UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

CREATIVITY TRAINING: AN EXAMINATION OF TRAINING CONTENT,

FORMAT, AND ACTIVITY TYPE

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

By

CRISTINA L. BYRNE
Norman, Oklahoma
2011

CREATIVITY TRAINING: AN EXAMINATION OF TRAINING CONTENT,
FORMAT, AND ACTIVITY TYPE

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF PSYCHOLOGY

BY

_____
Dr. Michael D. Mumford, Chair

_____
Dr. Shane Connelly

_____
Dr. Lori Snyder

_____
Dr. Jorge Mendoza

_____
Dr. Michael Buckley

Acknowledgements

I would like to thank and recognize several people for their help and support in this effort. First, I would like to thank my major professor, Dr. Michael Mumford, for his guidance in the development of this dissertation, as well as his advice about graduate school, careers, and life in general. Additionally, I would like to thank the other members of my committee, Dr. Shane Connelly, Dr. Lori Snyder, Dr. Jorge Mendoza, and Dr. Michael Buckley for their advice and careful consideration of my work. I would also like to thank several of my colleagues who played significant roles in helping me to complete this work. In particular, I must thank Genevieve Johnson, Jay Hardy, and Vincent Giorgini who served as expert raters.

I would also like to give a special thanks to all of my fellow graduate students and colleagues, with special thanks to Amanda Shipman, Tamara Friedrich, Darin Nei, Michael Hughes, and Jamie Barrett, who have provided both professional and personal support throughout these last five years. It has truly been an honor.

I also cannot express enough my gratitude to my mom Francesca, my dad Jim, my brother John, and my sister Maria for their continued patience, understanding, and support throughout graduate school. I will make it up to you - I promise. I would also like to thank all of my in-laws. The Byrne family has been a great source of encouragement and support through these years. Finally, I want to thank my husband Brian, for his support, both emotional and financial, his sincere encouragement, and his relentless, but gentle, prodding to carry on and finish this achievement that is as much his success as it is mine. None of this would have been possible without you.

Table of Contents

List of Tables

List of Figures

Abstract

Previous research indicates that creative performance can be enhance through the employment of creativity training, in particular training focused on the improvement of creative problem solving skills. In the current study, 133 undergraduates were asked to participate in a short, self-paced training program designed to enhance their creative problem-solving skills. The participants also were asked to complete pre- and post- assessments of knowledge and creative performance. Their creative performance on a marketing problem was evaluated for quality, originality, and elegance. The results indicate that training did increase knowledge, as well as the originality of the creative solution. Additionally, it was found that creative performance was influence by the training format and activity type. The implications of these findings for understanding the nature of the interaction between training format and activity type are discussed.

Introduction

Innovation plays a critical part of today's economy (Dess & Pickens, 2000).

Organizations are now facing environmental changes that make introducing innovative

products and services critical for their success and survival (Florida, 2002; Tushman &

O'Reilly, 1997). In response to these rapidly changing conditions and an increased

demand for companies to innovate, creativity and the factors that shape it are receiving

more attention than ever from researchers (Mumford, Scott, Gaddis, & Strange, 2002;

Mumford & Hunter, 2005). While creativity has not traditionally been considered a

employee performance outcome of critical concern (Dess & Pickens, 2000; Mumford

et al., 2002), organizations are paying more attention to it and are placing higher

premiums on innovation and creative work (Drazin & Schoonhoven, 1996). Given the

new found importance and emphasis placed on creativity, organizations have sought,

and are still seeking, different methods to increase the level of creativity of their

workforce. One method that has been used in organization to increase creativity is

through the employment of creativity training. In a recent meta-analysis on the

effectiveness of creativity training, Scott, Leritz, and Mumford, (2004) observed that

training focused on enhancing the creative problem-solving skills of trainees tended to

exhibit the largest effect sizes.

The purpose of this study was to investigate the impact of training content with

regard to the cognitive processes trained (i.e., problem-solving skills), the format of

training with regard to knowledge type used, and type of training activity with regard

to principle and knowledge application. In this study, we examined the influence of

these training design variables on the quality, originality, and elegance (Besemer &

O'Quin, 1999; Christiaans, 2002) of creative problem solutions. One key premise

formed the basis for this effort. Namely that creativity training can, in fact, enhance

creative problem-solving skills. In particular, that training focused on the enhancement

of cognitive processes and problem-solving skills would result in more creative

solutions. In addition to supporting this premise, we also wished to identify some

training conditions that might lead to more effective training and thus, better problem-

solving.

Creative Problem-Solving

Creative thought, or the generation of high quality, original solutions (Ghiselin,

1963; Mumford & Gustafson, 1988, 2007), has been a focus of creativity research for

some time (Brophy, 1998). Initially, this research sought to uncover the cognitive

abilities associated with creative thought (i.e., divergent thinking) (Guilford, 1950;

Merrifield, Guilford, Christensen, & Frick, 1962). Recently, however, it has become

clear that divergent thinking is not the only factor involved in the production of

creative thought. In 2006, Weisberg demonstrated that creative problem-solving is

highly influenced by expertise or knowledge. Other studies that have examined the

processes used when working with and manipulating knowledge point to the

importance of cognitive processes like problem definition (Getzels &

Csikszentmihalyi, 1976; Okuda, Runco, & Berger, 1990; Rostan, 1994) and

conceptual combination (Baughman & Mumford, 1995; Finke, Ward, & Smith, 1992;

Ward, Patterson, & Sifonis, 2004). Other research has also examined the strategies

applied during the execution of these cognitive processes that might lead to the

production of better problem solutions (Scott, Lonergan, & Mumford, 2005; Byrne,

Shipman, Mumford, 2010). This research is noteworthy because it suggests that interventions can potentially be designed that will contribute to and enhance an individual's creative performance vis-à-vis their execution of cognitive processes and the strategies used during the execution of these process.

It would be hard not to acknowledge the evidence that suggests that knowledge, or expertise, is a critical element in creative problem-solving (Ericsson & Charness, 1994; Weisberg & Hass, 2007). Knowledge by itself, however, is not sufficient to guarantee the generation of creative problem-solutions (Sternberg & Dess, 2001). People need to be able to work with and restructure this knowledge if they are to generate original, high quality solutions to novel, complex, ill-defined problems calling for creative thought (Mumford & Gustafson, 2007). In recognition of this point, several scholars (e.g., Amabile, 1988; Dewey, 1910; Parnes & Noller, 1972; Silverman, 1985; Sternberg, 1988; Lubart, 2001) have put suggested several different models describing the cognitive processing activities involved in the creative thought process.

One such model was put forth by Mumford, Mobley, Uhlman, Reiter-Palmon, and Doares (1991). In this study, a literature review was conducted examining the cognitive processes thought to be involved in creative thinking. In total, eight core processes were found to be commonly referenced throughout the literature in various models. While these eight processes were often given various labels and slightly different definitions, Mumford and colleagues were able to identify and connect the underlying principles described in these models. The eight most commonly referenced processes involved in incidents of creative problem-solving were identified as: 1)

problem definition, 2) information gathering, 3) concept selection, 4) conceptual combination, 5) idea generation, 6) idea evaluation, 7) implementation planning, and 8) solution monitoring. These processes are held to operate in a cyclical, or interactive, manner. For example, the type of information gathered depends on how one initially defines the problem. However, if the products produced during the information gathering stage prove inadequate, people will potentially cycle back to the problem definition. Furthermore, the successful execution of each of these processes is thought to depend on knowledge, or expertise. The first four of these processes are called early cycle processes, while the latter four are called late cycle processes. The early cycle processes are focused primarily on the generation and development of a new concept. This new concept provides the foundation for the late cycle processes, which focus primarily on the generation, development, and implementation of ideas based off of the newly created concept.

Mumford and his colleagues (Dailey & Mumford, 2006; Mumford, Baughman, Maher, Costanza, & Supinski, 1997; Mumford, Baughman, & Sager, 2003; Mumford, Baughman, Supinski, & Maher, 1996; Mumford, Baughman, Threlfall, & Supinski, 1996; Mumford, Supinski, Baughman, Costanza, & Threlfall, 1997; Mumford, Supinski, Threlfall, & Baughman, 1996; Osburn & Mumford, 2006; Scott, Lonergan, & Mumford, 2005) have conducted a series of studies that provide evidence for the importance of each of the processing activities in creative problem-solving. In sum, their results and findings suggest that the successful execution of these processes is highly related to the production of higher quality and more original problem solutions. Furthermore, their work indicates that each process makes its own unique contribution

to creative thought and creative performance. Additionally, the effectiveness of this process execution depends on the employment of certain strategies in relation to the type of knowledge being applied.

Process Strategies

Taken as a whole, these studies indicate that effective execution of the processes proposed by Mumford, Mobley, Uhlman, Reiter-Palmon, and Doareas (1991) is, in fact, critical to the creative thought process and the generation of new ideas. However, these findings broach another question - what leads to effective process execution? Although many factors including abilities (Osburn & Mumford, 2006) as well as contextual influences (Dailey & Mumford, 2006) might influence the effective execution of these processes, it seems that a particularly important influence is the strategies employed during process execution.

In an initial study examining strategy use during process execution, Baughman and Mumford (1995) examined the strategies contributing to effective execution of the conceptual combination process. They suggested that conceptual combination was based on a search for shared features, or attributes, of the concepts to be combined. Mapping and integrating shared features was held to contribute to better creative problem-solving. In an experimental study, they found that feature search and mapping along with elaboration strategies contributed to the production of higher quality and more original products for creative problems. These findings have also been supported in a study by Ward, Patterson, and Sifonis (2004).

In a similar study examining processes execution during idea generation, Finke, Ward, and Smith (1992) focused on the strategies that might contribute to the

effective execution of this process. The argued that idea generation requires accounting for the potential applications of new knowledge that arises from conceptual combination. In a series of experimental studies, they observed that when people are asked to think about the applications of a new concept, solutions of higher originality were obtained for new product designs.

In still another study examining the effective strategies employed during idea evaluation, Lonergan, Scott, and Mumford (2004) asked undergraduates to assume the role of a marketing manager devising a new advertising campaign. The participants' "subordinates" (i.e., paper people) provided ideas of varying quality and originality that could be used in developing these campaigns. Participants produced the highest quality, and most original, advertising campaigns when they employed a compensatory approach in idea evaluation. In other words, they were more creative when they sought to improve the quality of highly original ideas, or the originality of high quality ideas. In a similar study examining the role of forecasting in idea evaluation and implantation planning, Byrne, Shipman, and Mumford (2010) found that when evaluating ideas more extensive forecasting focused predicting a large number and variety of outcomes was related to more effective creative problem-solving. They found a similar relationship when participants were asked to forecast the outcomes of a plan for implementing their ideas. Furthermore, during implementation planning, it was shown that forecasting the negative outcomes and obstacles, so that appropriate back-up plans can be made was also highly related to higher quality and more original products.

Although there is some reason to suppose that the strategies applied in process execution vary as a function of the domain at hand and the type of knowledge with which people are working (Weisberg, 2006; Scott, Lonergan, & Mumford, 2005), the findings noted above indicate that one focus that could potentially be used during creativity training is to enhance process and strategy execution skills that contribute to creative thought on certain types of problems and to develop instructional protocols intended to illustrate the application of these strategies.

Creativity Training

As previously mentioned, Scott, Leritz, and Mumford (2004) conducted a meta-analysis examining the effectiveness of creativity training programs. Seventy studies were analyzed that provided training evaluation data of adequate quality to be included in this meta-analysis. The training programs included in this meta-analysis assessed training effectiveness in terms of one of four criteria 1) divergent thinking test performance, 2) performance on tasks calling for creative problem-solving, 3) actual, real-world, creative performance as reflected in supervisory, or teacher, appraisals of creativity, and 4) attitudes towards creative efforts. Additionally, the descriptions of the training programs provided were coded to reflect attributes of these studies relevant to the internal validity of study design (e.g. pre-post design, transfer tasks used, publication in peer reviewed journal), external validity (e.g. age, gifted sample, pre-post adolescent samples, undergraduates, working adults), course content (e.g. process emphasized, training techniques employed), and training delivery method or activity types (e.g. field exercises, group exercises, domain based exercises).

A key result that emerged from this meta-analysis was that creativity training was, in fact, effective. The effect size estimates obtained for enhancing each of the four criteria mentioned above were as follows: divergent thinking skills - .75, problem-solving skill - .84, performance as rated by supervisors - .35, and attitudes toward creative efforts - .24. Given these results, creativity training appears especially effective at improving divergent thinking and creative problem-solving skills.

It is clear from these findings, that creativity training can, in fact, increase creative problem-solving skills. However, they also broach a different question. More specifically, what training content and delivery methods are associated with greater improvements in creative performance? In this meta-analysis, it was found that when realistic practice exercises and extensive practice was provided, creativity training proved especially effective. When looking at instructional delivery method, it was also found that especially effective programs used lectures, cooperative learning, and case-based exercises. Additionally, when training programs emphasized strategies relevant to each of the cognitive processes under consideration they were found to be strongly related ($r = .49$) to assessments of effectiveness.

These findings suggest that creativity training programs seeking to develop creative thinking by illustrating strategies that underlie effective process execution are likely to prove most effective in enhancing creative performance. Particularly effective programs would also use lectures followed by extensive practice, in particular case-based exercises. However, because of the relatively small number of studies that actually examined the effectiveness of single training format and or a single delivery method, it seems prudent to investigate the effectiveness of these training variables

further. In particular, this study sought to examine creative performance differences between people trained on different processes and strategies, using different types of training format, and with different types of exercises and practice.

Training Content

In their studies, Mumford and his colleagues (Dailey & Mumford, 2006; Mumford, Baughman, Maher, Costanza, & Supinski, 1997; Mumford, Baughman, & Sager, 2003; Mumford, Baughman, Supinski, & Maher, 1996; Mumford, Baughman, Threlfall, & Supinski, 1996; Mumford, Supinski, Baughman, Costanza, & Threlfall, 1997; Mumford, Supinski, Threlfall, & Baughman, 1996; Osburn & Mumford, 2006; Scott, Lonergan, & Mumford, 2005) examined the relevance of each of the eight processing activities involved in creative problem-solving. They found that each process was, in fact, related to the creativity of the solution. However, it has yet to be examined whether some of the processes are more important for different creative outcomes (i.e., quality and originality). By considering the quality and originality of the solution separately, it might be found that the early and late cycle processes have differential effects on these outcomes. The early cycle processes include: problem construction, information gathering, concept selection, and conceptual combination. These four processes, in particular the latter two, are thought to be were the novel concept is created. In other words, these are the process that allow for the creation of new knowledge. Given this occurrence, it seems to follow that training in these early cycle processes would improve the originality of the solution more so than the quality of the solution. The late cycle processes include: idea generation, idea evaluation, implementation planning, and solution monitoring. These four processes, in particular,

9

idea evaluation and implementation planning, are focused on obtaining the best idea through critical evaluation and the best overall solution by generating a logical, well-thought out plan from implementing the idea. Thus, it seems to follow that people trained in these late cycle processes will improve the quality of the solution more so than the originality. These observations led to the first hypothesis:

> *Hypothesis One:* Training in the early cycle processes will prove to be more effective in enhancing the originality of the creative solution, while training in the late cycle processes will prove to be more effective in enhancing the quality of creative solution.

Training Format & Activity Type

In terms of training format, prior research indicates that creativity can proceed through either case-based or analogical mechanisms (Mumford, 2002; Mumford & Moertl, 2003). In 2005, Scott, Lonergan, and Mumford, found that when training people in strategies used during conceptual combination, it was most effective to provide a match between the type of knowledge used (principle-based vs. case-based) and the type of heuristics (or strategies) used (analogical vs. case-based). In other words, when concepts are framed in terms of principles, effective use of analogical heuristics is highly related to the creativity of the solution. Similarly, when concepts are framed in a terms of cases, effective use of case-based heuristics is highly related to the creativity of the solution. These findings suggest that there is a connection between the type of knowledge people employee and how they apply that knowledge to the problem. It also suggests that matching knowledge type and application will prove more effective.

Furthermore, some of the cognitive processes involved in creative thought are inherently more generative (i.e., problem construction, conceptual combination, idea generation) in nature, while others are more evaluative (i.e., idea evaluation, solution monitoring, implementation planning). Additionally, since case-based knowledge is more difficult to work with due to its complex, contextual nature, it follows that providing people with an opportunity to see exactly how the knowledge can be abstracted and used will be beneficial. Practice in evaluating the significant elements of cases might also be beneficial. Thus, a when using a case-based approach to training, it may be beneficial to give examples of how the knowledge is applied along with evaluative exercises that allow for practice in identifying significant case elements. On the other hand, principle-based knowledge tends to be abstract and lacks contextualization. Thus, providing practice that allows people an opportunity to work with and directly apply these abstract principles might prove beneficial. Thus, when using a principle-based approach to training, it may be beneficial to allow for practice in applying the new knowledge which would be more generative in nature. Given the matching hypothesis put forth by Scott, Lonergan, and Mumford (2005), it also follows that creating a beneficial pairing between the knowledge structures used during training and the activities or exercises employed during practice, will help to increase the creativity of the solution more so than in cases where a mismatch occurs. Taken together, these effects led to our second hypothesis:

Hypothesis Two: Different training methods (format and activity type) will be more effective when a match occurs between the format (i.e., knowledge structure used during training) and activity type. Specifically, case-based

11

training followed by evaluative activities will lead to more creative solutions, while principle-based training followed by generative activities will lead to more creative solutions when compared to mismatched conditions (i.e., case-based training with generative activities).

Lastly, while creativity training has been shown to be an effective way to increase creative performance, it is not without its limitations. It has long been thought that creativity and intelligence are related phenomena. In fact, Guilford and Hoepfner (1966) argued that creativity is not often observed that scatter plots of IQ and divergent thinking scores were triangular in nature, meaning that those with low IQ were also low in divergent thinking, or creativity, while students with high IQ were scattered over the range of divergent thinking scores. This finding was also replicated by Schubert (1973) using an army sample. Thus, if we are to be able to enhance creative problem-solving skills, it may be the case that a baseline level of intelligence is required to enhance divergent thinking and creative problem-solving skills. Similarly, given the findings that divergent thinking skills predict creative performance (Vincent, Decker, & Mumford, 2002; Guilford, 1950; Merrifield, Guilford, Christensen, & Frick, 1962; Weisberg, 2006; Mumford, 2001), there might also be some baseline level of divergent thinking skill required to perform creative work. It follows then that creative performance will be easier to enhance in populations with baseline levels of divergent thinking skills, as well as baseline levels of intelligence. Thus, our third and fourth hypotheses seem indicated:

Hypothesis Three: The effectiveness of creativity training will only be

observed for individuals with a relatively high degree of intelligence and

divergent thinking skills.

Hypothesis Four: Contingent on H3, the impact of the training factors of

interest (content, format, and activity type) will only be seen for individuals

with a relatively high degree of intelligence and divergent thinking skills.

Method

Sample

To test these hypotheses, a sample consisting of 133 undergraduates attending

a southwestern university was utilized. Fifty-nine men and 74 women (one missing

sex data) agreed to participate in this study. They were recruited from psychology

courses providing credit for involvement in experimental studies. After reading short

paragraphs describing the available studies, the participants then selected the studies in

which they would volunteer. The average age of the sample was 19.59. The average

score on the ACT was approximately 26, nearly a standard deviation higher than

national norms.

General Procedures

Participants were recruited to participate in what was purported to be a study

examining a problem-solving training program. During the last half of this three hour

study, participants were asked to complete a series of questionnaires and standardized

tests intended to serve as controls for individual differences variables that might

influence performance in the training program.

Participants were asked to work through a self-paced training program during the first half of this study. Before and after the completion of this training packet, participants were asked to complete creative problem-solving tasks. This consisted of develop marketing, or advertising, campaigns for new products – a root beer based energy drink and a campaign for a wireless company entering a new market. These problem-solving tasks can be viewed in Figures 1 and 2.

Insert Figures 1-2 About Here

Based on the finding of Besemer and O'Quin (1999) and Christiaans (2002) concerning the main characteristics of creative products, the campaigns developed were scored for quality, originality, and elegance. Participants were also asked to take a short knowledge test that assessed knowledge retention about the basic information covered in the training packet regarding the problem-solving steps and strategies trained. Scores were calculated by totaling the number of correct responses. These tests can be viewed in Figures 3 and 4.

Insert Figures 3-4 About Here

Covariates

According to previous research (Vincent, Decker, & Mumford, 2002; Guilford, 1950; Merrifield, Guilford, Christensen, & Frick, 1962; Weisberg, 2006), creative problem-solving can be influenced by intelligence, divergent thinking, and expertise.

Accordingly, during the latter portion of this study, participants were asked to complete the Wonderlic Personnel Test. This test provides a 50 item measure of intelligence. The Wonderlic yields split-half reliabilities above .80. Several studies have provided evidence for the construct and predictive validity of the Wonderlic as a measure of intelligence (Bell, Matthews, Lassiter, & Leverett, 2002; Frisch & Jessop, 1989; Hawkins, Faraone, Pepple, Seidman, & Tsuang, 1990; McKelvie, 1989).

To assess divergent thinking, three tests develop by Guilford and colleagues (Merrifield, Guilford, Christensen, & Frick, 1962) were administered. On the first test, the object synthesis test, participants were presented with two words (e.g., clamshell, shoestring) and were asked to conceptually combine these words in order to generate a new object (e.g., necklace). In total, 24 word pairs were presented and scored for fluency or the number of objects generated. On the second test, called consequences, people were presented with unusual events (e.g., what would happen if gravity was cut in half) and for each of five events they were asked to think of as many consequences as possible (e.g., the invention of weighted shoes). These responses were scored for fluency – the number of responses generated, as well as flexibility – the number of unique response categories generated. On the third test, the utility test, participants were asked to think of multiple uses for five common objects (e.g., a brick or pencil). This test was scored for fluency – the number of uses generated by the participant, and flexibility – the number of unique response categories generated. As scored, all measures applied produce internal consistency coefficients above .70. Evidence for the validity of measures has been provided by Kettner, Guilford, and Christensen (1959) and Merrifield, Guilford, Christensen, and Frick (1962).

A measure of expertise was used based on earlier work by Scott, Lonergan, and Mumford (2005). This measure contains a set of six background data, or life history, questions (Mumford, Stokes, & Owens, 1990) that examine previous involvement with advertising and marketing issues. For example, "how often do you think about how you could make advertisements better?" And, "how often do you discuss current advertisements with your friends?" This scale yields an internal consistency coefficient above .70. Scott, Lonergan, and Mumford (2005) provide evidence for the validity of this approach in measuring expertise.

Additionally, participants were asked to complete two personality inventories. The first, Cacioppo and Petty's (1982) measure of need for cognition, was administered to assess motivation for cognitive tasks. This 18 item measure presents people with statements such as "I would prefer complex to simple problems" and "I only think as hard as I have to", and asks them to endorse on a five point scale, the extent to which they agree with these statements. These questions produce internal consistency coefficients above. 80. Cacioppo and Petty (1982) as well as Dailey and Mumford (2006) have provided evidence bearing on the construct validity of this scale.

Finally, participants completed Goldberg's (1992) adjective checklist which provides a comprehensive assessment of personality based on the Big Five factor model of personality. Participants were asked to rate the extent to which they believed a list of 100 adjectives (e.g., active, energetic, touchy, nice, caring, friendly) described themselves using a nine-point scale. This checklist assesses openness, agreeableness, neuroticism, extraversion, and conscientiousness. Each of these scales evidence

16

internal consistency coefficients above .80. Becker, Billings, Eveleth and Gilbert (1997), Conway and Peneno (1999), Reysen (2005), and Saucier (2002) provide evidence for the validity of these scales.

Dependent Variables

The creative products, or advertising campaigns, were presented to a panel of three judges. The judges were asked to rate these proposals for quality, originality, and elegance based on the findings of Besemer and O'Quin (1999) and Christiaans (2002) concerning the key attributes of creative products. Quality, originality, and elegance judgments were to be made using five point benchmark rating scales (Redmond, Mumford, & Teach, 1993). These benchmark scales were developed based on a review of sample campaigns. This sample contained products of varying quality (complete, coherent, useful), originality (unexpected, elaborative), and elegance (simple, clever, easy flow). Figures 5, 6, and 7 present the benchmark rating scales developed to assess quality, originality, and elegance for the root beer advertising campaigns proposed.

Insert Figures 5-7 About Here

Before making these ratings, the judges participated in a 20 hour training program. During this training program, judges were familiarized with the nature of the tasks and the definitions of quality, originality, and elegance being applied. Next, using the benchmark rating scales, judges assessed a set of sample fifteen products and then met to discuss their ratings and resolve any discrepancies they had over the

definitions and samples. The interrater agreement coefficients obtained for solution

quality, originality, and elegance for both campaigns were approximately .71

averaged.

Manipulated Variables

       Training Content (Early vs. Late Cycle). The first manipulation was

implemented by constructing individual modules for each of the eight cognitive

process described earlier. Approximately half of the participants received training in

the first four, or early cycle, processes (problem identification, information gathering,

concept selection and conceptual combination), while the other half received training

on the last four, or late cycle, processes (idea generation, idea evaluation,

implementation planning, and solution monitoring). Based on previous work ((Dailey

& Mumford, 2006; Mumford, Baughman, Maher, Costanza, & Supinski, 1997;

Mumford, Baughman, & Sager, 2003; Mumford, Baughman, Supinski, & Maher,

1996; Mumford, Baughman, Threlfall, & Supinski, 1996; Mumford, Supinski,

Baughman, Costanza, & Threlfall, 1997; Mumford, Supinski, Threlfall, & Baughman,

1996; Osburn & Mumford, 2006; Scott, Lonergan, & Mumford, 2005), training was

focused around a number of strategies found to be effective for each of the processes.

       During problem construction, participants were informed that it is critical to

focus on what information about the problem will be available that will help to decide

on how best to structure the problem. They were also informed that when constructing

the problem it is important to pay attention to alternative goals, alternative procedures,

and operating restrictions that can be used as guides to help restructure the problem.

During information gathering, participants were informed that it is advantageous to

focus on key relevant facts, discrepant information, and to use a wide search range

when seeking relevant information. Additionally, they were instructed to disregard

irrelevant facts. During concept selection, participants were instructed to pay attention

to the underlying principles and to think about the long-term goals of the solution

when selecting concepts. They were also instructed avoid thinking about specific

action plans and to avoid being overly critical at this early stage. During concept

combination, participants were instructed to identify the *unique* features of the

concepts that have been previously selected. They were also instructed to create a link

or map the features onto each other. Using these shared, or linked, features, they were

then told to try to generate a new category or concept based on these shared features.

And finally, they were told that elaboration by generating additional features of the

new concept would be beneficial.

During the first late cycle process, idea generation, participants were instructed

to generate a multiple ideas using a wide range for different categories, or concepts,

and to also briefly consider the application of these ideas at this stage. During idea

evaluation, participants were informed that forecasting the likely outcomes of the

ideas, in particular negative outcomes, would be beneficial during this stage.

Additionally, they were instructed to use multiple standards (e.g., quality, originality,

financial) when assessing their ideas. Finally, they were instructed to forecast errors

that might occur and revise the idea extensively during this stage. During,

implementation planning, participants were instructed to focus on the resources

available and consider the restrictions operating in the situation that could hinder

effective plan execution. Additionally, they were instructed to think about the specific

procedures that would be needed to execute an effective plan and to develop extensive back-up plans during this stage. Lastly, during solution monitoring, participants were instructed that identifying critical outcomes that indicate whether or not the plan is working would be beneficial. Additionally, they were instructed to look for these outcomes as well as the restrictions that were identified during the planning stage. Finally, they were informed that during solution monitoring it is critical to look for and explore emergent opportunities.

Training Format (Principle-based vs. Case-based). The second manipulation was implemented by constructing two versions of each of the training content types (i.e., early and late cycle training content). The first version of the training was prepared in principle-based format. In other words, a description of the targeted process along with key strategies (described above) to implement the process was described in bullet-point format. The explanation and definition of the process and accompanying strategies were then followed by a concrete example of their effective execution. The second version of the training was prepared using case-based, or experiential, format. In other words, a contextualized story was constructed that described and demonstrated the targeted process along with key execution strategies. Two examples of the four possible combinations of training content and format (i.e., early cycle process in principle-based format; late cycle process in case-based format) using two exemplars processes of the eight trained are located in Figures 8 and 9. This design is fully crossed, thus, participants received training in only four of the eight strategies, in either a case-based or principle-based format.

Insert Figures 8-9 About Here

Training Activity Type (Generative vs. Evaluative). The final manipulation was implemented by having the participants complete training activities, or exercises, having either a generative or an evaluative focus for each of the four steps trained. In the generative activity condition, participants were asked open-ended questions. These questions required the participant to *apply* the process and strategies focused on during the training program. Participants were typically asked to generate multiple response options for each strategy that was demonstrated in the training unit. In the evaluative activity condition, participants were asked to critically evaluate examples of how the strategies could be applied in an example problem. In evaluative activities, participants were typically presented with responses that varied in their degree of effectiveness and accuracy in terms of how the processes were applied. Participants either selected the best response option or rated the effectiveness of the response options individually. Examples of each of the two types of activities for two exemplar processes are located in Figures 10 and 11.

Insert Figures 10-11 About Here

Analyses

Given the nature of some of the hypotheses, specifically H3 and H4 regarding intelligence and divergent thinking, the data set was first split based on the median

21

scores for divergent thinking and intelligence – two variables known to be factors in creative problem-solving ability and skill acquisition. Paired sample t-tests were then performed on the pre- and post-knowledge tests, as well as ratings of creative performance. Additionally, a series of MANOVA's were performed examining the impact of the manipulations on creative performance. The data was similarly split on divergent thinking scores and intelligence for these analyses. MANCOVA's using the other covariates previously described were performed but because no significant covariates were found (other than intelligence and divergent thinking), thus separate MANOVA's were used instead splitting the data on these two ability variables.

Results

Effects of Training

After splitting the data set using median intelligence scores as assessed by the Wonderlic Personnel Test, paired-sample t-tests were performed. The obtained results showed significant improvements in both knowledge, $t(61) = 3.20$, $p = 0.010$, and solution originality, $t(64) = 2.04$, $p = 0.045$, for those participants scoring high on the Wonderlic Personnel Test. Those participants with lower intelligence scores did, however, show some improvement in the knowledge learned in training $t(62) = 2.10$, $p = 0.040$, but did not exhibit marked improvement in terms of creative performance. These results, including pre and post means and standard deviations, are presented in Table 1.

Similarly, when split using median scores on the consequences test of divergent thinking, the results indicate that those scoring high in divergent thinking skills improved in both knowledge $t(59) = 4.28$, $p = 0.010$ and originality $t(64) =$

2.30, $p = 0.025$. However, participants scoring low on the consequences test did not

significantly improve in either of these performance areas. These results, including pre

and post means and standard deviations, are presented in Table 2.

Insert Tables 1-2 About Here

Influence of Manipulations

In examining the effects of the manipulations on post training creative

performance, the data set was again split on intelligence and divergent thinking. The

MANOVA results indicate a multivariate interaction for training content (early vs. late

cycle) by training format (principle-based vs. case-based), $F (3, 55) = 7.76$, $p = .001$,

$\eta^2 = .297$. This finding only held for those scoring high on the intelligence measure.

Inspection of the cell means indicate that when training late cycle processes, a cased-

based training format proved to be more effective ($M = 2.86$, $SE = 0.245$) than a

principle-based format ($M = 2.53$, $SE = 0.175$) in terms of solution quality. However,

in terms of solution originality ($M = 2.75$, $SE = 0.184$ vs. $M = 2.52$, $SE = 0.258$) and

elegance ($M = 2.67$, $SE = 0.168$ vs. $M = 2.44$, $SE = 0.235$), using a principle-based

format proved to be more effective than a case-based format. Finally, when training

early cycle processes, the two training formats did not differ in terms of quality or

originality, but did however differ in regards to elegance ($M = 2.71$, $SE = 0.189$ vs. M

$= 2.46$, $SE = 0.178$), with case-based training proving more effective.

Furthermore, a significant univariate interaction was found for training format

(case-based vs. principle-based) and activity type (generative vs. evaluative) in terms

of solution originality $F (1, 57) = 4.16$, $p = .046$, $\eta^2 = .068$. The nature of the interaction is such that when using a principle-based training format, generative activities proved more effective ($M = 2.86$, $SE = 0.184$), in comparison to evaluative activities ($M = 2.56$, $SE = 0.195$). In contrast, when using a case-based approach, evaluative activities ($M = 2.87$, $SE = 0.247$) proved more effective at increasing solution originality than did generative activities ($M = 2.31$, $SE = 0.220$). The preceding results along with all other non-significant results are presented in Table 3.

When examining those participants scoring high on the consequences test of divergent thinking, a similar univariate interaction was found between training format and activity type. However, these findings held for all three aspects of creative performance: quality, $F (1, 57) = 4.71$, $p = .034$, $\eta^2 = .076$, originality, $F (1, 57) = 4.90$, $p = .031$, $\eta^2 = .079$, and elegance, $F (1, 57) = 5.59$, $p = .021$, $\eta^2 = .089$. Inspection of the cell means indicate that, in general, for all three aspects of creative performance (i.e., quality, originality, and elegance), pairing case-based training format with evaluative exercises was more effective (approximately $M = 2.85$, $SE = 0.180$) than pairing case-based training with generative exercises (approximately $M = 2.16$, $SE = 0.189$). However, pairing principle-based training format with generative activities was only slightly more effective (approximately $M = 2.66$, $SE = 0.178$) than pairing principle-based training with evaluative exercises (approximately $M = 2.58$, $SE = 0.157$). Even though this difference is slight, the pairing of principle-based training with generative activities (approximately $M = 2.66$, $SE = 0.178$) was much more effective than the pairing of case-based training with generative activities (approximately $M = 2.16$, $SE = 0.189$). Similarly, the pairing of case-based training

with evaluative activities (approximately $M = 2.85$, $SE = 0.180$) was much more effective than pairing principle-based training with evaluative activities (approximately $M = 2.58$, $SE = 0.157$). This indicates that matched conditions proved to substantially more effective than their mismatched counterparts. The preceding results along with all other non-significant results are presented in Table 4.

Insert Tables 3-4 About Here

Discussion

Before discussing the implications of the present study, certain limitations must be noted. First, and foremost, the present study was based on an experimental paradigm. Although a low-fidelity simulation task in the marketing area provided the basis for this investigation (Motowildo, Dunnette, & Carter, 1990), and the undergraduate participants appeared to find this task engaging, a question still remains about whether or not these findings can be extended to a population that has a greater amount of expertise in the field of marketing (Ericsson & Charness, 1994; Weisberg, 2006). Furthermore, it should be noted that only one type of problem – advertising campaigns, drawn from one domain – marketing, was examined in this study. This observation raises a question regarding the cross-problem, cross-domain, generality of our findings (Baer, 2003).

In a similar vein, it should be noted that the design employed in this study leaves the conclusions open to some threats to internal validity. No control or placebo groups were used in order to save university subject pool resources, which leaves

some question still open about whether or not training did in fact cause increases in knowledge gained and creative performance. However, there is a substantial body of knowledge, also supported by the current study, suggesting that creativity training does, in fact, improve creative performance (Scott, Leritz, & Mumford, 2004). While we did provide some evidence to that effect, the purpose of this study was to move past the question of whether or not creativity training works in order to answer the follow-on to that question, "What *type* of training works best?" Thus, while we cannot compare our training conditions to a no training control group, we can still answer questions regarding the impact of the manipulated variables on creative performance.

Additionally, it should also be recognized that other training design variables do exist (e.g., amount of practice, self-regulation based follow up, feedback, etc.) that were not specifically examined in this study. Although the variables examined were fairly broad and encompassing, other variables of importance do exist and should be examined in the future to help further improve the design and potential effectiveness of creativity training programs. Finally, while participants were asked to complete the post problem-solving activity and use the strategies and processes trained, there is no guarantee that these processes and strategies were actually utilized.

Even bearing these limitations in mind, we believe the present effort does lead to some important conclusions about how we might go about developing creative problem-solving skills. One main conclusion that flows from this study is that creativity training does work. While this was a conclusion that was highlighted by the creativity training meta-analysis previously discussed, it is important to provide further support and replication of empirical findings whenever possible. So, while this

conclusion is not necessary novel, it is nonetheless an important demonstration of previous work and the effectiveness of creativity training programs.

Secondly, these results suggest that some performance differentiation does exist between early and late cycle processes in regards to the creative outcomes of quality, originality, and elegance. While there was no main effect for training content (i.e., early vs. late cycle), there was a significant interaction with training format, such that late cycle processes, when trained using a case-based format, led to higher quality solutions. In contrast, late cycle training using a principle-based format, led to solutions evidencing higher originality and more elegance. These findings along with the observation that early cycle training using a case-based format led to solutions judged to be more elegant, lend partial support to Hypothesis 1. Training in the early cycle processes proved to be more effective in enhancing the elegance of the creative solution – *only when using a case-based format*. In contrast, training in the late cycle processes proved to be more effective in enhancing the quality of creative solution – *only when using a case-based format*. This indicates that creative performance in terms of quality, originality, and elegance is not just a function of the use of early vs. late cycle processes, but something much more complicated involving the type of knowledge being applied to the problem. This study cannot parse out the exact nature of these difference, thus further study is warranted in this area.

Third, it seems clear from these findings that different training activities are needed, depending on the knowledge structures employed during training. In particular, a pattern was observed that demonstrated a similar matching principle to that observed by Scott, Lonergan, and Mumford (2005). Different training activity

types were more effective when matched with a compatible training format (or knowledge structure used during training). Specifically, case-based training followed by evaluative exercises led to more creative solutions, while principle-based training followed by generative exercises lead to more creative solutions when compared to mismatched conditions (i.e., case-based training with generative activities and principle-based training with evaluative activities).Thus, for designers of training programs, it will be important to construct a situation that matches the training activities to the knowledge structures employed during training as these results indicate that this option is more effective than training using mismatched knowledge and activity types. The matching that is necessary here is to focus on how the newly learned information is applied. Can trainees easily use the abstract information from principle-based knowledge? Can trainees easily find the significant information in a case? So we need to compensate for the somewhat negative aspects of knowledge base used. In other words, the information learned from case-based training can unfortunately be difficult to apply. Thus, we must demonstrate to trainees how to apply these concepts and how to identify the significant information from cases. On the other hand, principle-based knowledge is somewhat abstract, so we must give trainees more practice in actually applying the concepts in a concrete way.

Finally, it seems clear from this study that unfortunately, while creativity training works, it doesn't work for everyone in the same way or as effectively. In this study, training was more effective for those individuals with baseline intelligence and divergent thinking skills. The practical implications of this are clear – organizations wanting to improve creative performance in their workforce, should focus their efforts

and investments on those individuals, with high divergent thinking skills and high levels of intelligence, that are most likely to be successful. While this might seem severe and against a positive view of the human ability to learn new information, resources, especially resources devoted to creativity training, can be often be limited in organizations. Thus, it seems prudent to spend those resources where there is a greater likelihood of success.

References

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior, 10,* 123-167.

Baer, J. (2003). Evaluative thinking, creativity, and task specificity: Separating wheat from chaff is not the same as finding needle in haystacks. In M. A. Runco (Ed.), *Critical Creative Processes* (pp.129-152). Cresskill, NJ: Hampton.

Baughman, W. A., & Mumford, M. D. (1995). Process analytic models of creative capacities: Operations involved in the combination and reorganization process. *Creativity Research Journal, 8,* 37-62.

Becker, T. E., Billings, R. S., Eveleth, D. M., & Gilbert, N. W. (1997). Validity of scores on three attachment style scales: Exploratory and confirmatory evidence. *Educational and Psychological Measurement, 57,* 477-493.

Bell, N. J., Matthews, T. D., Lassiter, K. S., & Leverett, K. S. (2002). Validity of the Wonderlic personnel test as a measure of fluid or crystallized intelligence: Implications for career assessment. *North American Journal of Psychology, 4,* 113-120.

Besemer, S. P., & O'Quin, K. (1999). Confirming the three-factor creative product analysis matrix model in an American sample. *Creativity Research Journal, 12,* 287-296.

Brophy, D. R. (1998). Understanding, measuring, and enhancing individual creative problem-solving efforts. *Creativity Research Journal, 11,* 123-150.

Byrne, C. L., Shipman, A. S., & Mumford, M. D. (2010). The effects of forecasting on creative problem-solving: An experimental study. *Creativity Research Journal, 22,* 119-138.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology, 42,* 116-131.

Christiaans, H. H. C. M. (2002). Creativity as a design criterion. *Creativity Research Journal, 14,* 41-54.

Conway, J. M., & Peneno, G. M. (1999). Comparing structured interview question types: Construct validity and applicant reactions. *Journal of Business and Psychology, 13,* 485-506.

Dailey, L., & Mumford, M. D. (2006). Evaluative aspects of creative thought: Errors in appraising the implications of new ideas. *Creativity Research Journal, 18,* 367-384.

Dess, G. G., & Pickens, J. C. (2000). Changing roles: Leadership in the 21st century. *Organizational Dynamics, 28,* 18-34.

Dewey, J. (1910). *How We Think.* New York: Heath.

Drazin, R., & Schoonhoven, C. B. (1996). Community population, and organizational effects on innovation: A multilevel perspective. *Academy of Management Journal, 39,* 1065-1083.

Ericsson, K. A., & Charness, W. (1994). Expert performance: Its structure and acquisition. *American Psychologist, 49,* 725-747.

Finke, R. A., Ward, T. B., & Smith, S. M. (1992). *Creative Cognition: Theory, Research, and Applications.* Cambridge, MA: MIT Press.

Florida, R. (2002). *The rise of the creative class*. New York: Basic Books.

Frisch, M. B., & Jessop, N. S. (1989). Improving WAIS-R estimates with the Shipley-Hartford and the Wonderlic Personnel Test: Need to control for reading ability. *Psychological Reports, 65,* 923-928.

Getzels, J. S., & Csikszentmihalyi, M. (1976). *The Creative Vision: A Longitudinal Study of Problem Finding in Art.* New York: Wiley.

Ghiselin, B. (1963). Ultimate criteria for two levels of creativity. In C. W. Taylor & F. Barron (Eds.), *Scientific Creativity: Its Recognition and Development* (pp. 30-43). New York: Wiley.

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment, 4,* 26-42.

Guilford, J. P. (1950). Creativity. *American Psychologist, 5,* 444-454.

Guilford, J. P., & Hoepfner, R. (1966). Creative potential as related to measures of IQ and verbal comprehension. *Indian Journal of Psychology, 41,* 7-16.

Hawkins, K. A., Faraone, S. V., Pepple, J. R., Seidman, L. J., & Tsuang, M. T. (1990). WAIS-R validation of the Wonderlic Personnel Test as a brief intelligence measure in a psychiatric sample. *Psychological Assessment: A Journal of Consulting and Clinical Psychology, 2,* 198-201.

Kettner, N. W., Guilford, J. P., & Christensen, P. R. (1959). A factor analysis study across the domains of reasoning, creativity, and evaluation. *Psychological Monographs, 73,* 1-31.

Lonergan, D. C., Scott, G. M., & Mumford, M. D. (2004). Evaluative aspects of creative thought: Effects of idea appraisal and revision standards. *Creativity Research Journal, 16,* 231-246.

Lubart, T. I. (2001). Models of the creative process: Past, present, and future. *Creativity Research Journal, 13,* 295-308.

McKelvie, S. J. (1989). The Wonderlic Personnel Test: Reliability and validity in an academic setting. *Psychological Reports, 65,* 161-162.

Merrifield, P. R., Guilford, J. P., Christensen, P. R., & Frick, J. W. (1962). The role of intellectual factors in problem solving. *Psychological Monographs, 76,* 1-21.

Motowidlo, S. J., Dunnette, M. D., & Carter, G. W. (1990). An alternative selection procedure: The low-fidelity simulation. *Journal of Applied Psychology, 75,* 640-647.

Mumford, M. D. (2001). Something old, something new: Revisiting Guilford's conception of creative problem solving. *Creativity Research Journal, 13,* 267-276.

Mumford, M. D. (2002). Social innovation: Ten cases from Benjamin Franklin. *Creativity Research Journal, 14,* 253-266.

Mumford, M., Baughman, W., Maher, M., Costanza, D., & Supinski, E. (1997). Process-based measures of creative problem-solving skills: IV. Category combination. *Creativity Research Journal, 10,* 59-71.

Mumford, M. D., Baughman, W. A., & Sager, C. E. (2003). Picking the right material: Cognitive processing skills and their role in creative thought. In M.A. Runco (Ed.), *Critical Creative Processes* (pp. 19-68). Creskill, NJ: Hampton.

Mumford, M. D., Baughman, W. A., Supinski, E. P., & Maher, M. A. (1996). Process-based measures of creative problem-solving skills: II. Information encoding. *Creativity Research Journal, 9,* 77-88.

Mumford, M. D., Baughman, W. A., Threlfall, K. V., & Supinski, E. P. (1996). Process-based measures of creative problem-solving skills: I. problem construction. *Creativity Research Journal, 9,* 63-76.

Mumford, M., & Gustafson, S. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin*, *103,* 27-43.

Mumford, M. D., & Gustafson, S. B. (2007). Creative thought: Cognition and problem solving in a dynamic system. In M. A. Runco (Ed.), *Creativity Research Handbook: Vol. 2* (pp. 33-77). Cresskill, NJ: Hampton.

Mumford, M. D., & Hunter, S. T. (2005). Innovation in organizations: A multi-level perspective on creativity. In F. J. Yammarino & F. Dansereau (Eds.), *Research in multi-level issues: Volume IV*. Oxford, England: Elsevier.

Mumford, M. D., Mobley, M. I., Uhlman, C. E., Reiter-Palmon, R., & Doares, L. (1991). Process analytic models of creative capacities. *Creativity Research Journal, 14,* 91-122.

Mumford, M. D., & Moertl, P. (2003). Cases of social innovation: Lessons from two innovations in the 20th Century. *Creativity Research Journal, 15*, 261-266.

Mumford, M.D., Scott, G.M., Gaddis, B., & Strange, J.M. (2002). Leading creative people: Orchestrating expertise and relationships. *The Leadership Quarterly, 13,* 705-750.

Mumford, M. D., Stokes, G. S., & Owens, W. A. (1990). *Patterns of Life Adaptation: The Ecology of Human Individuality.* Hillsdale, New Jersey: Erlbaum.

Mumford, M. D., Supinski, E. P., Baughman, W. A., Costanza, D. P., & Threlfall, K. V. (1997). Process-based measures of creative problem-solving skills: I. Overall prediction. *Creativity Research Journal, 10,* 77-85.

Mumford, M. D., Supinski, E. P., Threlfall, K. V., & Baughman, W. A. (1996). Process-based measures of creative problem-solving skills: III. Category Selection. *Creativity Research Journal, 9,* 395-406.

Okuda, S. R., Runco, M. A., & Berger, D. E. (1991). Creativity and the finding and solving of real-world problems. *Journal of Psychoeducational Assessment, 9,* 145-153.

Osburn, H. K., & Mumford, M. D. (2006). Creativity and planning: Training interventions to develop creative problem solving skills. *Creative Research Journal, 18,* 173-190.

Parnes, S. J., & Noller, R. B. (1972). Applied creativity: The creative studies: Part results of a two year study. *Journal of Creative Behavior, 6,* 164-186.

Redmond, M. R., Mumford, M. D., & Teach, R. J. (1993). Putting creativity to work: Leader influences on subordinate creativity. *Organizational Behavior and Human Decision Processes, 55,* 120-151.

Reysen, S. (2005). Construction of a new scale: The Reysen likability scale. *Social Behavior and Personality, 33,* 201-208.

Rostan, S. M. (1994). Problem finding, problem solving, and cognitive controls: An empirical investigation of criticality acclaimed productivity. *Creativity Research Journal, 7,* 97-110.

Saucier, G. (2002). Orthogonal markers for orthogonal factors: The case of the Big 5. *Journal of Research in Personality, 36,* 1-31.

Schubert, D. S. (1973). Intelligence as necessary but not sufficient for creativity. *Journal of Genetic Psychology, 122,* 45-47.

Scott, G. M., Lertiz, L. E., & Mumford, M. D. (2004). The effectiveness of creativity training: A meta-analysis. *Creativity Research Journal, 16,* 361-388.

Scott, G. M., Lonergan, D. C., & Mumford, M. D. (2005). Conceptual combination: Alternative knowledge structures, alternative heuristics. *Creativity Research Journal, 17,* 79-98.

Silverman, M. P. (1985). Science as a human endeavor. *American Journal of Physics, 53,* 715-719.

Sternberg, R. J. (1988). A three facet model of creativity. In R. J. Sternberg (Ed.), *The Nature of Creativity* (pp. 125-148). Cambridge, England: Cambridge University Press.

Sternberg, R. J., & Dess, N. K. (2001). Creativity for the new millennium. *American Psychologist, 56,* 332.

Tushman, M. L., & O'Reilly, C. A. (1997). *Winning through innovation.* Cambridge, MA: Harvard Business School Press.

Vincent, P. H., Decker B. P., & Mumford, M. D. (2002). Divergent thinking, intelligence, and expertise: A test of alternative models. *Creativity Research Journal*, *14,* 163-178.

Ward, T. B., Patterson, M. T., & Sifonis, C. M. (2004). The role of specificity and abstraction in creative idea generation. *Creativity Research Journal, 16,* 1-10.

Ward, T. B., Smith, S. M., & Finke, R. A. (1999). Creative cognition. In R. J. Sternberg (Ed.), *Handbook of Creativity* (pp. 189-213). Cambridge, England: Cambridge University Press.

Weisberg, R.W. (2006). Expertise and reason in creative thinking: Evidence from case studies and the laboratory. In J.C. Kaufman & J. Baer (Eds.), *Creativity and Reason in Cognitive Development* (pp. 7-42). New York: Cambridge University Press.

Weisberg, R. W., & Hass, R. (2007). We are all partly right: Comment on Simonton. *Creativity Research Journal, 19,* 345-360.

Appendix A: Tables

Table 1

Effects of Training on Knowledge and Creative Performance

	Pre-Training		Post-Training				
	M	*SD*	*M*	*SD*	*t*	*df*	*p*
Intelligence High							
Knowledge Test	3.92	1.52	4.75	1.41	3.20	61	0.010
Creative Performance (Originality)	2.44	0.83	2.68	0.82	2.04	64	0.045
Intelligence Low							
Knowledge Test	3.42	1.38	3.85	1.71	2.10	62	0.040
Creative Performance (Originality)	2.39	0.71	2.57	0.60	1.91	67	0.060

Note: *t* = Paired; *df* = Degrees of Freedom; *p* = Significance Level;

Table 2

Effects of Training on Knowledge and Creative Performance

	Pre-Training		Post-Training				
	M	*SD*	*M*	*SD*	*t*	*df*	*p*
Divergent Thinking High							
Knowledge Test	3.61	1.41	4.56	1.58	4.28	59	0.010
Creative Performance (Originality)	2.46	0.80	2.70	0.68	2.30	64	0.025
Divergent Thinking Low							
Knowledge Test	3.73	1.52	4.05	1.64	1.37	64	0.175
Creative Performance (Originality)	2.37	0.75	2.54	0.74	1.66	67	0.100

Note: *t* = Paired; *df* = Degrees of Freedom; *p* = Significance Level;

Table 3

MANOVA Results for Creative Performance split on Intelligence

	Multivariate				Quality				Originality				Elegence			
	F	df	p	η^2	F	df	p	η^2	F	df	p	η^2	F	df	p	η^2
Intelligence High																
Main Effects																
Content	1.47	3, 55	.232	.074	0.39	1, 57	.537	.007	0.03	1, 57	.856	.001	0.04	1, 57	.849	.001
Format	2.47	3, 55	.071	.119	0.86	1, 57	.358	.015	0.33	1, 57	.568	.006	0.01	1, 57	.946	.001
Activity Type	1.00	3, 55	.399	.052	1.38	1, 57	.246	.024	0.38	1, 57	.542	.007	2.43	1, 57	.124	.041
Interactions																
Content by Format	**7.76**	**3, 55**	**.001**	**.297**	0.49	1, 57	.485	.009	0.27	1, 57	.608	.005	1.60	1, 57	.211	.027
Content by Activity Type	0.32	3, 55	.813	.017	0.34	1, 57	.565	.006	0.01	1, 57	.932	.001	0.20	1, 57	.655	.004
Format by Activity Type	1.75	3, 55	.168	.087	1.19	1, 57	.280	.020	**4.16**	**1, 57**	**.046**	**.068**	2.05	1, 57	.158	.035
Content by Format by Activity Type	0.51	3, 55	.681	.027	1.34	1, 57	.253	.023	0.31	1, 57	.578	.005	1.02	1, 57	.318	.018
Intelligence Low																
Main Effects																
Content	0.79	3, 58	.503	.039	1.20	1, 60	.277	.020	1.23	1, 60	.272	.020	0.01	1, 60	.944	.001
Format	0.39	3, 58	.760	.020	0.11	1, 60	.738	.002	0.40	1, 60	.529	.007	0.01	1, 60	.984	.001
Activity Type	1.22	3, 58	.310	.059	1.15	1, 60	.288	.019	3.78	1, 60	.057	.059	0.31	1, 60	.577	.005
Interactions																
Content by Format	0.46	3, 58	.713	.023	0.62	1, 60	.434	.010	0.01	1, 60	.939	.001	1.00	1, 60	.322	.016
Content by Activity Type	0.27	3, 58	.848	.014	0.16	1, 60	.695	.003	0.41	1, 60	.526	.007	0.55	1, 60	.461	.009
Format by Activity Type	0.90	3, 58	.449	.044	2.34	1, 60	.131	.038	0.20	1, 60	.658	.003	1.68	1, 60	.199	.027
Content by Format by Activity Type	0.24	3, 58	.868	.012	0.02	1, 60	.882	.001	0.16	1, 60	.695	.003	0.26	1, 60	.612	.004

Note : F = F Ratio; df = Degrees of Freedom; p = Significance Level; η^2 = Effect Size (eta squared); Multivariate F based on Roy's Largest Root.

Table 4

MANOVA Results for Creative Performance split on Divergent Thinking

	Multivariate				Quality				Originality				Elegence			
	F	df	p	η^2	F	df	p	η^2	F	df	p	η^2	F	df	p	η^2
Divergent Thinking High																
Main Effects																
Content	0.31	3, 55	.818	.017	0.40	1, 57	.530	.007	0.01	1, 57	.985	.001	0.61	1, 57	.438	.011
Format	0.51	3, 55	.674	.027	0.27	1, 57	.606	.005	1.50	1, 57	.225	.026	0.29	1, 57	.592	.005
Activity Type	1.40	3, 55	.254	.071	3.25	1, 57	.077	.054	3.75	1, 57	.058	.062	2.47	1, 57	.122	.041
Interactions																
Content by Format	2.10	3, 55	.111	.103	0.34	1, 57	.560	.006	1.00	1, 57	.321	.017	0.65	1, 57	.423	.011
Content by Activity Type	0.74	3, 55	.533	.039	1.32	1, 57	.256	.023	1.22	1, 57	.274	.021	0.24	1, 57	.630	.004
Format by Activity Type	2.16	3, 55	.103	.105	**4.71**	**1, 57**	**.034**	**.076**	**4.90**	**1, 57**	**.031**	**.079**	**5.59**	**1, 57**	**.021**	**.089**
Content by Format by Activity Type	0.67	3, 55	.574	.035	1.53	1, 57	.222	.026	0.68	1, 57	.412	.012	0.34	1, 57	.562	.006
Divergent Thinking Low																
Main Effects																
Content	0.24	3, 58	.871	.012	0.60	1,60	.443	.010	0.07	1,60	.790	.001	0.43	1,60	.512	.007
Format	0.73	3, 58	.538	.036	0.97	1,60	.330	.016	0.97	1,60	.328	.016	0.02	1,60	.877	.001
Activity Type	0.53	3, 58	.662	.027	1.14	1,60	.290	.019	1.53	1,60	.221	.025	0.97	1,60	.329	.016
Interactions																
Content by Format	1.69	3, 58	.177	.081	0.10	1,60	.749	.002	2.33	1,60	.132	.037	1.47	1,60	.230	.024
Content by Activity Type	0.17	3, 58	.916	.009	0.07	1,60	.792	.001	0.28	1,60	.598	.005	0.28	1,60	.598	.005
Format by Activity Type	0.24	3, 58	.870	.012	0.01	1,60	.922	.001	0.02	1,60	.887	.001	0.36	1,60	.550	.006
Content by Format by Activity Type	0.34	3, 58	.797	.017	0.58	1,60	.450	.010	0.01	1,60	.986	.001	0.39	1,60	.536	.006

Note : F = F Ratio; df = Degrees of Freedom; p = Significance Level; η^2 = Effect Size (eta squared); Multivariate F based on Roy's Largest Root.

Appendix B: Figures

Figure 1. Benchmark rating scale for quality.

Quality

Definition: The overall quality of the advertising/marketing campaign
Completeness: Did the participant understand the critical issues? Did he/she address all of the most relevant information at hand?
Coherence: Was the response coherent? Was it well thought out and logical?
Usefulness: Is the response actually feasible and appropriate for addressing the problem?

Rating Scale

1 – Poor quality. The solution is haphazard and fragmented and does not address any of the key issues; it does not provide key information in a logical manner.
IBC wants to target people at the age of 15-25 to buy their product because people in that age group drink more soda than older people and even if they don't they may buy it for their kids. IBC wants to sell more of its product because in recent years it has struggled to do so. It is hard to see Coke and other industries doing great and watching your own decline over the years.

2 – Poor to average quality. A few key issues may be addressed; however, a clear solution is still not presented; key parts of the solution are unclear.

3 – Average quality. The solution is presented in a logical form; a number of key issues may still be missing or vague, but overall the solution addresses some of the major issues of the problem and is presented clearly and coherently.
TV ads will be used to promote the new look, contest under cap and of course super bowl commercials. These should be played on stations that are frequented by the age target – MTV, ABC, ESPN, ABC Family. The prizes that can be won should be shown on the IBC website. The new label should be made and distributed immediately. All of the previous ideas should be set into motion.

4 – Average to excellent quality. Many of the key issues are addressed in the solution and solution is feasible; however, some information may seem unimportant to the solution or is not completely thought out.

5 – Excellent quality. The solution is presented so that it is exceptionally coherent and clear and addresses the key issues in a manner that is feasible.
1) Begin design of ads for Facebook/Myspace/YouTube, 2) Design what the IBC car will look like, 3) Position the ads to run immediately, 4) Begin tour across America to the major colleges, 5) On the tour, provide tests, t-shirt give-aways, have music playing, and 6) During spring break have the car tour the top 10 spring break locations. At the locations have all sorts of contests, give away prizes, and pass out IBC impact. This strategy will effectively gain awareness and popularity for IBC impact very quickly. It will reach a wide range of people ages 15-25. It will give a new modern look to IBC. By doing the ads and campus tour first, this will create awareness of our product. Then once some market penetration has occurred – having our television spots will reinforce and further the positive connection with IBC Impact.

Figure 2. Benchmark rating scale for originality.

Originality

Definition: The extent to which the advertising/marketing campaign is original and creative
Unexpected: Did the participant approach the problem in a novel, imaginative, unpredictable, or innovative manner?
Elaborative/Descriptive: Did the participant provide a rich answer—one that helps the reader to visualize the solution for addressing the problem?

Rating Scale

1 – Poor originality. The campaign is very predictable and is given in basic terms with no elaboration. The campaign only uses bare ideas and is commonplace and ordinary.
The idea of having young people advertise the drink shows that it is fun, great, and a new thing. This will eliminate the fact that some people think it's an elderly drink. The idea that it has a great taste will increase the odds of people buying the product to drink and not just for floats. The continuous advertisement will make people buy it because everyone wants to know what the fuss is all about.

2 – Poor to average originality. The campaign presents ideas in a slightly unique manner. The campaign mostly provides common ideas that do not reflect much elaboration or description.

3 – Average originality. The campaign contains something that makes it different from the typical campaign. The approach is original and contains some descriptive information. Descriptions and elaborations are present but not entirely complete.
I believe that if we make the bottle look like the old one but as if its peeling away then underneath the old is the new look of the energy drink it will catch peoples' attention as to we're bringing something new to them and not the same thing. The problem with keeping the old look is that people like to see change. They want new things to come out and not be stuck with the same old thing. This is the best way I could think of without getting rid of the old design.

4 – Average to excellent originality. The campaign contains something that makes it different from the typical campaign. The approach is original and contains adequate descriptive information. Descriptions and elaborations are present and clear.

5 – Excellent originality. The campaign is exceptionally unique. The participant includes characteristics or details that make the campaign unique. The campaign clearly reflects an unexpected understanding of the problem and goes beyond the norm and presents new ideas that are highly descriptive.
I have decided to implement the plan for the Grandpa Commercial because I feel that it is the commercial that is more versatile, interesting, and triggers a more broad audience ranging from young to old. For this commercial I need a team to pick and interview old men. Here are the criteria: 1) white male 2) white hair 3) medium height 4) can express dancing moves in a commercial way 5) can yell in a high voice. Interview the man and listen to his voice. Make sure it is clear and understandable; however I want an oldish voice. For the commercial the man is to wear neutral colors, striped collared shirt, gray or brown pants with suspenders. For the grandson ... (plan continues in this way for grandson and set of commercial). The two boys will be shown in the kitchen first, taking the drinks out of the fridge. Scene 2: shows grandpa getting out of chair into the kitchen. He wanders what all the noise (boys yelping in background). Grandpa reaches into fridge to grab IBC drink takes it back to his chair and says "Good old root beer" Secs. Later he's up jumping and dancing with funny music in the backgrounds. Kids join in.

Figure 3. Benchmark rating scale for elegance.

Elegance

Definition: The degree to which the advertising/marketing campaign is effective while maintaining simplicity.
Refinement: Is the campaign designed so that it uses the minimal number of elements to be effective?
Clever: Was the plan well-designed and cleverly put together?
Flow: Was the plan articulated in a way that is easy to follow? Does it flow seamlessly?

Rating Scale

1 – Poor elegance. The campaign is not clever or well-designed. There are a number of ideas gathered together without order. Campaign is very difficult to follow and/or far too complex.
Pros – addresses demographic particularly, winner would have created perfect mix, people may have to try it to design a t-shirt, gets main ideas across. Cons – non-creative people would not try it.

2 – Poor to average elegance. The campaign reflects some organization of ideas, but at times is difficult to follow due to lack of focus or excessive complexity.

3 – Average elegance. The campaign shows good organization of ideas and they mostly fit together and are orderly. There may be too many unnecessary details regarding some ideas while other critical things are neglected.
The beginning of this campaign must be the vintage feel. TV spots and radio must use the emotion of brand loyalty with evolution into IBC Impact. Commercials, billboards, and print ads should begin at the beginning of March in time for spring (to make floats for Easter, etc.). After Easter turn ads into high energy, more caffeine, better for kids and ad leads into summer. Mid July switch gears into IBC Impact floats with a secret (alcoholic beverage) and market the 21-25 demographic. The kids are targeted first and as the brand receives more recognition, introduce the product.

4 – Average to excellent elegance. The campaign is easy to read and follow. The campaign elements fit well together and are/or cleverly arranged. There may be some unnecessary ideas or missed points. Also, there may not be a good trade-off of effectiveness and complexity.

5 – Excellent elegance. The campaign is easy to read and follow. The ideas are cleverly arranged for maximum effectiveness, while maintaining simplicity. An adequate amount of detail is provided without being over the top. The campaign is well thought out and organized.
For a hot new product entering an already competitive market – advertising is not the way to place IBC Impact at the top of consumers choice. For product release and fast impact on sales and revenues – promote, promote, promote. Using the most popular mediums of radio and free entertainment for the 15-25 demographic you can find ways to place the product into the hands of consumers. Promote through radio live-on-location sets giving away anything from actual product, glistening in the original glass bottle to key chain bottle openers for the "old-fashion" bottle caps. In addition, work on a promotion contest with radio stations to get consumers involved. This can be done with a "what can you create with bottle caps" contest. Continuing with a risk free promotion campaign and collaboration again with radio stations and movie theatres hand out product to those who attend free "sneak previews" across the nation. This is a mutually beneficial promotion campaign for the consumer, the producer, and the intermediary.

Figure 4. Pre creative problem-solving task.

Company History

WIRED is a national wireless company, serving 6 million customers, in 26 states. With service revenues of $3.2 billion in 2007, WIRED maintains one of the industry's highest levels of customer satisfaction by emphasizing customer support, quality network coverage, and a comprehensive range of wireless products and services. The company is an active corporate citizen through charitable contributions, award-winning community relations programs, and associate volunteer activities.

Founded in 1996, WIRED and its nearly 8,100 associates are focused on total customer satisfaction, delivering excellent customer service, offering customers great products and services, and generating profitable growth for the company's investors.

In 2008, WIRED added 297,000 new customers to its network, and continues to grow and expand into new markets. Recently, WIRED expanded its market and is now providing service in Kansas, Missouri, Oklahoma, and Texas.

You are an Associate Director of Marketing and Promotions for WIRED. You lead a team of 12 people who have backgrounds in marketing, advertising, sales, and product promotion. You report to the Vice President of Marketing and Promotions, along with the Associate Directors Board which is made up of four other Associate Directors and is led by the Vice President.

Current Situation

As the company has just expanded to a new market in the Midwest, there is a need to develop a new campaign that specifically targets these areas and introduces WIRED as the newest and best wireless service company in the area. In addition, an introductory promotions campaign will need to be developed in order to provide customers with incentive to change wireless companies.

Your task is to develop a campaign proposal to submit to the board. This campaign should include both a marketing strategy (e.g., commercials, advertising, promotional events) and a plan for a new introductory service offer that will be available for new customers in the area. Use the space on the following page to develop your plan.

Figure 5. Post creative problem-solving task.

Company History

Founded in 1919 by the Griesedieck family, the Independent Breweries Company, also known as IBC Root Beer, located in St. Louis, Missouri was originally formed to create a substitute beverage during the era of Prohibition. Despite its success, Independent Breweries Company closed its doors after the end of Prohibition, but the trademark was purchased by the Kranzberg family who operated the Northwestern Bottling Company. In the late 1930s, it was then sold to the National Bottling Company where the popular soda received continued success for twenty years. After World War II, quality and great taste were not enough to keep IBC root beer competitive, resulting in decreased popularity and distribution.

In 1976, the trademark was sold to Taylor Beverages, which was then sold to the Seven-Up Company in 1980. After Dr Pepper and Seven Up merged, IBC grew increasingly popular and was eventually distributed throughout the entire United States. Ultimately, Dr Pepper/Seven Up, Inc. was acquired by Cadbury Schweppes of London, England.

Current Situation

The tradition of the original, old fashioned taste is still carried on in every bottle of IBC Root Beer. However, today's soda market is fiercely competitive and IBC has again been facing difficult times. It seems that one age group (15-25) is no longer attracted to IBC Root Beer, because it is seen as "Grandpa's favorite soda." In a recent market poll, 85% of respondents from this age group said they rarely buy root beer and usually only to make root beer floats, and 75% of these respondents said they are not particular about which brand of root beer they purchase when making floats. For these reasons, sales and profits have been steadily decreasing since the acquisition and the Vice President of Sales at Cadbury Schweppes, has contacted you for help. Currently you are working for IBC as the Director of Marketing. You have been with IBC for ten years, serving for two years as the director. The Vice President has asked that you develop a marketing campaign for a new product being distributed by IBC Root Beer.

This product is a new *highly* caffeinated form of root beer, called "**IBC IMPACT**", which was created with a younger demographic (15-25) in mind. The Vice President wants you to maintain the classic image of IBC products including the vintage glass bottle, while still targeting the 15-25 demographic. Additionally, the company does not expect **"IBC IMPACT"** to be more than a fading fad. Therefore, the desired result is that you capitalize on the highly caffeinated beverage market while it is still popular. Use the space on the following page to develop your plan.

Figure 6. Early Cycle knowledge test.

1) What is the first step in problem-solving?
A) Information Gathering
B) Concept Selection
C) Problem Construction
D) Concept Combination

2) In problem construction, what should you do after you have answered several questions regarding the situation?
A) Gather information
B) Ask more questions
C) Restate/reframe the problem
D) Seek advice

3) Which of the following is NOT an important point to remember when gathering information about a problem?
A) Pay attention to key relevant facts
B) Look for information that is particular only to that problem
C) Identify any discrepant information that might be helpful
D) Disregard the irrelevant facts

4) Why is information gathering an important step in problem-solving?
A) It allows you to think about other similar problems
B) It is important to think about the facts of the problem
C) It is important to know all the information both critical and noncritical
D) It allows you to look at the key critical information in the problem

5) When selecting concepts to work with during problem-solving it is important to focus on:
A) Specific action plans
B) Criticisms and evaluations
C) The underlying principles and long-term goals
D) All of the above

6) When selecting concepts to work with, it important to <u>postpone</u> two processes, *select these two processes:*
A) Setting specific action plans
B) Finding the underlying principles
C) Examining long-term goals
D) Prematurely evaluating and criticizing actions

7) Which of the following is <u>NOT</u> a step found in conceptual combination?
A) Identify unique features of the concepts you are working with
B) Map those features onto each other
C) Generate Ideas
D) Elaborate the features of the new concept

8) Conceptual combination is the basis for what?
A) Problem-solving
B) Generating solution ideas
C) Evaluating ideas
D) Constructing the problem

Figure 7. Late Cycle knowledge test.

1) What is the first step in problem-solving?
A) Planning
B) Idea Generation
C) Idea Evaluation
D) Monitoring

2) During idea generation, which of the following is NOT an important consideration?
A) Identifying a wide range of categories
B) Evaluating those categories
C) Generating multiple ideas for each category
D) Briefly running through the application of ideas generated

3) Which of the following is NOT an important step when evaluating an idea?
A) Forecast the outcomes of the idea, particularly negative outcomes
B) Think about errors that could happen
C) Develop back-up plans
D) Revise the idea extensively

4) Why is idea evaluation an important step in problem-solving?
A) It allows you to think about specific procedures or actions
B) It is important to think about positive outcomes
C) It allows you to identify the restrictions operating
D) It allows you to consider both the pro's and con's of each idea

5) When planning for idea implementation it is important to:
A) Pay attention to resources that are available
B) Think about errors operating in the situation
C) Consider restrictions operating in the situation
D) Both A and C

6) When planning for idea implementation, it important to execute two processes, *select these two processes:*
A) Think about the specific procedures you will use
B) Find the underlying principles
C) Examine the long-term goals of the plan
D) Develop back-up plans to deal with errors and crises

7) Which of the following is NOT a step found in solution monitoring?
A) Identify critical outcomes that need to be monitored
B) Look for restrictions that were outlined during planning
C) Follow the procedures outlined during planning
D) Explore emergent opportunities

8) Solution monitoring is important because:
A) Plans need to be implemented correctly
B) Things don't always go according to plan
C) Plans need to be reconfigured
D) Emergent opportunities are easy to spot

Figure 8. Principle-based training example (Early Cycle – Concept Combination).

Once you have selected the concepts, the next step is to combine them in a novel way. This combination provides the basis for generating ideas. For example, take the concepts in the last scenario – "The environment is important to some customers and the company must be profitable." These concepts can be combined in a unique way – "Make environmentally friendly products that are profitable." Once you have this new concept, you can begin generating ideas that are based on this concept (e.g., find a way to used recycled plastic etc.).

There are several important points to remember when combining concepts.

You want to **identify the unique features** of the concepts selected.
Then you **map the features** onto each other to create a link.
Use these shared features to **create a new category/concept**.
Elaborate on these by thinking of additional features they have in common.

Below is an example:

You are a children's book author. Your publisher has just asked you to develop a new series of books based on your past work. The publisher wants you to incorporate elements of your previous novels, but also wants a new twist to the story with new plots and action. Your previous works have typically focused around two concepts: An enchanted land and children coming of age.

IDENTIFY UNIQUE FEATURES:
In order to create a new series of books that combines these two concepts, you first identify the unique features. The enchanted forest has always had a variety of *mythical creatures* each with *unique powers*. It has also involved some sort of *villain character* that tries to destroy the peace of the enchanted forest and a *hero character* that save the innocent mythical creatures. In the stories of children coming of age, there has always been some *adventure* involved. This adventure typically leads to the child learning a *valuable moral lesson*. These stories also usually involve many *obstacles* that the child must overcome.

MAPPING FEATURES:
The good mythical creatures are similar to the children.
The villains are similar to the obstacles faced by the children.

CREATE NEW CONCEPT CATEGORIES:
Mythical creature coming of age story

ELABORATION OF FEATURES:
Mythical creature faces obstacles and challenges
Mythical creature conquers the challenges and learns lesson without a hero's help

Figure 9. Case-based training example (Late Cycle – Idea Evaluation).

After you generated several ideas for the solution to the problem, the next step is to critically evaluate those ideas. This allows you to consider both the pro's and con's of each idea. There are several aspects of the idea that need to be evaluated. For example, you want to consider how it will play out down the road. How effective will your solution be? What problems can you predict?

Below is a story demonstrating how this can be done.

Charlotte just volunteered to head up a fundraiser for a club that she is involved with. Her faculty sponsor, Dr. Daniels, has outlined some of the key goals that need to be accomplished by the fundraiser. First, they need to able to raise at least $500. Dr. Daniels insists that the fundraiser must be new to the club – he doesn't want to repeat past events. However, he also doesn't want anything too unusual or wacky. Additionally, he thinks the fundraiser needs to be family oriented. Charlotte, along with several other students, is in charge of organizing all the details for this fundraiser. In order to this, Charlotte and her group have come up with the idea of a ***BB-Q Western themed dinner with raffle drawings***. It is important that Charlotte evaluate this idea. She can do so by ***forecasting the outcomes*** of this idea including potential ***negative outcomes***. For example, the dinner will likely raise $500 in ticket sales. It will also be fun and enjoyable for both families and students. However, the raffle could make the event appear somewhat cheap. The raffle prizes have the potential to draw more people in, but only if they are desirable. Next, Charlotte will need to evaluate the idea against ***multiple standards***. For example, this is a good *quality* idea that has the potential to raise the needed money. However, it is not the most *original*, but the group has not ever done an event quite like this. The event will cost her group *financially*, but there is potential to make even more. Additionally, this idea has the potential to enhance the group's *reputation* on campus. To evaluate the idea further, Charlotte will need to consider ***errors*** associated with the idea. For example, problems could arise if the dinner is not prepared well. The chosen location could create a poor atmosphere for the theme of the event. The raffle prizes donated could be cheap and people would not want to buy tickets. Additionally, the Western theme could be poorly executed. Based on her evaluation Charlotte should ***revise*** the idea thoroughly. For example, the group needs to host a BB-Q Western themed dinner at a reputable BB-Q restaurant. This would help ensure that the atmosphere was appropriate and the theme well executed. The group also needs to ensure that the raffle prizes are desirable. This will help motivate people to purchase tickets.

Once Charlotte evaluates the idea thoroughly and prepares a revised idea, she is now ready to plan for its implementation.

Figure 10. Generative exercise example (Late Cycle – Solution Monitoring).

Read the following scenario. Given the problem and solution provided, **identify several** critical outcomes desired in the scenario. Also, address how you would monitor these outcomes, look for other restrictions, and how you would explore emergent opportunities.

You work for a marketing firm – specifically you are in charge of several promotional campaigns. Your supervisor has asked you to help develop a campaign for one of the company's newer clients. The client is the Susan G. Komen Foundation which is dedicated to the fight against breast cancer. They are having their national "RACE FOR THE CURE" in Oklahoma City. The campaign is to gather participants from a diverse set of people (young—old, rich—poor, etc.), as well as to increase attendance, donations, support, and sponsorship. The foundation has a slogan for this year's race: THINK PINK!

You decide to incorporate the concepts of diversity and pink into your ad campaign. Specifically, you decide to use a variety of shades of pink all throughout the campaign. In particular, you want to create a "shades of pink" rainbow as the symbol for this year's race. The different shades of pink represent the diversity of the organization. You develop a proposal to present this to the foundation. Each advertisement is well laid out in detail. The proposal is approved and implementation has begun.

IDENTIFY CRITICAL OUTCOMES:

HOW WOULD YOU MONITOR THESE OUTCOMES?

WHAT RESTRICTIONS WOULD YOU LOOK FOR?

DISCUSS ANY EMERGENT OPPORTUNITIES:

Figure 11. Evaluative exercise example (Early Cycle – Problem Construction).

Read the following scenario. Below it you fill find questions that could be asked about that situation to help you reframe the problem in a different way. **Select a question** from each group that you think will be the most informative and helpful.

You have been assigned to work on a team project for a class that is worth 25% of your class grade. A member of your team has skipped meetings, not shown any progress on his part of the project, and you have had trouble getting in touch with him. The project is due in two weeks.

INFORMATION: "How can I. . . "
Find out what might really motivate this person to work?
Get the advice of the teacher?
Know if the teacher told him to do this to "test" us?
Know what the professor will do if the project isn't done?

ALTERNATE GOALS: "How can I. . . "
Learn the "early warning" signs of someone who won't pull their weight?
Bring up my grade in other ways?
Get extra credit for doing the project without enough people?
Avoid classes that have team projects?

ALTERNATE APPROACHES: "How can I. . . "
Maximize the project, on time, while short staffed?
Best redistribute the work if he will not be able to do it?
Trade "problem" team members with another group?
Get rid of the team member?

RESTRICTIONS: "How can I . . . "
Handle this so that everyone wins, even the errant member?
Handle this without too much disruption for the group"
Handle this without letting him feel the agony of personal rejection?
Handle this without involving the teacher?

Below is a restatement of the problem using the one of the questions from each of the above categories. Please evaluate this restatement of the problem. Does it provide a good, alternative representation of the problem?
There is a class project due in two weeks. One of your team members is not pulling their weight, probably because he is unmotivated to complete the assignment. You would like to get a good grade on the assignment, but on option would be to just take the grade and try to make up extra credit in other ways. But it would also be good to get as much work done on it as possible, even without that team member. Maybe if the you and the other team members split the work up, you can make it happen. That way everyone wins, and your team doesn't have to involve the teacher.

Rate the overall quality of this restatement from 1 to 10   _____
Rate the over helpfulness of this restatement from 1 to 10 _____