations for future research and practice are discussed.

CHAPTER I

INTRODUCTION

“When it comes to the future, there are three kinds of people: those that let it happen, those that make it happen, and those who wondered what happened.” John M Richardson, Jr.

Background

Since the time of Florence Nightingale, nursing has often been described as an art and a science; however its emphasis has almost always been science. Indeed, no one wants a nurse assessing a patient’s well-being or completing a complex skill with only a rudimentary understanding of what must be done and why. Additionally, the state of healthcare today and the central role that nurses play require much more. The Carnegie Foundation for the Advancement of Teaching commissioned a study to examine the state of nursing education in light of the tremendous nursing shortage facing the United States (Benner, Sutphen, Leonard & Day, 2010). This report contends:

New nurses need to be prepared to practice safely, accurately, and compassionately, in varied settings, where knowledge and innovation increase at an astonishing rate...(and) must understand a range of nursing knowledge and science, from normal and pathophysiology to genomics, pharmacology, biochemical implications of laboratory medicine...the physics of gas exchange in the lungs, cell-level transport of oxygen for the acutely ill patient, as well as the human experience of illness and human growth and development-and much more (p.1).

Added to this, nurses must function with all this knowledge in critical situations under stressful circumstances, often in understaffed, undersupplied facilities within a chaotic health care system.

Creativity is one of the crucial elements in learning that prepares and enables a nurse to function in this multifaceted environment and solve problems, an essential component of nursing practice (Fasnaught, 2003). Furthermore, there is concern that failure to educate with creativity in mind, actually contributes to diminishing creativity in thought and innovation critical to nursing practice. (Fawcett, Brophy, Rather & Roos, 1997; Sullivan, 1987; Thomas, 1997).

Creativity is a broad and complex concept that is diversely defined in the literature and varies depending on the discipline defining it. Sternberg and Lubart (1999) define creativity by identifying two characteristics that subsume most definitions: “the ability to produce work that is both novel (i.e. original, unexpected), and appropriate (i.e., useful, adaptive, concerning task constraints” (p.3). These characteristics have been used to codify creativity in business, nursing and other arenas where creativity is highly regarded, and that regard is linked to the value of the product produced (Amabile, 1998; Fasnaught, 2003).

We have progressed from a manufacturing, skill based society to a knowledge based society (Sawyer, 2006; Schön, 1983). Theorists tell us that with the massive influx of knowledge secondary to technology, information will increase to the point where rather than just having knowledge, the ability to access knowledge will be a priority skill for those in professional practice (Hall & Walton, 2004; Hunt & Newman, 1997; Snyder-Halpern, Corcoran- Perry & Narayan, 2001). It will also be necessary to know how to

adequately use that knowledge to solve problems.

Nowhere is that more true than in the health care arena where an explosion of technology, research, an aging population with more complex and chronic health problems and the impact of an evolving reform (i.e., The Affordable Care Act), combine to create an extremely complex health care environment. Creativity is critical to problem solving in complex and rapidly changing situations (Runco, 1994, 2004; Sternberg & Lubart, 1996; Torrance, 1971).

Creativity has often been identified as simply intelligence although controversy about this in the past has abounded (Guilford 1967, Wallach & Kogan, 1965). Over several decades Torrance has demonstrated this is not the case; creative thinking is linked to intelligence, but is a separate and unique ability (2000). It is a key to problem solving, yet developing creative thinking in nursing has not been well addressed and consequently presents special challenges.

Among the health professions nursing is unique in its holistic, personal, and intimate approach to patient care. Consequently, the nurse has the potential to impact the patient at every interaction, just as the patient also has the potential to impact the nurse. Each interaction, which is always unique, is the point at which creativity is sparked and utilized to ultimately effect health and wholeness. However, creativity in nursing has not previously been advanced as a key value, as emphasis on evidenced based practice and the scientific method has been the basis of nursing school curricula. Levine identified and defined creativity as key to nursing care:

Creativity is the marriage of the art and science of nursing The long search for 'better ways' to perform procedures has confused the issue of creative thought

in nursing. . . .the nurse and her patient share a moment of their lives together. It may be that often that moment is marked by all the attributes of a creative act (Levine, 1997, p. 17, 18).

While in business or other areas of endeavor it may be possible to measure creativity based on the product produced, a nurse may need to develop an action that is very creative without a result that is as concrete as prescribed by science.

Consider the patient who has a severe terminal condition whose wounds and concomitant odor make the last days miserable for the patient and the caregivers. A creative nurse hits upon the solution of using a drop of peppermint oil on the linens to alleviate the odor and therefore the discomfort of patient and caregivers alike. The patient is relieved of embarrassment and shame, and both professional caregivers and family can tend to the patient's final needs together instead of in unpleasant fits and spurts. This small inventive act is not objectively taught in a classroom, but marks the kind of creative thinking that is so necessary to preserve the human element in today's high tech environment. This particular act is derived from the imagination and knowledge base of the nurse: creative reasoning or what Schön refers to as "reflection-in-action" (1983, p.54). How can that creativity be developed?

In the past creativity was seen as a mystical, unknowable attribute of creative people that was not measurable and was subject to some ethereal quality of only the gifted. Fortunately, as studies have progressed, it is believed all people are capable of creative thinking (Cropley, 1997). Simonton's (2000) research in this area has debunked the myth that creativity is the purview of the lone genius and demonstrates creativity is the result of ordinary cognitive processes, and is therefore available to everyone.

Csikszentmihalyi (1996) discusses a systems process necessary for creativity to take place. There is a dynamic interaction between the individual creator, the set of rules that drive creativity within the domain (i. e., normal science) and the domain specific guidelines within a field. This is not a suggestion that nurses should be creative when it involves critical interventions that have evidence based practice as an underpinning, such as maintaining sterility of a central intravenous line, or to change the parameters when infusing cardiac medicines. Rather, the nurse extends thinking based on existing expertise. The intellectual knowledge base is necessary to develop creative problem solving and creativity then helps to incorporate the intellectual knowledge (LeStorti, et al. 1999). Fawcett, et al. (1997) define creativity in nursing in a way that assists the non-nurse to understand the nuances of when creativity is required:

Creativity is reorganizing, modifying, or synthesizing a variety of ideas into new and different patterns. Although creativity is not necessarily correlated to intelligence, it is an intellectual skill that requires the ability to rethink established patterns and combine or associate seemingly unrelated elements of knowledge in new and novel ways. It requires extension of our current thinking, and it builds on existing expertise. Using this approach, creativity is demonstrated when we modify procedures, use research to debunk the erroneous or mythical ‘one right way’ (so often fostered in nursing education) or initiate research to generate or test theories that will advance knowledge and improve the care of those who come to us for compassionate and creative care (p. 218).

Therefore, it follows that creativity can be cultivated and facilitated through education. The problem is, how do we educate nurses to think creatively in the clinical

environment? Traditional pedagogies have often involved passive learning reflective of an instruction paradigm where “knowledge is delivered by an instructor and students are viewed as passive vessels ingesting knowledge for recall on tests” (Barr & Tagg, 1995, p. 705). The challenge is to develop education constructed around a learning paradigm where “the chief agents in the process are the learners [who] must be active discoverers and constructors of their own knowledge” (Barr & Tagg, p. 705). The registered nurse in the millennial healthcare milieu must be able to think and develop creative solutions for day-to-day problems to provide safe, competent care in environment and situations that are ever changing.

Nursing practice is a continual process of identification of problems and appropriate and effective solutions. Traditionally this has been referred to as the nursing process. With divergent thinking patterns this can become a very creative process. Guilford (1967), a pioneer in legitimizing the focus of creativity in psychological research, identified divergent thinking as a concept for describing the creative process. He developed the concept of divergent thinking as the ability to produce a broad range of associations to a given stimulus or to arrive at many solutions to a problem (Guilford, 1967). The opposite dimension is convergent thinking, which is more reflective of a traditional learning paradigm, involving the ability to logically think through a problem and produce one right answer (Guilford, 1967; Strickland, 2001). Both convergent and divergent thinking patterns are necessary for problem solving. Creative thinking is problem solving at its best.

As our population ages, as our technology expands, as once terminal illnesses become chronic, the modern nurse will need creativity as a key part of the critical

thinking array to manage patient care. LeStorti, et al. (1999) tell us “the problems that are being encountered within the emerging paradigm of nursing- problems of care, team leadership, case management and patient advocacy -challenge nurses to augment their traditional problem solving repertoire with the techniques of creative thinking” (p.63).

These are lofty statements. Can we educate for creativity in nursing?

Purpose and Question

The purpose of this study was to examine whether employing interventional educational techniques to enhance creative thinking, when used with a group of second degree baccalaureate nursing students, increased creative thinking after two semesters of using these techniques with selected students.

The main research question for this study was: Does providing explicit instruction on creative thinking and providing creative thinking strategies improve the creative thinking scores as measured by the Torrance Test of Creative Thinking (TTCT) in second degree nursing students when these interventions are applied over two semesters?

Sub- questions included:

- Is there an increase in creative thinking scores in students with a particular previous degree concentration?
- Are improvements in creative thinking scores associated with the interventional group students’ grade point average in their prior degree?
- Are the improvements in creativity scores following the intervention associated with gender?

Significance of the Study

Nursing schools are seeking to increase admissions and graduation rates in order

to meet the need created by the looming nursing shortage crisis in an aging nation. In addition, there is a tremendous boom in technology, medical knowledge and treatment. It is speculated information learned by today's nursing and medical students has a rapid half-life (Barnhill, 2010; Goehner & Smith, 2010; Studdy & Fox-Hiley, 1994). As a result, nurses will need to be able to access knowledge and apply it to clinical problems they will not have encountered during their educational preparation. Therefore, the development of critical reasoning skills by nurses is essential in their course of study and during clinical practice. Creativity is vital to clinical reasoning. Even though creativity in nursing practice and critical reasoning have been identified long ago as critical (Levine, 1997), little has been done to facilitate creativity as a formal part of nursing curricula. While there is research on training programs in creativity within the business workplace, there is a dearth of research in creativity and nursing education.

Research as to whether creative thinking in nursing education can be facilitated will serve to provide a strategy to incorporate this important skill and guide future research in developing critical reasoning in nursing education. Measurable educational strategies based on sound educational theoretical frameworks will help to close the gaps in the literature propelling future work in applicable nursing education studies; this was the aim of this study.

Definitions

Creativity is a concept that arises from the area of psychology, but scholars have difficulty deciding on a definition due to the complex nature of the concept. The following definitions help define this study.

Divergent thinking: the ability to produce a broad range of associations to a given

stimulus or to arrive at many solutions to a problem (Guilford 1967).

Creativity: “the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficult; searching for solutions, making guesses, or formulating hypotheses and possibly modifying them and retesting them; and finally communicating the results” (Torrance, 1989, pp.73-91). Definitions of creativity abound. For the purpose of this study Torrance’s definition is used as it captures the phenomenon beyond the concept of production of a product and the TTCT will be used as the measurement instrument.

Adult learners: For the purposes of this study, an adult learner was defined as ages 22 and above. While typically adult learners in college are defined as 24-25 and above, these students qualified as nontraditional college students as defined by Choy, and therefore, also share characteristics of adult learners. Choy discusses nontraditional learners as those who exhibit one or more of the following characteristics:

1. Entry to college delayed by at least one year following high school
2. Having dependents other than a spouse,
3. Being a single parent,
3. Being employed full time,
4. Being financially independent,
5. Attending part time,
6. Not having a high school diploma (2002, p. 2-5).

. These study participants were are all financially independent and held a previous college degree. Their entry into nursing was delayed. Therefore, even though nearly all were at

least 24 or older we included those who were 22 as they met the non-traditional criteria in at least one aspect; financial independence.

Nursing second degree program (accelerated program): A program of study in nursing where students have a previous baccalaureate degree in another field and have returned to acquire a baccalaureate degree in nursing. This program is a continuous 15 month curriculum as opposed to the traditional track of 24 months.

Andragogy: Knowles (1984) is credited with popularizing this theory about adult learners. It premises five assumptions:

1. Their self-concept moves from one of being a dependent personality toward being a self-directed human being.
2. They accumulate a growing reservoir of experience that becomes an increasingly rich resource for learning.
3. Their readiness to learn becomes oriented increasingly to the developmental tasks of their social roles.
4. Their time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly their orientation towards learning shifts from one of subject-centeredness to one of performance-centeredness.
5. Their motivation stems from primarily intrinsic sources as opposed to solely extrinsic sources (p. 44-45).

Limitations and Delimitations

The limitations of this study included a variety of factors. The sample size was limited to those who voluntarily participated in the study from of a class of 80 potential

participants (the total number of accelerated students admitted per year to the University nursing program). This was the only such program in all of south and central Texas and the only one to which the researcher had access to intervene in the curriculum. The sample size of this study may limit its generalizability.

Attrition of participants occurred for a variety of reasons. Three students refused consent to participation. One student did not complete the program. Seven did not present for the posttest session and did not follow up on contacts for post testing. There was no attrition of faculty. There was also the risk that faculty's use of the interventions, despite a training session and manual to facilitate consistency, may have varied.

There were also delimitations of this study. These were intentional boundaries set as part of the research design, but not seen as compromising the integrity of the study. The potential interventions that were selected based on a review of the literature were not the only possible interventions that could have been chosen but were those most conducive to the curriculum. The time of the study spanned the course of two semesters. There is no evidence to indicate particular time exposures to the variety of strategies used as interventions were the correct time exposures to produce a change in creative thinking scores. The study was designed to explore creative thinking as it applies to adult learners. Accelerated students were chosen for this population as they are adult learners.

Bias and Assumptions

The measurement method of this study assumed a normal distribution of variance within the groups studied. Also related to bias, as I am a member of the accelerated program faculty, I did not act as instructor for the groups where the intervention was introduced in order to minimize the risk of bias that might result inadvertently from my

direct role as instructor of the interventional group. While I made every effort to remain removed from the interventional instruction, the risk still continued on a low level as I interacted with all students.

Summary

With the nursing profession facing a multifaceted crisis and the impact said crisis presents to nursing education, it is imperative we develop nurses who can function with excellent critical thinking skills within their scope and place of practice. Key to that ability is the development of creative thinking. The chief aim of this study was to examine if specific interventions designed to enhance creative thinking significantly improved the scores of creative thinking on the TTCT if applied over two semesters. The TTCT Figural Form A & B were chosen as the measurement tool; the TTCT is highly reliable and validated over many years and populations. It measures five areas of creative thinking: fluency, originality, elaboration, abstractness of titles, and resistance to premature closure, as well as 13 additional creative strengths. The intent of the study was to add to the body of knowledge of nursing education. If creative thinking can be developed in nursing students, we can begin to better prepare nurses for future healthcare environments and challenges, and improve the quality of nursing care in general.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this study was to examine whether an interventional design to enhance creative thinking used with a group of second degree nursing students contributed to higher levels of creative thinking after two semesters of using these techniques with selected students. This chapter locates this study in the context of adult education as well as nursing education by first discussing what creative thinking is and why creativity is critical to nursing practice. It will also review how education in nursing has taught in relation to creativity, as well as presenting a theoretical framework for the study and a discourse on measuring and teaching for creativity.

Creative Thinking

Professional nursing education revolves around problem solving. Problem solving often involves, and may even require, creative thinking. In fact, they are so intertwined, Guilford (1967) stated they are essentially the same phenomenon. What does an individual think of when defining creativity? Simonton (2000) identified it as the most pervasive and important of all human activities and the expression of optimum human functioning. For centuries, creativity has been associated with the idea of genius. But creativity is also demonstrated in hundreds of small ways in daily life. Kaufman and Beghetto (2009) sought to solve this conceptual problem through development of a “Four C” model of creativity: *mini-c* (transformative learning), which encompasses the creativity inherent in learning; *little-c* (everyday problem solving and creative expression); *Pro-C*, exhibited by people who are professionally or vocationally creative

but not eminent, and *Big-C*, reserved for those who are considered truly great in their field. This was to distinguish between the unsung types of creativity we may see used to problem solve daily challenges verses the creative endeavors of those whose work ascends to greatness and creative genius. The Four-C model was also intended to help accommodate models and theories of creativity that stressed domain-competence as an essential component, and domain transformation as the highest mark of creativity. It also, they argued, made a useful framework for analyzing creative processes in individuals. Even so, the concept of creativity is too large to fit into any one universal definition.

The concept of creativity, or at least the widespread popularization of the word, was first proffered by Alfred North Whitehead. He used the term to designate “that activity whereby actualities (conceived as individual instances of self-creation) come into being” (Meyer, 2005, p.1). Creativity is studied in relation to many different fields but most of the literature exists in the areas of psychology and education. Guilford in his 1950 address as president of the American Psychological Association issued a challenge to the psychology researchers at the time to explore this field as an essential field within psychology. Up until that time only 0.2% of all published psychological studies focused on creativity (Guilford, 1950, p.445). Guilford in his successive work identified creativity not as a function of high intelligence, but as a separate entity that is in some degree possible in most individuals (1967). This statement has profound implications for education.

Csikszentmihalyi (1990) in seeking to capture the concept of creativity in a way that transcended all possible aspects of this term identified creativity from a system perspective: an interaction between the domain practiced or performed within, the person

(the individual), and the field. Amabile, Barsade, Mueller and Staw (2005) developed a workplace definition for creativity that includes “coming up with fresh ideas for changing products, services and processes so as to better achieve the organization’s goals” (Amabile et al, p.367). In a summary of scientific research on creativity Michael Mumford suggests, “Over the course of the last decade, however, we seem to have reached a general agreement that creativity involves the production of novel, useful products” (Mumford, 2003, p. 110).

In summarizing the exploratory work over the past six decades in analysis of the creative thinking process, DeHaan (2009) concluded that the multicomponent process of creative thinking may appear as a single cognition but in fact is composed of three components: (a) divergent thinking, that mental ability to visualize problem from a new aspect; (b) convergent thinking which allows the thinker to focus and evaluate ideas mentally; and(c) analogical thinking which allows the thinker to understand a new idea in the context of familiar ideas.

Sternberg identifies creativity as work that is both novel (i.e. original or unexpected) and appropriate (i.e., useful or meets task constraints) (1997). Sternberg and Lubart (1996) further developed an “investment theory” of creativity that identifies six distinct but interrelated properties: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment. This agrees with the observation of Csikszentmihalyi (1990) who identified that in order to develop a creative solution, it necessitates an understanding of the basic knowledge of the domain and enough facility to operate within it.

Creativity carries with it an intrinsic and perhaps extrinsic motivation, as well as

the willingness to act, curiosity, and a sense of satisfaction (Amabile, 1983; Sternberg & Lubart, 1996). Torrance (1989), who is recognized for his work in the development of measurement of creativity, defines creative thinking as “the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements disharmonies and so on; identifying the difficult; searching for solutions, making guesses or formulating hypotheses and possibly modifying them and retesting them; and finally communicating the results” (p. 78). Simonton (2000) emphasized the process milieu for creativity by arguing it is an interaction of cognitive, personal, developmental, and social aspects.

Nursing Practice and Creativity

When one thinks of a professional registered nurse, “creativity” is not the first adjective that comes to mind. But to the nursing educator, perhaps it should be. The American Association of Colleges of Nursing (AACN) states that several factors are coming together which may well create the perfect storm of a national nursing shortage crisis (AACN, 2011). This storm necessitates creativity be a part of nursing thinking, both as a profession and individually.

Consider first the average age of nurses currently practicing is becoming increasingly older. In 2000, an estimated 31.7 percent of all RNs (Registered Nurse) were under the age of 40; in 2004 only 26.6 percent of all RNs were estimated to be under the age of 40. Similarly, in 1980, 40.5 percent of RNs were under the age of 35, compared to only 16.6 percent in 2004. The median age of RNs, 46 years old, remained the same between 2004 and 2008, but the number of RNs under age 30 increased for the first time in three decades. (National Survey of Registered Nurses, 2004, 2008).

In addition, there is a critical shortage of qualified nursing faculty which severely limits the number of nursing students who can be accepted into nursing programs. Add to that the Bureau of Labor Statistics estimates a 23 percent increase in nursing jobs by 2016, the largest for any occupation (Dohm & Shniper, 2007).

America is aging as the baby boomer generation begins to reach geriatric status. Our geriatric population is living longer than ever before but they are also living with a host of chronic illnesses that in the past were fatal at a much younger age. Fewer students are entering the nursing profession. At the same time, the nursing profession in general is not associated with high status although it did benefit from a large influx of women in the past because of limited career options as women. With many more career opportunities before them, fewer women are going into the profession (Buerhaus, 2008).

Finally, nurses, the largest of the healthcare professional groups, spend the most direct time with the patient; therefore, healthcare safety and delivery is critical. Several studies verify the critical shortage of qualified nurses and its effects on decreased health care. (Aiken, Clarke, Sloane, Sochalski & Silber, 2002; Cheung & Aiken, 2006). Patients with the highest nurse to patient ratios face up to a 31 percent greater risk of dying (Aiken, et al. 2002). The growing shortage is truly an impending national healthcare crisis.

Entering into this scenario is the student who chooses to pursue professional nursing. Technology and medical research are progressing at a rapid rate that some of what the student learns in terms of content is obsolete before or shortly after graduation (Barnhill, 2010). Nurse researchers speak of severe concerns of a “practice-education gap” as it becomes more and more difficult to keep up with the increasing changes in a

field driven by accelerated developments in technology and research. As a result nursing education must change fundamentally (Benner et al., 2010). Two of the tenets put forward by the American Organization of Nurse Executives (AONE) identifies that a) the knowledge base of the nurse will shift from “knowing” a specific body of knowledge to “knowing how to access” the evolving knowledge base to support the needs of those for whom care is managed and b) the processing of accessed knowledge will shift the work of the nurse from critical thinking to “critical synthesis” (AONE, 2005). Consequently, the nursing student must be prepared as a lifelong learner (AACN, 2008).

Inherent in the idea of critical synthesis is critical reasoning defined as “the ability to reason as a clinical situation changes, taking into account the context and concerns of the patient and the family” (Benner, et al., 2010, p. 85). Inherent in this type of critical reasoning is clinical imagination to presuppose possible scenarios and solutions in a given situation. Benner, et al. includes creative thinking as one of the criteria for clinical reasoning. Until Benner recently coined this term of critical reasoning, critical thinking was the catch all phrase for a nurse’s way of thinking and problem solving. This phenomenon’s true meaning has been bantered about for years. Scheffer and Rubenfeld (2000) sought a specific definition using the Delphi technique with an international panel of nursing experts to define critical thinking in nursing. The panel, conducted between 1995 and 1998 developed a consensus statement that included ten habits of mind (affective components) and seven skills (cognitive components) and concluded:

Critical thinking is an essential component of professional accountability and quality nursing care. Critical thinkers in nursing exhibit these habits of mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness,

intellectual integrity, intuition, open-mindedness, perseverance and reflection.

Critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge (p. 357).

In particular, in the same report, creativity was defined as “intellectual inventiveness used to generate, discover, or restructure ideas; imagining alternatives” (p. 358).

In this profound definition of critical thinking, great emphasis was paid to creativity.

Most of the other descriptors in the definition determined by Scheffer and Rubenfeld are inherent to creativity, in particular contextual perspective, inquisitiveness, intuition, open-mindedness, perseverance, and reflection. However, creativity has historically not been a part of nursing education (Kalischuk, & Thorpe, 2002).

Hodgdon (1996) offered there is a strong connection between critical thinking and imagination. Using concept analysis, Hodgdon concluded that imagination is connected to creativity, to the construction of meaning, and to the generation of unending possibilities; additionally it enables the emotions to coexist with rationality, allowing creativity to exist as an important function within the context of critical thinking.

In the past, visionary leaders have identified the need to foster creativity within nursing education (LeStorti & Johnson, 1999; Levine, 1997; Schlotfeldt, 1997; Stafford, 1981) but the call was not heeded. Instead, as technology overtook nursing and medicine, the focus became the scientific, “evidence based practice” which has been seen as counterintuitive to creative thought processes. Nursing education, as other American institutions of higher education, as delineated by Barr and Tagg (1995), has been based and valued as programs which provide instruction, as opposed to institutions that exist to

produce learning. In fact, a paradigm shift in nursing education is seen as the only way to accommodate the radical changes in our profession and the demands it will and already does require as nursing moves into the impending crisis. The Tylerian model of learning based on objectives, attributed to Ralph Tyler, has been the mainstay of most academic programs in the twentieth century, but Tyler himself states his goal was simply to encourage educators to develop appropriate evaluative measures (Cordero & Garcia-Garduno, 2004). This has arguably resulted in the “banking” method of teaching as described by Freire (2000), which views the teacher as the expert depositing knowledge and the student as the knowledge receptacle. It is clear this model will not adequately prepare future nurses who can care and adapt to changing society and its medical challenges (Benner, et al., 2010).

This is not to propose nurse educators abandon the necessary key content, scientific principles, or evidence based practice competencies that are the basis for sound, scientific practice and which generally reflect convergent thinking patterns as opposed to divergent thinking patterns. In fact, Csikszentmihalyi (1990) identifies that it is not possible to be productively and successfully creative without a mastery of the principles of the domain. However, the pursuit of developing creativity in nursing students is also necessary to develop competent and safe practitioners.

Educating Nurses for Creativity

Various aspects of facilitating creativity in nursing education have been minimally studied. Models for creativity in systems for nursing care delivery have been suggested (Gilmartin, 1999) but not developed and measured. Creativity as a concept has been discussed, debated, and delineated as important to explore (Fasnacht, 2003; Fawcett,

Brophy, Rather & Roos, 1997; Jacano & Jacano, 1996; Jones 1983; LeStorti, et al. 1999; Levine, 1997; Schlotfeldt, 1997; Stafford, 1981), and strategies for creative teaching scenarios have been marginally considered (Demetrulias & Shaw, 1985; Ferguson, 1992; McAllister, 1995). Eisenhauer and Gendrop (1990) reviewed the published research on creative problem solving, and 21 additional studies in nursing, which involved primarily nursing students. They surmised that compared to non-nursing students, the nursing students scored lower in fluency, originality and flexibility, demonstrated less autonomy and perceived themselves as less creative.

There are no studies in the literature that measure an increase in creativity in the thinking of United States nursing students after receiving the benefits of strategies to teach to enhance creativity. Also lacking are studies where interventions to increase creativity in practicing nurses are identified and tested, nor is there evidence of exploration of nurses attitudes toward the concept of creativity in nursing practice. One study by Ku, Lo, Wang, Hsieh and Chen (2002) conducted in Taiwan, indicated there was an increase in the measurements of fluency and flexibility, two measures of creative thinking in the Torrance Test of Creative Thinking, after applying specific creative teaching strategies to the teaching protocol for the Nursing Concepts Course. The authors discuss what they describe as a passive mode of education by the students in a banking model, reflective of the Taiwanese culture. Because of cultural differences, this result is not readily generalized to nursing education in the United States.

A study of psychiatric nurses in clinical practice was conducted to determine if one year of systematic clinical supervision and supervised planning of individual care would have a positive effect on nurses' sense of coherence, creativity, work-related strain

and job-satisfaction on a general psychiatric ward. Improvements were demonstrated in the areas of creativity and the organizational climate (Berg & Hallberg, 1999).

As it relates to barriers to creativity, sadly there is evidence to indicate that traditional nursing education tends to diminish creativity in nursing students from the time of their initial commencement of their program to graduation (Eisenmann, 1970, Sullivan, 1987). Nursing educators and leaders have declared the need for creativity as an imperative for nurses to utilize to meet these challenging times in health care. Little is available to identify proven strategies with measurable increases in the performance of creative thinking.

Theoretical Framework

There is not one clear framework that lends itself to the study of increasing the creative thinking of nursing students, but there are several theories that frame this study. Arthur Cropley has focused on creativity for half a century in his writing. His focus is “everyday creativity,” as is the focus of this study, as opposed to the creativity associated with genius. Much of the literature on creativity focuses on creativity in children, both identifying and fostering it, and in business where product is the primary result. Cropley looks at creativity in children but also in adults. He has identified and contributed to the work that establishes the interaction between intelligence and creativity, concluding they are separate but mutually interdependent concepts (1966). Cropley focuses on the people/process approach to creativity, rather than the “product approach” as a result of the creative thinking process. Rarely do we see a workplace related “product” in the student arena. The student role, by its nature, is about ideas and expanding one’s thinking; additionally in nursing students it is in the development of safe and holistic

practice, to facilitate meeting the needs of the patient and family members. Cropley identifies the process of creativity as developing “novelty” by the following stages.

- Preparation, which involves identifying the problem, setting goals, and convergent thinking
- Information, where the thinker perceives, learns, remembers and uses convergent thinking. (These two stages comprise the development of the necessary domain skills as a platform to progress into creative thinking.
- Incubation, a cogitation of divergent thinking, making associations, bisociating and the building of networks (*across ideas: writer’s emphasis*) occurs
- Illumination, where the individual recognizes a promising configuration
- Verification, where the thinker checks relevance and effectiveness of the novel configuration
- Communication which involves achieving closure and gaining feedback
- Validation where the individual judges the relevance and effectiveness (2001, p.73).

This theory of novel creation as creativity supports one of the few definitions of creativity as specific to nursing, reiterated here by Fawcett, et al.

Creativity is reorganizing, modifying, or synthesizing a variety of ideas into new and different patterns. Although creativity is not necessarily correlated with intelligence, it is an intellectual skill that requires the ability to rethink established patterns and combine and associate seemingly unrelated elements of knowledge in new and novel ways. It requires extension of our current thinking and it builds on existing expertise. Using this approach, creativity is demonstrated when we

modify procedures, use research to debunk the erroneous or mythical “one right way” (so often fostered in nursing education), or initiate research to generate or test theories that will advance knowledge and improve the care of those who come to us for compassionate and creative care (1997, p.218).

As we are examining creativity in adults involved in higher education, the next lens which frames this study is the principles of andragogy as coined by Malcolm Knowles; notably the curriculum in which the participants were engaged is based in these adult learning principles. According to Knowles (1980), because of the changes of knowledge and society, education is “learning how to learn, the skills of self-directed inquiry” (p. 41).

One of the first scientifically designed studies on adult learners was Houle’s (1961) qualitative study of 22 “continuing learners” who he identified as falling into three categories (a) the goal oriented learner, (b) the activity oriented learner and (c) the learning oriented learner. The conclusions of this study helped to shape Knowles’s concept of andragogy, which he originally defined as “the art and science of helping adults learn” (1980, p. 43). He revised this definition to embrace the idea of four learning characteristics that varied on a continuum, to some degree dependent on the situation and the student. He iterates (a) as learners mature they move from dependency to being a self-directed human being and learner, (b) the learner accumulates a reservoir of experiences that provide a rich resource of learning, (c) readiness to learn is intimately related to the developmental tasks associated with their social roles, and (d) postponed application of knowledge shifts from an orientation to immediacy of application, to a performance-centeredness.

Knowles presents an excellent description of the mindset and milieu of the students that enroll in the accelerated nursing program. These are students who have prior experience with learning within higher education and are highly motivated to become nurses as they have the option, having obtained a previous baccalaureate degree in another field, of potentially seeking a graduate degree pursuant to another field. Instead they have chosen to obtain a second baccalaureate degree in nursing. As the program is highly competitive due to limited enrollment, these students have previous GPA's of 3.5 or more. Therefore these students in many cases would be admissible for a graduate degree in their previous field. They have life experiences from other fields to enrich their erudition from this learning experience. They consistently demonstrate their desire to develop the skills and knowledge associated with the registered professional nurse. They are motivated to apply their nursing knowledge immediately, as it is required for the clinical portion of their schooling as well as their practice upon graduation. They fit Knowles's description of the adult learner precisely.

The third conceptual lens that frames this study is that of transformative learning. It was initially identified by Mezirow in 1975 and it continues to be modified. The traditional definition is a learning process by which previous uncritically assimilated assumptions, beliefs, values and perspectives are questioned and thereby become more open, permeable, and better validated (Cranton, 1994, 2002; Mezirow, 1991, 2000). In its essence, it is the notion that adults' experiences and subsequent reflection transform them in fundamental ways; that learning is tied integrally with personal growth and development (Cranton & Roy, 2003). It is this idea of questioning and individuation that links this concept to creativity. By individuating their thinking, a student who increases

creative thinking and develops the habit of mind of creativity becomes a learner who changes and transforms to a lifelong learner and creative thinker. Transformative learning is rarely the focus of traditional curricular planning and is even rarer as a focus in traditional nursing curricula and nursing education literature, yet transformative learning is what nursing educators seek to accomplish in their educational endeavors. In an accelerated program we seek to stimulate transformative learning in a highly motivated individual who is not a nurse; indeed, a group of students who have very different ideas as to what a nurse is, through the process of socialization and skill development to individuals who can think critically to provide lifesaving care to individuals, families and communities with health challenges. Therefore, the education of nurses by its nature seeks to promote transformative learning.

In addition to Cropley, Mezirow, Knowles and Torrance, the exploration of this study is framed by the work of Donald Schön and his concept of “reflection-in-action” (1983). Schön observed the need for professions to educate for artistry as well as domain specific knowledge. He discusses how most professional schools are developed on technical rationality (1987, p.26-27), that is the practice being derived solely from the positivist view and that good professional practice is based only on applied proven science. While this gives technical competence, it does not facilitate the practitioner who can evaluate the holistic view of a set problem and develop unique solutions. In the context of the healthcare field, this approach translates to a gestalt view of the whole person, a goal for nursing and health practitioners who value excellence in care. It also sets the stage for the creative act, whether it is to an individual patient, or a system as a whole to the end of solving a problem. Schön talks at length about the person who can

know-in-action: those who through an unarticulated knowledge can adjust their practice to accommodate the unusual or unique circumstances of a situation and those who can reflect-in-action; those who can reflect on what they are doing within this tacit knowledge and change and adjust within the circumstance to address the problem. Schön parallels this activity to that of artists, i.e., painters, musicians, sculptors and designers, who create out of tacit knowledge and skill as they develop their craft. He likens these artists to those who are exceptional in their professions of medicine, business, and law. While Schön does not discuss creativity per se, he captures its essence by describing this need among professionals to be educated to develop the artistry of their practice as well as the technical competence necessary to practice their profession with excellence. In nursing, this means to develop the inner wisdom to act on principles to develop unique solutions to complicated problems, whether on the individual patient care level, the management level or the system level. Schön discusses the need for university students in professional preparation programs to be coached, not taught, much the way professional musicians or painters are coached. (1987). In nursing there is the opportunity for this but not the practice as we press our students not for a solution to a problem but instead, the right answer. This study is an examination of one aspect of providing coaching to the end of either knowing-in-action or reflection-in action as Schön discusses.

Assessing for Creative Thinking

Guilford (1967) originally described creativity as divergent thinking; exploring new options and ideas for problem solving as opposed to convergent thinking, which is based on using known patterns of thinking to develop a problem solution. Guilford's initial work has spawned many different explorations on the construct of creativity; most,

dependent on different definitions, identify and attempt to assess different components of creativity. There is no consensus on a definition of creativity due to the complex nature of the environment, person, and situation in which it occurs. Testing for creativity in the business world tends to focus on product and effectiveness (Amabile, 1996) but this is an inaccurate measure when it comes to students. Researchers have developed many different surveys, checklists, and assessments (Amabile, 1996); Davis, 1989; Piirto, 1999). The testing for creativity is so diverse that taxonomy has become necessary. A taxonomy presented by Hocevar & Bachelor, (1989) breaks over 100 measurements of creativity into eight categories: (a) tests of divergent thinking, (b) attitude and interest categories, (c) personality inventories, (d) biographical inventories, (e) ratings by teachers, peers, and supervisors, (f) judgments of products, (g) eminence, and (h) self-reported creative activities and achievements. The most widely used approach is the concept of “divergent thinking” as originally developed by Guilford (1956). Guilford’s “structure of intellect” (1967), which defines creative thinking as divergent thinking, emphasizes four abilities in creative thinking: fluency, flexibility, originality and elaboration. Other tests have been developed as well. Tests such as the Remote Associates Test and the Alternate Uses Tests do not lend themselves to large groups of individuals and present challenges in scoring and interpretation. The most evaluated of the tests built on this concept of Guilford’s divergent thinking include Wallach and Kogan’s creativity battery (1965), which was further developed by Torrance into the Minnesota Test of Creative Thinking. This is now known as the Torrance Test of Creative Thinking (TTCT) (Afolabi, Dionne & Lewis, 2006).

Torrance developed the Test of Creative Thinking (1966) honing Guilford’s four

constructs and defining them as fluency (the quantity of answers to a problem), originality (the uniqueness of the answers), elaboration (the enrichment of the ideas delineated), and flexibility (the variety of answers). Torrance's TTCT is the most well-known and widely used assessment of creativity. Developed in 1966 it was revised in 1974, 1984, and 1998 (Kim, 2006). The Torrance test has been validated not only in the United States but internationally (Wechsler, 2006).

Treffinger, Young, Selby & Shepherdson (2002) evaluated the TTCT as the best of 72 published instruments for creativity assessment with high validity and reliability. A variety of other researchers affirmed the reliability and validity of the TTCT in research and group assessment (Amabile, 1996; Cropley, 1972; Runco & Albert, 1985; Kim 2006; Treffinger et al, 2002, Weschler 2006).

Longitudinal studies of participants in the TTCT were followed up at 20, 30 and 40 year intervals and demonstrate that the qualities shown in the tests persisted as to the quality and number of their life achievements (Torrance, 1972, 1981, 1999). These studies confirmed the predictive value of the TTCT and indicated the results of the TTCT could better predict achievements than IQ test results.

Teaching for Creative Thinking

Educating for creativity is a varied and tangled arena. While Schön discusses it with a broad brush as "coaching" (1983, 1987), others have ventured into more specific strategies. There are myriad training programs, from kindergarten to college spanning as brief a period of time as an hour to semesters of training. The majority of training programs that have evolved through the years are based on the concepts developed by Guilford and colleagues know as divergent thinking (Christenson, Guilford & Wilson,

1957; Guilford, 1950; Wilson, Guilford, Christenson & Lewis, 1954). Divergent thinking over the past 60 years has emerged as an undercurrent of creative ability as measured by several tests, most notably the Torrance Test of Creative Thinking (TTCT). The best known, used and tested measures evaluate in terms of fluency (number of responses), flexibility (category shifts of responses), originality (number of unique responses and elaboration (refinement of response). Consequently, training programs also tend to focus on divergent thinking in their curricula as this concept has been well supported as fundamental to creative problem solving and creative performance. (Scott, Leritz and Mumford, 2004; Vincent, Decker and Mumford, 2002). The operationalization of various training programs depends for the most part on the perspective of the definition of creativity used by the developers (Scott, et al., 2004).

In developing a training program for a specific venue, two things must be considered. First, that the training is applicable to the domain such as a creative problem solving approach (Sternberg & Williams, 1996; Treffinger, Isaksen & Stead-Dorval, 2006), and secondly, a training program which fits the setting and venue for time and applicability. Attempts at establishing the effectiveness of training programs have also been extensive. One of the most stringent studies was done by Rose and Lin (1984) which was a quantitative meta-analysis of training programs which utilized the TTCT to measure outcomes. Forty-six studies were included. Analysis indicated that creativity training was effective with an effect size of .64. Critics argued that the testing was primarily in schools, and external and internal validity was questioned (Cropley, 1997; Nickerson, 1999). In response to this study, Scott, et al., developed a more extensive meta-analysis which evaluated the effectiveness of various types of training for creative

thinking (2004). This meta-analytic study examined 70 prior studies and found that well designed creativity training programs do produce significant gains with effect sizes across criteria, settings, target populations, and time. The internal and external validity that were concerns in the previous meta-analysis were countered. The most successful programs focused on development of cognitive skills, and provided an environment of skill application with realistic exercises targeting real life situations. DeHaan notes that this meta-analysis by Scott and his colleagues identified, perhaps surprisingly, that open techniques and approaches providing less specific guidance were less effective; that specific strategies presented to students to enhance creative thinking were most effective, as was instruction on the nature of creativity (2009). Clearly, there is good evidence to show that specific, evidenced based training programs in creative thinking work.

Summary

Creativity is a broad, somewhat ethereal ability that has for thousands of years been left to the Muses. For ages it was thought to be the purview of a select few. In the twentieth century visionary researchers began to discover that creative thought is available to anyone, and beyond that, can even be developed by educational practices. And yet, education, and particularly medical and nursing education, lag decades behind in that pedagogy, with the persistent thinking that scientific endeavors and rigor do not lend themselves to the exercise of this attribute. It is clear that healthcare professions, and nursing in particular, are facing a crisis. With the perfect storm of an aging population, a massive nursing shortage, a graying nursing faculty, and now an unfolding form of nationalized healthcare, the future of what it will mean to be a nurse in upcoming years is under tremendous transition. It is certain that we do not know what healthcare in five to

ten years will look like. It is imperative that nurses are prepared to meet the upcoming challenges as our nation ages and healthcare demands will exponentially rise.

Consequently, nursing education must fully develop critical reasoning abilities in our nurses. Critical reasoning, and thus creative thinking, is essential to the skills the nurse must have to problem solve, save lives, alleviate suffering, and provide leadership in the healthcare arena. We can no longer continue to educate nurses in the way we have in the past. Heretofore, nursing education has done little to recognize and educate to develop this important habit of mind. It is imperative we specifically and intentionally develop creative thinking in nurses as we educate them to care for the nation and for each of us.

CHAPTER III

METHODS

The Purpose

Creativity is a complex and vast subject and the lens through which it is viewed can determine how it is perceived and measured. The purpose of this exploratory experimental study was to examine if creative thinking could be enhanced through specific interventions applied to the teaching of second degree nursing students when these interventions were applied over two semesters.

The Epistemology

The epistemology that informed this study is one of objectivism as reflected in the post-positivist paradigm. Objectivism reflects a classicist view of truth as an entity that can be discovered. Through this study, the researcher hoped that by manipulating a particular variable in the classroom setting, a specific measurable increase in an outcome would occur. As this study is based on human subjects, and human behavior is not a concrete object, this design reflects a post positivist viewpoint which recognizes that just because something is demonstrated in as controlled a setting as possible, does not guarantee it will be replicated invariably forever with certitude (Crotty, 1998). While the basis of this study is constructed on the idea that knowledge is built, reflecting a constructionist view, the study was focused on a measurable type of thinking which the experiment hoped to address. As this was an experimental design and the intention was to determine a cause and effect relationship, it reflected the objectivist view but with the provisionality of the post positivist, reflecting what Karl Popper asserted: “every scientific statement must remain tentative forever” (1959, p.280).

The Design

The design of the study was an exploratory experimental study that sought to ascertain an increase in creative thinking as measured by the Torrance Test of Creative Thinking (TTCT) using a pre and posttest design. This design involved the assignment of groups randomly into a pre and posttest structure (modified by a Solomon Four design), where the independent variable (creative thinking instructional prompts) was manipulated to determine if there was a difference in the outcome variable (creative thinking) (Fraenkel & Wallen, 2008).

There is not one test that can measure all aspects of creativity. The TTCT is designed to measure creative thinking abilities and has been validated over time for this purpose (Torrance & Presbury, 1984, Baer 1993, Kim, 2006). Torrance has developed two equivalent forms of the TTCT: the Figural TTCT and the Verbal TCCT both can be used with pre and post testing. The Figural test was used for this study as it allowed scoring for norm referenced assessments of fluency, abstractness of titles, elaboration originality and resistance to premature closure. In addition, the figural test assesses for 13 criteria referenced creative strengths which are pooled with the norm referenced assessments to result in a creative index score which is then norm referenced to produce a standard age score and a standard grade score. The Verbal TTCT allows for scoring in fluency, flexibility, and originality. As the figural test has these additional measures, the figural exam was chosen for measurement.

Variables

In this study, the independent variable was the set of prompts provided during group work by the classroom instructor to facilitate creative thinking. The dependent variable was the score on the TTCT in fluency, flexibility, elaboration, originality and resistance to closure as well as 13 creative strengths that are combined to result in an age based and grade based creative index score. Covariates that were also to be examined if there proved to be an increase in creative thinking (H_1 supported) were gender, major from prior baccalaureate degree and grade point average for prior degree. These would then be correlated to the scores for fluency, flexibility, elaboration, originality and resistance to closure.

This study was submitted to Texas State University's Institutional Review Board (IRB) and was determined to be exempt. In addition the author sought to apply for IRB exemption at the University where the study was conducted. Upon interview with the IRB Chair, this study was exempted from applying due to the exemption granted from Texas State University (Personal communication, Dr. J. Schmelz, 24 June, 2011).

Sample

This study was conducted within a cohort of second degree nursing students at a large Health Science Center University School of Nursing in South Texas. As this population had already obtained a four year undergraduate degree, they represented adult learners in higher education. They qualify as adult learners under the "nontraditional" characteristics developed by Choy in that at the very least they are financially independent and returning to school (Choy, 2002). The average age of the students in the sample was 29.0 with a span from 22 to 53 years. This school was chosen as it is the only institution in south

Texas that offers a second degree nursing program. This school has recently developed this curriculum based on adult learning principles (Knowles, 1980). Students were approached as a group at the end of a class in the first semester of their nursing program. The study was explained and the students were offered the opportunity to participate in the study, with the incentive of a reception with food at the completion of their participation. It was emphasized there would be no advantage or disadvantage to participating in the study regarding academic assessment in their nursing classes. Informed consent was obtained (See Appendix A).

An accessible sample of 50 to 70 voluntary participants was anticipated. With a margin of error of 5% and a confidence interval of 95%, and a population size of 70 with a response distribution of 50%, the recommended sample size is 60. Sample size was sufficient for the statistics to be performed as 60 students consented to participate. There was no opportunity to expand the sample as the entire population was invited to participate.

After informed consent was obtained the groups were randomly assigned using a computerized random number generating selection process, to participate in either the interventional group or the non-interventional group. Within the intervention group and the non-intervention group the students were randomly assigned to either take the pretest or not take the pretest. All participants took the posttest. This provides a Solomon Four Design (Solomon, 1949). As a pre and posttest design, this design is immune to most threats of internal validity. This design also holds the advantage of adding a higher degree of control over the threat to external validity by controlling for pretest sensitization (Helmstadter, 1970).

Table 1

Solomon Four Design Group

Group	Pretest	Intervention	Posttest
1	O	X	O
2	O		O
3		X	O
4			O

The Intervention

In this curriculum, there was much learning facilitated via group work. In the course of the group work done in each class, the opportunity to facilitate creative thinking and problem solving existed. Learning was facilitated through structured group activities throughout the curriculum for all students. Initially, an instruction session as to what facilitates creative thinking was provided to the students experiencing the intervention. The students were each given a laminated card with the various creative strategies delineated on it (See Appendix B). The intervention group was prompted before group activities with specific creativity promoting prompts and instructed to review their cards as per the meta-analysis done by Scott, et al. (2004). Prompts included (a) instructing students to imagine other viewpoints, (b) advising students in the session to question assumptions, (c) encouraging students to generate their own ideas and solutions (d) reminding students to relate the problem/question at hand to other disciplines, (e) to build

self-efficacy by reinforcing verbally their ability to be creative, and (f) providing a non-judgmental venue for sharing ideas. The control group experienced group learning without the creativity prompts.

The faculty attended a workshop to brief them on the study and to identify the specific prompts to be used prior to group activities to the intervention groups.

Discussion of potential scenarios and how the interventions would be applied followed. A handbook of how to prompt creative thinking according to the strategies developed by Sternberg & Williams (1996) and Treffinger, D. J., Isaksen, S. G., & Stead-Dorval, K. B. (2006) and confirmed by Scott, Leritz & Mumford (2004) was given to each faculty and reviewed during this session to help standardize the prompts given (See Appendix C).

The independent variables were creative thinking interventions (or lack thereof), while the dependent variables were the scores on the TTCT expressed in fluency, elaboration, originality, abstractness of titles and resistance to premature closure combined with the 13 creative strengths and ultimately the age and grade based standard creative index scores. The mediators were to be previous grade point average, previous degree major and gender as the current literature reflects that gender may affect creative thinking (Torrance, 2000). As no independent variable has more than two levels, a post hoc test would not be necessary (Field, 2009).

If a significance level of $< .05$ was determined to be achieved in the TTCT scores after intervention, correlations would be done to determine if there was a correlation in gender, previous grade point average and previous major.

For this study, H_1 stated students who received instruction on creativity and instructional strategies to prompt creative thinking would score higher on creativity as

evidenced by increased scores in fluency, elaboration, originality, abstractness of titles and resistance to premature closure on the Torrance Test of Creative Thinking than students who received no specific interventions of creative thinking or instruction on creativity and then took the TTCT. H_0 would indicate there is no significant difference between groups after the interventions were complete.

The Instrument

The Torrance Test of Creative Thinking (TTCT) is designed to measure creative thinking abilities. Of the limited tests that are appropriate for this sample and milieu, the TTCT is the one that emerges as the most developed, tested, reliable and valid of the tests that exist to examine creative thinking in a measurable manner. Torrance has developed two equivalent forms of the TTCT: the Figural TTCT and the Verbal TCCT and both can be used with pre and post testing. The Figural test was used for this study as it allows scoring for fluency, elaboration, originality, abstractness of titles, and resistance to closure. In addition, the test is scored for creative thinking strengths in 13 categories. The norm referenced raw scores are then pooled with the criteria referenced creative strengths data to result in a creative index score which is then referenced to age and grade to result in a standard age score and a standard grade score. As there was essentially no significant difference between the age based and grade based score, the age based standard score was used for all statistical analysis. The Verbal TTCT allows for scoring in fluency, flexibility and originality only, and therefore was not used. The Figural TTCT: Form A was administered in the first semester of the nursing program. The Figural TTCT: Form B was used as the post-test after three completed semesters. Scores were statistically compared for fluency, elaboration, originality, abstractness of titles, and resistance to

closure and resultant creative index scores to determine if creative thinking increased significantly among those who received the intervention.

The separate norm-referenced assessment scores of creativity are defined by Torrance as follows:

Fluency is based upon the total number of relevant responses.

Originality is based on the statistical infrequency and unusualness of the response.

Abstractness of Titles relates to the subject's synthesizing and organizing processes of thinking.

Elaboration is based on two underlying assumptions: (a) the minimum primary responses to the stimulus figure is a single response and (b) the imagination and exposition of detail is a function of creative ability.

Resistance to Premature Closure is based on a person's ability to keep open and delay closure long enough to make the mental leap that makes possible original ideas. (2008).

The criterion-referenced assessments of creative strengths are defined as:

1. **Emotional Expressiveness** measures the subjects' ability to communicate feelings and emotions verbally or nonverbally through drawings, titles, and speech of the figures of the drawings.
2. **Storytelling Articulatness** indicates a subject's ability to clearly and powerfully communicate an idea or tell a story by providing some kind of environment and sufficient detail to put things in context.
3. **Movement or Action** judges a person's perception of movement through titles and the speech and bodily posture of figures in the drawings.

4. **Expressiveness of Titles** notes a person's use of titles that go beyond simple description and communicate something about the pictures that the graphic cues themselves do not express without a title.
5. **Synthesis of Incomplete figures** is the combination of two or more figures.
6. **Synthesis of Lines (Form A) or Circles (Form B)** is the combination of sets of parallel lines or circles.
7. **Unusual Visualization** points out an individual who sees things in new ways as well as old ways and who can return repeatedly to a commonplace object or situation and perceive it in different ways.
8. **Internal Visualization** indicates that a subject is able to visualize beyond exteriors and pay attention to the internal, dynamic working of things.
9. **Extending or Breaking Boundaries** suggest that a person is able to remain open long enough to permit the mind to make mental leaps away from the obvious and commonplace and to open up or extend the boundaries or limits imposed upon the stimulus figure.
10. **Humor** suggests that an individual perceives and depicts conceptual incongruity, unusual combinations and surprise.
11. **Colorfastness of Imagery** reflects a subject's ability to excite and appeal to the senses.
12. **Fantasy** notes a person's use of fantasy imagery in responding to the test tasks.
13. **Richness of Imagery** reflects a subject's ability to create strong, sharp, distinct pictures in the mind of the beholder.

(Torrance, 2008). List of Definitions for TTCT reprinted with Permission of Scholastic Testing Service, Inc., Bensenville, IL

Reliability. Numerous studies have been conducted over the years on the TTCT. Reported reliabilities range from .50 to .93. It is agreed that the TTCT displays reasonable reliability for group and research applications (Treffinger, 1985).

Scholastic Testing Service, Inc. (STS) owns and controls distribution of the TTCT. Tests are purchased from the STS. Scoring was accomplished by sending the tests to STS for grading. The scoring reliability is .90 or above. Graders are trained and then tested for inter-rater reliability on an ongoing basis. If a scorer cannot maintain a reliability coefficient of .90, they are not utilized for scoring (Torrance, 2000).

With Figural TTCT Streamlined Scoring age-related norms were the type of scoring that was used (at the adult level) for the ANOVA analysis. Age-related norms use one set of norms for each of the grades for which the test is appropriate, including the adult level. Required for scoring, the Figural TTCT Norms-Technical Manual includes national norm tables with standard scores and national percentiles by age for each scored area. The tables also show national percentiles for average standard scores, as well as a creativity index developed from the five standardized scores (www.ststesting.com/2005giftttct.html, March 2011).

Validity. The TTCT is considered to have appropriate validity if scoring is accomplished according to its manual. The tests were sent to STS for scoring. The TTCT has been more intensively researched and reviewed than any other instrument dealing with creativity and norming samples have longitudinal validations and high predictive ability over a significant range of ages: grade one through adult (DeHaan (2009), Kaufman and Baer (2006). Results of the TTCT scoring also include subtest scores on thirteen creative strengths. These are used in combination with the fluency, elaboration, originality,

abstractness of titles and resistance to closure scores to determine the creative index which is then converted to an age based and grade based standard score.

A number of threats to internal validity exist beyond those controlled by the study design. These include the following: the students in this study were together over 15 months' time and during the study the groups intermingle, so it is possible there was a sharing of what each group was experiencing, increasing the possibility of Type II error. Students were requested to refrain from discussing the creativity training they received with their non-intervention classmates. In addition, this group of students may have had members who are exceptionally creative by nature and would serve to skew the results and risk a Type I error. The possibility that faculty deviated from the training received in initiating prompts also exists.

Criticism of the TTCT. Torrance acknowledges that this test cannot measure all aspects of creativity and it is impossible to sample the universe of creative thinking behaviors (2000). The activities assembled in the test are designed to measure a large number of these behaviors. While Torrance has been criticized by others (Wallach and Kogan, 1965 , Thorndike, 1963, 1972, Sternberg, 2013, personal communication) that he did not produce adequate information regarding intercorrelations between the tasks in the test or the measures derived from the tests, Torrance argues that would mean that creative thinking is a “pervasive, unitary function” (2000, p. 8). The tasks in these tests are described by Torrance as measuring creative thinking abilities and have been demonstrated in many studies through many different approaches, over 10 since 1974 (Torrance 2000).

Wallach (1968, 1970) has asserted that the TTCT is merely an intelligence test. Torrance responded to these criticisms by presenting the results of studies that involved 114 correlations with the figural test and 88 with the verbal test with measures of intelligence. The median coefficient of correlation with the figural measures was .06 and for the verbal measures, .21. Results obtained in other cultures produce similar results (Torrance, 1967, 2000).

The TTCT is primarily a test of divergent thinking. It has been criticized that by being based on activities that assess divergent thinking, which is viewed as a cognitive process, that it ignores a possible affective aspect to creativity. The 13 measures of creative strengths were added to the test in recent years to address that criticism.

Construct validity. Construct validity has been determined through a variety of studies over time. Various indicators of creative thinking have been measured against the TTCT with consistently positive correlations. As examples, Seddon (1983) measured divergent thinking and found the TTCT has appropriate psychometric properties to measure creativity. Townsend (1982) and Ziv (1976) examined humor and creative thinking and found repeated demonstrations of validity with the TTCT. Eichenburger (1978) examined performance on the TTCT and the correlation of judgment in physics and found a significant correlation existed ($r=.45$).

Another type of construct validity has been demonstrated in multiple studies where the TTCT was used to demonstrate an increase in creative thinking by participation in creative activities. These were conducted by investigators other than Torrance. Torrance surveyed 106 studies of this type and found that the TTCT had indeed measured the outcomes these investigators sought to achieve in 71% of these studies

(1972, 2000). Performance on the tests (TTCT) was improved by the interventions/activities where the investigators expected to see improvement.

Predictive validity. The TTCT has also demonstrated predictive validity in several longitudinal studies of creativity. Several short term tests were conducted between 1961 and 1970 examining predictive validity. Each study was significant to a level of $< .01$ (Torrance 2000). Long term studies have been accomplished by Cropley (1971, 1972), Witt, (1971), and Torrance (1969, 1971, 2000) which all examine predictive validity over time, the most recent study looking at predictive validity over 40 years. Validity coefficients in these studies ranged from .46 to .63, indicating substantial predictive validity, although Torrance points out that the longer the time elapsed, the more the factors of motivation, acquired skills, perseverance, having a strong purpose, as well as other behavior circumstances, are in operation as life evolves (Torrance, 2000).

Administration of test. Form A of the Figural TTCT was administered at a prearranged time/date within the School of Nursing outside of scheduled class time as indicated in Table 1 of the Solomon Four Design, at the beginning of the semester as a pre-test. All four groups took the posttest (Figural Form B) after completion of the third semester at a prearranged time at the School of Nursing outside of regularly scheduled class time. Additional times to take these tests were provided to two students later in the same day who were unable to take it at the prearranged time.

Directions to take the exam were read to the participants exactly as indicated in the Directions Manual for administering the test. The time limitations were enforced for each section of the test as required. Actual testing time for the exams was 30 minutes as directed for both pretest and posttest sessions.

Analysis and Results

Prior to statistical analysis of the data, the data were screened for missing data or extreme values by examining the distribution patterns of the acquired observational data. SPSS was used to determine outcomes employing an (Analysis of Variance) ANOVA. A Factorial (Multivariate analysis of covariates) MANCOVA was planned if the data supported a significant increase in scores.

Data were analyzed using SPSS software to complete an ANOVA to compare age based creative index scores. Differences in scores based on gender were to be correlated if a significant increase in scores from the TTCT was demonstrated at the significance of $<.05$, as some studies have indicated a difference in this covariate. In addition, if statistical significance was demonstrated in an increase in TTCT scores, the data were to be analyzed further to see if there was a difference between a previous degree cumulative grade point average, previous degree majors, as well as interactions between these variables. The intention was to examine if these covariates indicate areas where prediction of high scores in creative thinking might be possible as it relates to future candidates for recruitment into the accelerated nursing program if H_1 was supported.

In the interest of equitable education and ethical treatment of the students who did not receive the intervention or who did not participate in the study, those students were given the opportunity to attend a creative thinking seminar, and each who attended received a card with the same creative thinking prompts the intervention group received prior to the study.

Summary

The intent of this exploratory study was to measure a method to facilitate creative thinking in a group of nursing students. The TTCT was chosen as the test to measure an increase in creative thinking as it is the most heavily studied test for this purpose. A Solomon IV design was established. Students were randomly assigned to intervention and non-intervention groups, and then randomized into those who did and did not take the pretest. A total of 51 students participated in the study. The intervention group took a class on creative thinking and problem solving and received prompts to encourage creativity in each group project in their curriculum over two semesters. Of the 26 students who received the interventions, 15 took the pretest. Of the 25 students who received no intervention, 13 took the pretest. All 51 participants took the posttest. Ultimately, it was hoped the results would identify the H_1 (there would be an increase in TTCT scores in the group that had the intervention) was supported and the H_0 (there is no difference in scores) might be rejected, indicating an increase in creative thinking in those who received the interventions.

CHAPTER IV

RESULTS

This study was performed to examine whether the implementation of specific interventions to facilitate creativity in a group of second degree nursing students led to an increase of either age related or grade related creative index score on the Torrance Test of Creative Thinking (TTCT). The study design was set up in a Solomon IV design to prevent the threats to internal validity of pretest/posttest sensitivity. The main research question was “Does providing explicit instruction on creative thinking and providing creative thinking strategies improve the creative thinking scores as measured by the Torrance Test of Creative Thinking (TTCT) in second degree nursing students when these interventions are applied over two semesters?” H_1 stated there would be an increase of the scores on the TTCT in the intervention group. H_0 stated there would be no change in scores.

Description of Sample

A total of 51 participants completed the study, including seven males and 44 females. The average age of the participants as a whole was 29.0 years of age. All students were seeking a second degree, and came from a variety of academic and professional backgrounds. The total population of possible students was 63. Of that population, 60 consented to participate. During the course of the study, two students took the pretest but did not complete the posttest. Seven others did not participate in the posttest for reasons unknown. All nine were treated as missing data and dropped from analysis. Of the remaining participants, racial/ethnic distribution was as follows: Hispanic: 11, White: 31, Black: 3, Asian: 4, and Mixed Ethnic Group: 2. Participants

were predominately female, were racially and ethnically diverse, and ranged in age categories from 23to53 years of age. Distribution by age, ethnicity and gender follows in Table 2.

Table 2

<i>Age Gender Distribution</i>							
Age	Male	Female	White	Black	Hispanic	Asian	Mixed
20-24	2	12	8	1	4	1	
25-29	2	22	15	2	6		1
30-34	1	4	3			2	
35-39	1	1			1	1	
40-44		3	2				1
45-49	1		1				
50-54		2	2				
Totals	7	44	31	3	11	4	2

Data Analysis Techniques

Data were analyzed using the SPSS (21.0) Statistics Program. Descriptive statistical techniques were used to compute measures of central tendency and dispersion for interval data. Basic means of scores were calculated to look at initial score comparisons. Standard error was determined for each set of data. Analysis of Variance (ANOVA) was used to determine relationships of scores between the intervention/nonintervention groups and the pre and posttest groups. Partial scores from participants who did not complete the study were dropped from analysis.

Simple determination of the mean scores on each group that took the pretest indicated a decrease in the TTCT score, both for subgroups with and without the intervention. Those who took the pretest and received the intervention showed a decrease in mean score from 120.1 (age related score noted from here out as SA) /120.0 (grade

related score noted from here as SS) to 109.5 and 133.6 respectively, indicating a decrease of 8.8% and 5.4% respectively. Those that took the pretest and received no intervention showed a decrease from 119.2 SA/119.2 SS to 102.2SA/106.6SS with a respective decrease of 14.3% and 10.6%. This indicates that even in the most basic of measures, the H_1 was not supported in that all groups experienced a decrease in creativity index scores. Change occurred but in a negative direction.

Initial Analysis

A two tailed t-test was used to test the effects of pretest and post test scores in those who received no intervention. There was no significant difference (SA: $t=3.642$, $df=12$, $p=.003$), (SS: $t=16.409$, $df=12$, $p=.017$). Of those that received the intervention and took the pre and posttest, the change from the pre and posttest did not reach significance for the SS ($t=3.330$, $df=14$, $p=.005$) and barely reached significance on the SA ($t=2.099$, $df=14$, $p=.054$), which is essentially equivocal).

Age Based and Grade Based Scores

The TTCT results in two scores that are norm referenced for age and grade. There was no significant difference between the aged based or grade based score in the pretest as determined by t-test. Pretest ($t= .626$, $df=.27$ $p=.537$). However, in the posttest comparison of age based to grade based scores, there was a significant difference which is unexplained. Posttest ($t=-39.435$, $df=50$ $p=.000$).

ANOVA Analysis

In examining posttest data, the only area of change is between the control and intervention group who took the pretest, looking at the age based standard score creativity index (SA).

A one way analysis of variance was conducted to test the mean difference of the SA (creativity index aged based score) by intervention or no intervention. The mean posttest score on those receiving no intervention was 106.62. The mean posttest score on those receiving the intervention was 113.60. Analysis of variance demonstrated the significantly different means for the age scored creativity index posttest was the age scored creativity pretest. The Sum of the Squares for the treatment group was 291.873, $df=1$, Mean Square=291.873, $F=1.664$ with a significance of .204. The effect of the pretest was, Sum of the Squares =1790.474, $df=1$, Mean Square=1790.474, $F=10.205$ with a significance =.004. This produced an eta of .044, which is considered a small effect size (Cohen, 1988, p.22).

In the following table of the ANOVA data on the two groups that took the pretest and posttest, we show that the F statistic is not significant in demonstrating a change in the overall creativity index scores ($F=1.664$, $p=.204$). However, the F statistic of the treatment indicates that the group who received the intervention, tended to have a smaller decrease in creativity score than the group that received no intervention though this difference does not reach significance. With a larger sample it would potentially reach significance.

Table 3

<i>Descriptive Statistics</i>			
Dependent Variable: Age Based TTCT Score Posttest			
Treatment	Mean	Std. Deviation	N
No	106.62	18.451	13
Yes	113.60	12.223	15
Total	110.36	15.535	28

Table 4

<i>Tests of Between-Subjects Effects</i>					
Dependent Variable: Age TTCT Score Posttest					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2130.226 ^a	2	1065.113	6.071	.007
Intercept	506.187	1	506.187	2.885	.102
Treatment	291.873	1	291.873	1.664	.209
TTCT Pretest Aged based score	1790.474	1	1790.474	10.205	.004
Error	4386.203	25	175.448		
Total	347520.000	28			
Corrected Total	6516.429	27			

a. R Squared = .327 (Adjusted R Squared = .273)

Effect Size

Effect size is calculated as eta squared obtained by dividing the Sum of Squares for between groups (291.873) by the total Sum of Squares (6516.429) which results in an eta squared of .044. This indicates a small effect size according to Cohen (1988, p.22). Generally, effect size shows a relationship to practical significance; therefore the results of this study demonstrate a small practical significance. The eta of .044 indicates that only 4% of the results are responsible for the variance of the model, a very small effect indeed.

Ad Hoc Analysis

While the eta score of .044 indicates an overall effect, if the effect size is calculated for the age based and grade based scores separately for those who received the intervention and took the pretest and the posttest, the result is a small effect as opposed to a very small overall effect ($d=.27$, $r=.13$). While not statistically significant, it does indicate that a study with a larger sample size (with more power) might be expected to detect a statistically significant impact of the intervention.

Additional Questions

Additional questions that the researcher hoped to answer if H_1 was supported were:

- Is there a difference in the TTCT scores based on gender?
- Is there a difference in the TTCT scores based on previous grade point average?

- Is there a difference in the TTCT scores based on previous degree major?

As the data for H_1 did not reach significance and H_1 was not supported, statistical analysis to answer these questions was not possible.

Summary

These data indicate all groups decreased in creativity scores after two semesters of nursing education. There was a smaller decline in the creativity scores of those who took the pretest and had the intervention than those who took the pretest and did not have the intervention. This difference trended to significance but did not reach significance with this sample size. Eta squared indicated a small effect.

CHAPTER V

INTERPRETATION OF FINDINGS

Study and Findings

There is little research on creativity in nursing. It has often been said that nursing is an art and a science. Nursing school is traditionally taught from the “technical-rationality” point of view discussed by Schön (1983) and has become even more so as nursing seeks to affirm itself as a profession among rapidly changing technologies and medical advances. That is consistent with other professions such as law, medicine, and business. However, perhaps the art of nursing, or what Schön refers to as the “artistry” of the profession of nursing has been neglected, as evidenced by the decrease in creativity and creative problem solving that has been demonstrated over time in schools of nursing (Sullivan, 1987, Eisenman, 1970, Thomas, 1979). Nursing is at a place where the future of the role and responsibility of the nurse is expanding and creative reasoning is more than ever a necessary element to successful practice. The purpose of this study was to determine if creative thinking could be developed by specific interventions over two semesters among nursing students in a second degree, accelerated nursing program.

The participants of this study were a class of accelerated second degree students seeking a BSN in nursing at a large southwestern Health Science Center School of Nursing. A total of 51 participants completed the study. This study was organized into a Solomon IV design. All students were randomly assigned to either the intervention or non-intervention group. In addition, one-half the intervention group and one half the non-intervention group were randomly assigned to take the pretest, the Torrance Test of

Creative Thinking (TTCT, Figural Form A), in an effort to eliminate pretest /posttest sensitization. Those in the intervention group attended a class in creative thinking and problem solving where they were provided a laminated card to reference the strategies they learned. They received a series of prompts before every group exercise designed to encourage creative thinking, and were directed to refer to the laminated card, reminding them of the strategies learned and encouraging the students to implement them. These group exercises occurred over two semesters. The faculty also participated in a class on engendering creative thinking and problem solving along with review of the prompts to encourage creative thinking with the intervention group. Faculty also received a handbook of the strategies and prompts and the same laminated card the students received to use as a reference. All student participants took the TTCT Figural Form B as the posttest.

The original hypothesis was that there would be a definitive increase in scores on the Torrance Test of Creative Thinking to the level of $>.05$ significance as a result of these interventions, compared to the control group that received no intervention. The null hypothesis was that there would be no difference. In fact, both the original hypothesis and the null hypothesis were rejected, as scores in all subjects decreased despite the interventions provided. None of the statistical data resulted in significance with the exception of the difference that occurred between the groups that took the pretest and those that did not. The only factor that made a difference, as reflected in an increased change resulting in significance to the $.05$ level on the posttest in age related scores only, was if individuals took a pretest, and that increase only barely indicated significance at the level of $.0504$, which is essentially an equivocal finding. In other words, the evidence

that the pretest made a difference on the scores of the posttest is only slightly higher and could have occurred by random chance. Looking at the grade based score there was no difference.

Students who experienced the intervention tended to have a smaller decrease in creativity than those who did not have the intervention; however, it did not reach statistical significance. Had the sample been larger it is possible scores indicating that the intervention group had a smaller decrease in creativity would have reached significance. Statistical analysis showed no statistically significant findings in any of the analysis. Had statistical significance been demonstrated, then correlations would have been determined of TTCT scores with previous degree major, grade point average and gender. Unfortunately these analyses were not possible as the data indicated no statistical significance on the initial data analysis.

These results are unfortunately consistent with other studies which indicate that nursing school is a place that traditionally stifles creativity (Sullivan, 1987, Eisenman, 1970, Thomas, 1979). In a study by a Gendrop (1996), it is indicated this decrease in creativity may actually persist as the nurse becomes more and more experienced and entrenched in the profession and in their way of doing things.

Yet, the American Association of Colleges of Nursing, the American Nurses Association, and other leading nursing organizations, as well as the Carnegie Foundation Report (Benner, Sutphen, Leonard & Day, 2010) that was done to assess the current state of nursing education, call for nursing education to embrace and facilitate creativity in nurses as a vital piece of critical reasoning needed for future practice. While the current

study results did not demonstrate the intended effect there is still much to learn from the results.

The call for creativity in nursing has been sounded for years but overrun by the emphasis on the need for an evidenced based approach as a paradigm for scientific thinking. There is little in the literature that identifies how to accomplish the goal of educating nurses in a way that helps them become more creative (Freitas, Lance & Reed, 1991). While theories abound, little has been tested.

The interventions in this study utilized teaching strategies that have been successful in other venues with adult learners in a nursing education setting (Treffinger, Isaksen, Stead-Dorval 2006), Sternberg & Williams (1996). Yet no significant increase in creative thinking as measured by the TTCT was demonstrated.

Discussion with an Expert

This researcher consulted Dr. R.J. Sternberg regarding this study (personal conversation, August 30, 2013). He indicated that he believed that by using the TTCT, only divergent thinking was measured, which is only one type of creativity. In fact this may not measure the type of creativity we are seeking to evoke. He suggested using another test, the STAT, (Sternberg Triarcic Abilities Test), which is designed to test three aspects of students' abilities (analytical, creative, and practical) with the intention of predicting academic success, would better measure creativity (personal conversation , August 30, 2013). The researcher reviewed this test and identified that it was neither sufficient nor practical to measure creativity in this particular venue, nor is there another test in practice that has sufficient reliability and validity to measure creativity in this setting.

Upon further review of the literature, the TTCT still emerges as the most studied and validated test for measuring creative thinking. Is it completely comprehensive to this elusive term of creativity? No. But it does measure the most dominant concept of creative problem solving: divergent thinking. It remains the only test to be validated both on construct validity and long-term predictive ability (Kim, 2010).

This aim of this study looks at a very narrow definition of creative thinking. Indeed, the type of creativity reflected in this study is anything but narrow. It involves technical knowledge being, integrated with sociologic/cultural knowledge and brought to bear in real time action. While Torrance has given us a tool that looks at divergent thinking, what we are seeking to facilitate goes well beyond that. Certainly divergent thinking is a piece of the entire cognitive package however; it is only one piece of the puzzle. The tool to measure that does not yet exist.

Dr. Sternberg further suggested that the use of problem-based learning is what he recommends to facilitate creative thinking. Yet current nursing education curricula, particularly at the institution where this study was conducted, is infused with problem based learning in the form of unfolding case studies, simulations and patient case/care plan discussions. Clearly, that approach is already in place and yet there was no increase in creativity scores as measured; in fact creativity scores decreased. Others have found conflicting results in this regard as well. Bailey, McDonald and Claus (1970) found an increase in creativity scores as did Torrance (1964) when problem solving was introduced into a curriculum that had not used it (diploma programs) . However, Thomas found a decrease when it was applied in a baccalaureate program (Thomas, 1979). Pending further study, this suggests that either the introduction of problem solving methods may

not be a sufficient strategy to increase creativity in nursing students, or that some other factors in the nursing education experience may mitigate against the potential benefits.

The Environment

Torrance discussed the concept of *satori* used by the Japanese to refer to a creative epiphany (1979). Referring to his experience in Japan, he discusses the need to educate by immersion in an innovative environment to accomplish this state .He summarizes the necessary components expected in the Japanese culture to achieve satori:

The attainment of ‘satori’ involves many things. It requires intense devotion. One must be ‘in love’ with something. . . . It requires concentration and absorption to the exclusion of other things. Generally, it involves an intensive, long term, one-to-one relationship to a ‘sensei’ (teacher). Above all, it requires persistence-hard work, self-discipline, diligence, energy, effort, competence, expertness (1979, ix).

This definition of satori encompasses many aspects that experts in creativity say are necessary to educate for. Sternberg identifies the tenet that if creativity is to be cultivated it must be by the individual’s choice (2002). Amabile (1983) speaks of the necessary internal motivation to maintain the curiosity of creativity. At the same time, Chambers (1973) identifies the need for a teacher who is willing to mentor and put forth the effort to facilitate creativity and develop a relationship with their students Csikszentmihalyi (1990) identifies that it requires mastery of a domain to truly function creatively within in it and creativity is a function of the environment. The environment must facilitate it.

The environment of nursing school, despite the problem solving approaches to learning, is arguably an environment that is dominated by convergent thinking. This is

because the technical aspects of nursing demand precision and exactness; people's very lives depend on it. To do otherwise would be irresponsible. However, these technical skills can be taught with creativity, as can the principles which underlie the techniques that are necessary to perform the skills. It may be that to overcome such an intensely convergent educational environment, the frequent interventions and class on creative thinking and problem solving were not enough. As suggested by Torrance in his description of the satori concept, effecting a measurable change in creativity among nursing students may require an immersion of the students in an educational environment that has creativity as a core value and the commitment of the administration and faculty alike. The internal motivation to pursue creativity and choose it would need to be consistently fostered by faculty.

Possible perspectives in looking at an environment conducive to creativity can be seen as Schön discusses the need for reflection-in-action and reflection-on-action. Reflection-in-action represents the idea of utilizing tacit knowledge that is used to think about possibilities outside set rules, often with the help of a "coach," to think in new ways and develop unique solutions to problems in an environment as they present themselves (1983, 1987). This certainly can translate into the nursing curricula if nursing educators can see themselves as coaches in assisting students to develop the art of nursing. Reflection-on-action is the ability for metacognition that enables the actor to think about thinking on the problem and set or identify the true the problem when faced with a question. Often times this facility is associated with someone who has extensive expertise and time in a field who can think more holistically about a situation instead of reacting by "rules." They can examine the situation and determine a more circumspect

solution, a more creative solution. Daley examines how novices tend to draw from the “rules” of their schooling whereas professionals, over time, can think more holistically and identify the actual problem, without the need for trial and error; they then determine a solution born out of years of possible solutions and outcomes (1999). This would seem to indicate that trying to facilitate creativity in students is essentially a strategy that can’t possibly succeed. However, Ferry and Ross Gordon (1998) provide evidence that in some cases novices exhibit the reflection on action that Schön refers to, and suggest that this potential can be cultivated.

Kegan (1994) refers to the development of levels of consciousness in how we relate to our environment in the process of adult learning. He defines learning as a state of destabilization and re-stabilization as we discover new things about our life and our relationship with everything that surrounds us and with that we grow in our consciousness of how we see the world, with a constantly changing lens. Creativity falls within that definition as a move in small ways to a higher level of consciousness, a more dynamic and holistic way of thinking. In order for that growth to occur, it must be nurtured and cultivated (DeBold, 2002). We can perhaps accomplish this further by developing curricula that support those activities, by facilitating and allowing time for just such reflection, and develop this striving for a deeper higher consciousness in the profession so it becomes habit or the new homeostasis.

Faculty Involvement in the Study Intervention

The class on creative thinking and creative problem solving in the intervention group was taught by the researcher. The interventions were carried out by the faculty who had also participated in a creative problem solving class geared to teaching to facilitate

creative thinking. It was hoped this would help the faculty to enthusiastically provide the prompts for the intervention group. As mentioned previously in the study, although faculty committed to implement the intervention, it does not mean they were completely committed to the intervention. As we seek to develop “higher levels of consciousness” as defined by Kegan (1994) that same development needs to be developed and nurtured in faculty as well.

The faculty in the study had different relationships with the students as a group and as individuals. As the classes were large, it was not possible for the faculty to develop mentoring relationships with each student nor was it a requirement of the study. However, it is possible that this dimension was lacking and affected outcomes as there is some evidence that a mentoring relationship with the teachers can be a key factor in stimulating creative thinking in students (Chambers, 1973).

It is also possible the timing of the prompts may have been at issue as implemented. Sosik, Avolio and Kahai (1998) found that prompts or encouragement provided too soon in the creative process tended to shut down creative work being perceived by students a criticism or judgment. There was not specific advice given to faculty regarding the timing with which to prompt creativity.

It was also unknown at the outset of this study how much prompting is necessary to facilitate a change to creative thinking as a habit of mind, and how often this type of activity is required to begin to cause creative thinking to develop as a habit. Clearly, the interventions in this study did not reach that threshold.

It has been stated that nursing school fosters a very convergent type thinking environment due to the importance and precision of the technical aspects of care that are

taught. With that environment comes a low degree of fear that students have voiced consistently, especially prior to clinical experiences. Fears of failure, fear of injuring a patient, and fear of failing their instructor's scrutiny are replete in the literature (Hutchinson & Goodin, 2013; Kurebayashi, Prado & Silva, 2012). Nursing students frequently voice anxiety, particularly in the clinical learning setting. This can be a tremendous barrier to creativity. Obviously without an immersion in creative problem solving in the environment and a commitment by the faculty to promote an environment where curiosity and exploration are encouraged and rewarded in the areas where technical acumen is not essential or may be necessary but not sufficient, creativity has limited opportunity to flourish.

The Students

This student population was chosen because they are adult learners in the sense of exhibiting characteristics of nontraditional learners (Choy, 2002). Adult learners bring richness to baccalaureate education and to nursing because of their previous life experiences. The curriculum in which the students were enrolled was designed to accommodate adult learners and was based on principles of adult learning. Unfortunately, this is also an accelerated program that, by its nature, is stressful due to the compression of learning. Many of these participants have other roles as well as their role of nursing student with regards to family and financial obligations. Several of them were parents and some were single parents. They brought life stressors to a very stressful learning environment made even more so by the accelerated nature of the course. Stress is the enemy of creativity. Thus the threshold of overcoming the convergent thinking paradigm may be even higher.

Finally, study in the professions of the health sciences require that students succeed in the prerequisite sciences in order to gain entrance to the college of their choosing. (i.e. anatomy, physiology, microbiology). The majority of these students have a previous degree in a natural science (i.e. biology, chemistry). Students who have been successful in the exact sciences tend to have a more technical cause and effect type of thinking, more concrete (Hadzigeorgio, Fokialis, Kabouropoulou, 2012; Shaheen, 2010). While there can be creativity in the sciences we do not associate the sciences with creativity as a rule, and it is possible that the students do not either. Although the literature indicates that everyone can be creative, there has to be internal motivation to facilitate it. Perhaps nursing students are at a greater disadvantage in this realm because they don't think of themselves as creative or see their chosen profession as one that requires creativity, and the likelihood is that the previous college environment steeped in an exact science did not facilitate it.

Time and Timing of the Intervention

As we seek solutions to why the study results demonstrated no statistical significance, perhaps the answer lies deeper, in the organ for learning and creating: the brain. Various experts' opinions as to what sparks creativity, how to teach for it, and evaluate it may find reconciliation if we look at how thoughts, and particularly creativity, occurs. Perhaps the reason there is so much discrepancy in definitions of creativity and how it occurs has to do with the complexity of creativity in the brain. The mechanism of neurocognition of creativity is elegantly depicted by Dietrich (2004) and describes the role of the prefrontal cortex. He discusses that it is not the "seat of creativity" (p.1011) but is the processor of several functions that allows creativity to occur.

The prefrontal cortex comprises approximately half of the front half of the human brain. It has two distinct areas that tend to and can function independently. It consists of the dorsolateral prefrontal cortex (DLPFC) which is heavily connected to the temporal, parietal, and occipital lobes (TOP), particularly in regards to long term memory and perception. The prefrontal cortex does not store long term memory but involves working memory as well as abstract thinking, willed action, and planning. The primary input for the DLPFC is the TOP and its primary output is the motor cortices. The ventrolateral prefrontal cortex on the other hand is heavily connected to the amygdala through the cingulate cortex, which deals with emotion and social judgment. It is the source of assessing one's cognitive functions and behavior as appropriate. As the dorsolateral prefrontal cortex is involved in logical and rational decisions, the ventrolateral prefrontal cortex is essential in determining if an idea is novel and appropriate, i.e. creative (Damasio, 1994).

The type of creativity required in scientific domains is controlled primarily by the DLPFC with intricate input and processing from the TOP, where memory is stored and integrated. In order for this to occur, it appears there must be sufficient material stored in the TOP and the facility to use it comfortably. Facilitating this activity involves time and timing (Dietrich, 2004).

Nurses graduating from a baccalaureate program have a great deal of knowledge but limited facility in the practice and integration of that knowledge by the time of graduation. They are truly novice practitioners and the lack of comfort and confidence in their practice is well documented (Benner, 1984). Confidence and competence in their role comes from practice. This may explain why in previous studies, problem solving

learning related to an increase in creativity scores in the diploma graduates who had extensive clinical practice by graduation as opposed to the baccalaureate student who has less clinical time but more theoretical knowledge and education (Thomas, 1979; Torrance, 1964). Dietrich also identifies that time is necessary for creativity to occur. This is consistent with Schön's idea of reflection-in-practice and coaching necessary to develop the artistry in the practice of the profession. In an accelerated program there is currently limited time for reflection.

Accelerated students have traditionally demonstrated they can learn nursing effectively in an accelerated timeframe by demonstrating passing scores on the National NCLEX-RN™ Examination. However, the national licensing examination only establishes the successful candidate as a minimally safe novice in nursing practice. To further develop confidence and competence in the RN role, nursing schools often have students work with a preceptor in a clinical setting in the daily role of the nurse (much like the diploma programs did with their clinical learning environment). This theoretically helps integrate theoretical and practical knowledge so the nurse is more prepared to practice with more facility upon graduation. To address the problem of novices graduating and not being ready to take on the role of the registered professional nurse fully at graduation, the Institute of Medicine (2010) in their landmark report *The Future of Nursing* recommends residencies for nurses to help them transition safely to practice. Perhaps it is at the end of these experiences as the nurse develops competence and comfort with the new role that creativity education may be more effective.

Recommendations for Research

The concept of creativity remains something of a quagmire. The more we learn it seems the less we know. Experts cannot agree on what it is, except that it involves something “novel” (Sternberg, 2001). And yet we know it is imperative for the future of nursing. It raises many questions. Two studies that are critical follow up to this study are necessary. First, it will be necessary to repeat this study with more intensive exposure to exercises which foster creativity with a larger group of students across several types of nursing programs and with more extensive training for the faculty as well, ideally following the graduates long term to see if it impacts their practice. In addition, a study that looks at creativity scores in nurses who undergo creativity problem solving training at the end of their education in capstone or residency programs would give us insight into whether the timing and time of exposure to this training makes a difference.

Due to the complexity of the type of creativity that is necessary in practicing nurses, it will be necessary to study and define specifically what creative reasoning truly looks like, studying students’ and practicing nurses’ assessments of creative thinking to better determine what constitutes creative reasoning in nurses. This would be a qualitative study that examines the type of creativity that is critical to nursing practice that captures reflection-in-practice. In addition, an important aspect for further study is the factors in nursing education that mitigate creativity specifically and strategies to overcome these factors.

Recommendations for Practice

One of the key recommendations of this study for nursing education is that nursing educators will need to identify and embrace the need for creativity and adopt it as a key element in nursing education. This will require a paradigm shift in nursing education that involves a major transition away from nursing education as a primarily content focused pedagogy. Creativity will need to be embraced by faculty and the factors that facilitate creative reasoning be incorporated as a pedagogical cornerstone.

Creativity will also need to be identified as a key skill that is necessary for sound nursing practice by the nursing students. Those factors that are obstacles to developing creative thinking need to be removed, especially fear; fear of making mistakes and fear of failure. Reflection will need to be increased as a learning strategy to enable time and opportunity for creative problem solving. As described in Torrance's "satori," it will require immersion of the students in curricula dedicated to pedagogies with creativity as a main objective. Timing of the strategies may be key in the operationalization of the "creative curriculum". Essentially, creative thinking needs to be embraced as a core value in all of nursing education and barriers removed that block its facilitation.

Perhaps some answers lie in the area of aesthetic engagement. Several luminaires in education have long pointed to the arts as a mechanism to unlock creativity and imagination. Maxine Greene has stated "In order to engage with the arts, you have to release yourself by means of imagination into an alternative world, an "as if" world, the creative word, in whatever art form it is" (Kay, 1995, p.62).

In order to reach the satori described by Torrance, the arts (literature, music, drama, poetry and even dance) could be utilized throughout the curriculum to enhance learning and facilitate creativity. Dewey asserts “esthetic experience is imaginative . . . all conscious experience has of necessity some degree of imaginative quality” (1934, p.272). Essentially Dewey believed that to be aesthetically engaged is to learn and be open to creative expression. The American Association of Colleges of Nursing in their guidelines for accreditation *Essentials of Baccalaureate Education (2008)* reflect this belief as it lists as the first essential that the student must draw from their background in the liberal arts to inform their nursing education. Drawing on the arts to help facilitate creativity makes sense.

Aesthetic engagement could be incorporated in myriad ways into various aspects of the curriculum both in traditional programs and within an online venue. It can be incorporated into courses thought not conducive to integration with the arts such as physical assessment, by utilizing art and music to facilitate observational and assessment perception, as is currently under investigation at the Yale School of Nursing (Dr. Linda Pellico, personal communication, October 10, 2013). Activities, and more specifically a curricular focus such as this have tremendous potential to engage a creative habit of mind.

Final Conclusion

Results of this study showed there was no significant difference in creative thinking as measured by the TTCT in accelerated nursing students who received interventions to facilitate creative thinking compared to those who received no intervention. However, just because the study results did not yield statistical significance

results does not mean it is without consequence. This researcher works as a nursing educator at a land grant university which has a very active nursing school. When the researcher presented the Dean of the School of Nursing with the findings of this study, the Dean made a decision to place emphasis on creativity and innovation as part of the Mission and Values statements of the School of Nursing, which were under revision, and encourage faculty to create an environment of immersion to facilitate the development of creatively reasoning nurses. At a follow up faculty meeting, this idea was also embraced by the faculty. In addition, after discussion of the possible reasons for the results of this study, a goal has been set to include activities that foster creativity at the capstone portion of the student's education. It is a beginning that has the potential to have a large impact.

Nursing had a call during the 1970s to begin to develop the creativity in new nurses. The push for evidence based practice overwhelmed that clarion call. Nursing now has the opportunity and the necessity to cultivate its artistry by developing new educational paradigms which facilitate the critical ability of creative reasoning, if nursing is going to continue to grow, adapt, and thrive in this unfolding Pandora's Box that is healthcare in this decade.

Appendix A

Texas State University Consent Form for Participation In doctoral Research Study

IRB Approval number EXP2011E8452

Educating for Creative Thinking in Second Degree Nursing Students

The researcher conducting this study is:

Candace M. Tull, Doctoral Student, Cohort 2008, College of Education

If you have any questions you may contact the researcher

210-215 -5222 or tullc@uthscsa.edu

If you would like to direct your questions to someone other than the researcher, please contact: Jovita Ross-Gordon, Ph.D. 512-245-8404 or jross-gordon@txstate.edu, faculty advisor for the study.

You received an invitation to participate in a research study examining creative thinking in second degree nursing students. We ask that you read this document and ask any questions you may have before agreeing to participate in the study.

Purpose: The purpose of this study is to investigate creative thinking in adult students enrolled in a second degree nursing program. This study particularly focuses on investigating if specific educational activities influence scores on a test that assesses creative thinking.

Procedure: The researcher will randomly assign the study participants into two groups. These groups will be utilized for any group classroom work during semester two and three of the 2011-2012 Accelerated Nursing Program. One of these groups will receive specific educational activities and a brief training program in creative thinking. The other group will have the standard classroom interventions. Selected members of the groups will take the Torrance Test of Creative Thinking prior to the beginning of the study. At the end of the third semester, all participants will take the Torrance Test for Creative Thinking.

Confidentiality: Your identity will be kept confidential in all future reports or presentations on this study. The tests and the test results will be kept secure until such time as they are no longer needed for evaluation. The tests will be destroyed at the end of three years following the completion of the study, analysis, and write up for publication.

Voluntary Nature of the Study: Your decision to participate is voluntary and will not affect your current or future relations with the University of Texas Health Science Center – San Antonio or the College of Education at Texas State University – San Marcos. If you choose not to participate or choose to withdraw from the study, there will be no impact on your course grades or your program of study.

Benefits and Risks: The benefits of participation in this study are that you will contribute to the knowledge of how to best educate nursing students. There are no risks anticipated to the participants.

Contacts and Questions: Any questions regarding the research, research participants' rights, and/or research related injuries to participants should be directed to the IRB chair, Dr. Jon Lasser (512-245-3413 or lasser@txstate.edu), or to Ms. Becky Northcut, Compliance Specialist (512-245-2102).

Terms of Participation: If you decide to participate, you are free to withdraw your participation at any time during the study. You will be given a copy of this form to keep for your personal records. Findings of the study will be made available to you at the completion of the study if you so desire.

Statement of Consent

I have read the above information. I have asked questions and received answers about the study. I consent to participate in the study.

Signature of Study Participant

Date

Signature of Researcher

Date

I would like to be notified of the results of this study.

Appendix B

Laminated Card of Prompts

Generating

- What options and alternatives might there be?
- Can I think of more ways to do it?
- Different ways? New or unusual ways?
- What would I do if there were no obstacles?
- What's my greatest fantasy about how to do this?
- How might this problem be solved?
What can be used or done in a new way?
- What analogies might help? How do they work?
- How many more possibilities can I create or generate?
- What if the opposite were true?
- What would I wish for in my wildest hopes and dreams?
- Can I visualize or imagine solutions?
- What new connections can I make?
- How might I use some ideas or objects from a totally different context or purpose?

Focusing

- What alternatives are most appealing?
Which ones are most attractive?
- What options suggest new and promising ways to solve this problem?
- What ideas do I really like best?
- What ideas surprised me or caught my attention?
- What ideas offered the most unusual, different, or fresh perspectives?
- Do some of these ideas go together? Can they be combined, synthesized, or sequenced?
- What ideas deserve closer examination or consideration?
- What ideas offer the best chance to do something?

- Which ideas add value to what already exists? Which ones help make it possible to do things better?
- Which ideas take things in an entirely new direction?

Understand the Challenge: What is the challenge, opportunity, or concern that I/we are working on?

- The three B's: Keep it Broad, Brief and Beneficial
- WIBAI? Vs. WIBNI? Wouldn't it be awful/nice if . . . ?
- Use Positive Opportunity Starters – Verbs such as: improve, establish, invent, increase, extend, support, design, expand, enhance, promote, encourage, stimulate, develop, produce, change, build . . .
- Use the 4 W's and an H to explore data

The Problem Statement

- IWWM, HM & H2
- Word Dance: Circle the verb and the objective; find synonyms and mix and match
- The Head and Shoulders Test

Generating Ideas

- Brainstorming: Let the ideas flow freely, do not react to or judge them, push beyond the obvious or previous known solutions, ask for more detail
- SCAMPER: Substitute, Combine, Adapt, Magnify, Put to other uses, Eliminate, Reverse/Rearrange
- Analogies: Does this relate to something in nature? Some other area I've known?
- Force Fitting: Unusual items together
- Reflect
- Action Plan: ALoU, Hits and Hot Spot

Appendix C

Facilitating Creative Thinking in Students

A Guide to Increasing Creative Thinking in the Interventional Group

Researcher: Candace Tull

Contacts: Cell 210-215-5222

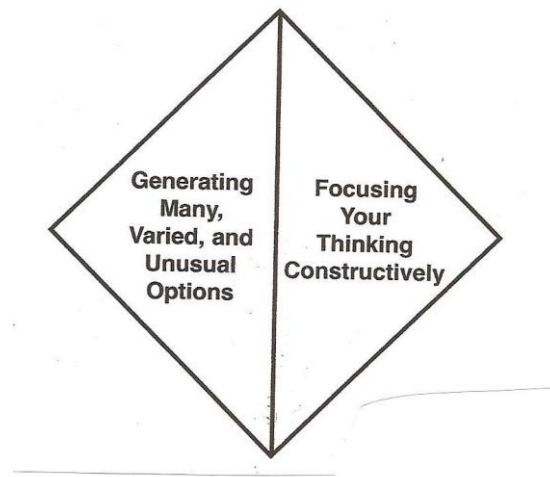
Office: 210 567-0882

E-mail:tullc@uthscsa.edu

Evidence for these interventions are contained in:

Sternberg, R. & Williams, W. (1996). *How to develop student creativity*. Alexandria: VA: Association for Supervision and Curriculum Development.

Treffinger, D. J., Isaksen, S. G., & Stead-Dorval, K. B. (2006). *Creative problem solving: An introduction* (4th ed.). Waco TX: Prufrock Press.



Toolkit

None of these prompts or guidelines are designed to be use in a particular order or even every time group work is done; rather it is a tool kit from which options (tools) are chosen that have been shown to promote creative thinking.

Maslow: If all you have is a hammer, everything is treated as a nail

Creative thinkers: Buy Low and sell high in the realm of ideas: from the investment view, the creative thinker poses an idea and attempts to sell others on its merits. After convincing others it is worthy (which increases the value of the idea), the creative thinker leaves it (the idea) to the others and moves on to the next. Immediate acceptance and applause for an idea often indicates it is not particularly creative.

How we think is often more important than what we think

What is creative thinking?

Synthetic ability (What we usually think of as creative thinking).

Ability to generate ideas and or to make connections between things that others don't recognize spontaneously

Analytic Ability (critical thinking ability) Ability to analyze and evaluates ideas. The creative thinker uses analytic ability to decide which ideas to pursue. Uses this ability to work out the implications of an idea and to test it.

Practical Ability (translate theory into practice). Uses this ability to convince others of an idea's worthiness. Also used to recognize which ideas have a potential audience.

Creative thinking requires all three

Tool One: Model creativity. Students follow what you do, not what you say. In your case studies, examples, questions you ask, previous interventions. Think carefully about your values, goals and ideas about creativity. You do not need to be a creative genius; allow the student to explore answers to questions.

Tool Two: Build self-efficacy. The main limitation of what students can do is what they think they can't do.

Assure them they are creative.

Avoid advice

Demonstrate non-judgementalism

Encourage new ideas

Tool Three: Reward Questioning: "That's a good question"

"That's an interesting idea" Think some more on your idea...what are its strengths?

Praise what works. Encourage them to examine those that don't.

Tool Four: Encourage Information seeking

Try looking at this from another discipline's (person, family member, colleague) viewpoint

Admit you don't know the answer to a question and invite them to seek the answer.

Avoid admitting you don't know and speculating an answer.

Help them to explore alternative explanations to an answer. "Is there another possible explanation? Why or why not?"

Tool Five: Allow time for creative thinking. Consider giving them a set amount of time just to think creatively about a problem. For those who are more internal in their responses, consider assigning the problem, tell them to think about this in dedicated time on their own and return the next day; some students are ruminators.

Tool Six: Reward Creativity. Can't with a grade in this experiment but be creative in how you reward it. Reward excellent creativity with appropriate reward and a little creativity with a little reward; encourage them to push further.

Tool Seven: Use Profiles of creative people. (Case based reasoning)

Consider encouraging students to explore the stories of creative people and their situations and identify the relevance and correlations. Case based learning has been shown to have a long term impact on learning.

Encourage students to think about a problem through the eyes of that person. (I.e. How would Florence Nightingale have looked at this?)

Tool Eight: Group Brainstorming; Idea generation in a non-judgmental environment.

Do not react to them, judge them, debate their merits or demerits or discuss them. The goal is to come up with as many varied and unique ideas as possible. The group should push to get beyond the ideas that are just remembered to those that should be constructed.

Tool Nine: Give them time to develop the creative question.

Tips:

Warm Ups: Look at something interesting, listen to music. What do I see, hear, feel?

What else might be here?

Provide necessary logistics for creating ideas. (Markers, [crayons are cheaper, less messy and don't bleed through], Tablets, Stickies)

Plan time appropriately.

Define Roles:

Client

Resource Group Members (students)

Facilitator (you)

Process buddy: Assists in managing environment and logistics; informs facilitator

What the Students Will Receive

Training in Divergent and Convergent thinking

Process of Generation and Focus

Understanding the Challenge: Defining the “problem”

Recognizing the opportunities around any problem

“Constructing Opportunities”

Generating:

Three B's: Broad, Brief, Beneficial,

WIBAI vs. WIBNI

Action verbs for opportunities: improve, establish, invent, increase, extend, support, design, expand, enhance, promote, encourage, stimulate, develop, produce, change, and build.

Five W's and an H

Who, what where when and how

Focusing:

Hits and Hot spots:

“If I had a magic wand I'd . . .”

“How are these related?”

The Problem Statement:

IWWM

HM

H2

Word Dance

Head and Shoulders test

Generating Ideas: Seeking Many Ideas

Goal:

Fluency (many ideas)

Flexibility: Variety of ideas

Originality: Uniqueness of ideas

Elaboration: Richness (detailed) ideas

Tools:

Brainstorming

“SCAMPER”

S ubstitute

C ombine

A dapt

M agnify or minify

P ut to other uses

E liminate

R everse or rearrange

Metaphor: Is there an idea in nature or another area that relates?

Reflection

Generating and Focusing Questions:

Generating:

What options and alternatives might there be?

Can I think of more ways to do this?

Different ways? New or unusual ways?

What would I do if there were no obstacles?

What’s my greatest fantasy about how to do this?

How might this problem be solved?

What can be used or done in a new way?

What analogies might help? How do they work?

How many more possibilities can I generate?

What if the opposite were true?

What new connections can I make?

How might I use ideas from a totally different context?

Focusing:

What alternatives are most appealing?

What options suggest new and promising ways to solve this problem?

What ideas do I really like best?

What ideas surprised me or caught my attention?

Do some of these ideas go together, can be combined or sequenced?

What ideas deserve closer examination?

What ideas offer the best chance to do something?

Which ideas help make it possible to do things better?

Which ideas take things in a new direction?

ALoU tool

Generating Acceptance:

Assisters: 5 W's

Resisters: 5 W's (think prevention if possible)

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