



2004

Classroom Structure as an Environmental Effect on Creative Production of College Students

Krista A. Coulter '04
Illinois Wesleyan University

Follow this and additional works at: https://digitalcommons.iwu.edu/psych_honproj



Part of the [Psychology Commons](#)

Recommended Citation

Coulter '04, Krista A., "Classroom Structure as an Environmental Effect on Creative Production of College Students" (2004). *Honors Projects*. 26.
https://digitalcommons.iwu.edu/psych_honproj/26

This Article is protected by copyright and/or related rights. It has been brought to you by Digital Commons @ IWU with permission from the rights-holder(s). You are free to use this material in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/ or on the work itself. This material has been accepted for inclusion by faculty at Illinois Wesleyan University. For more information, please contact digitalcommons@iwu.edu.

©Copyright is owned by the author of this document.

Running head: ENVIRONMENTAL EFFECT ON CREATIVE PRODUCTION

Classroom Structure as an Environmental Effect on
Creative Production of College Students

Krista A. Coulter

Department of Psychology
\
Illinois Wesleyan University

Author Note

I would like to thank my advisor Dr. Gail Walton for her guidance and encouragement throughout the year and my family and friends for their unending support. I would also like to thank the following people for their assistance in the production of this research project: Committee Members Dr. Linda Kunce, Dr. Doran French, and Professor Blair Martin; Research Assistants Samantha Austin, Jaqueline Hockensmith, Erica Harlow, Elizabeth Holman, Megan McGrady, Becky Skupien, and Jennifer Thompson; Dr. David Hibbard and Amy Atwood for statistical guidance, and Dr. Robert J. Sternberg, Dr. Todd I. Lubart, and Dr. Theresa Amabile for allowing me to make use of their instruments and methodology.

Abstract

Little research has been done to explore creativity in the classroom environment. The present study investigated the effects of three classroom settings (formal, intermediate, and informal) on the creative production of college students. Ninety students were tested using Sternberg and Lubart's (1995) Creativity Assessments both before and after participation in a teaching session. No significant changes were found between classes mean creativity scores after the experimental session. In the intermediate classroom, there was a significant decrease in scores before and after the session; however, in the other two classrooms, formal and informal, there was no significant change found.

\

Classroom Structure as an Environmental Effect on
Creative Production of College Students

"Classes will dull your mind. Destroy the potential for authentic creativity,"

-John Nash, A Beautiful Mind

In today's society, people, on average, spend the first two decades of their lives immersed in the educational system. Despite exposure to discovery learning, however, students are subjected to the conformity of the traditional classroom setting for the next sixteen years of school.

There is little study of the effect of classroom styles on creativity. A few studies suggest that instructional style affects the degree to which students express creativity. It is suggested that the creative spirit is suppressed through the competitiveness, strict structure, expository teaching, and emphasis on extrinsic factors that the traditional educational environment promotes (Spinks, Yi-Ku, Shek, & Bacon-Shone, 1996).

Sternberg and Lubart (1995) found that students often become less able to produce creative work as they progress through school. They suggest that younger children are still able to tap into their creative resources and have not yet been fully affected by the conformity of the educational system. Using Sternberg and Lubart's (1991) *investment theory of creativity*, the present study will investigate the effects of the educational environment on creative production.

In general, there has been limited research on creativity in the field of psychology. In his APA Presidential Address in 1950, J. P. Guilford stated that creativity articles accounted for less than 0.2% of all Psychological Abstracts, and by 1994, the figure had only increased to 0.5%. As the interest in studying creativity grew, two journals devoted to creativity began publication. They are the *Journal of Creative Behavior* and *The Creativity Research Journal* (Sternberg & Lubart, 1999).

Creativity is a difficult concept to study, resulting from the ambiguity of defining the construct. There are questions as to whether individual creativity is a trait (Csikszentimihalyi, 1999) or a state (Thomas & Berk, 1981). In defining creativity as a trait, researchers look at overall creativity as opposed defining creativity as a state that is situationally determined. Some research has studied creativity by defining it as a trait whereas other research has come to investigate whether or not it can be a state. Sternberg (2002) suggests that creativity is best defined as neither a trait or a state, but a decision. He believes, foremost, that individuals must decide to be creative in order to produce creative products. This decision may result from personality, emotional, or motivational factors.

There are a myriad of definitions that have been used to define creativity with considerable disagreement on the operational definition of creativity (Amabile, 1982, 1983; Bal, 1988; Sternberg & Lubart, 1991). Creativity was initially defined as the ability to produce work that is both novel and appropriate (i.e., useful or meets task constraints) by some

researchers (Lubart, 1994; Ochse, 1990; Sternberg & Lubart, 1991, 1995). After continuing research, the definition came to include social acceptance of the product, and this has since been used by many researchers (Amabile, 1983; Cheung, Rudowicz, Yue, & Kwan, 2003; Csikszentmihalyi, 1999; Sternberg, 2001; Sternberg, 1996).

In order to be constituted as creative, an idea must be original and new, thus novel. Also, creativity cannot be defined only as a mental process because creative ideas necessitate the interaction between producer and audience. Amabile (1983) stated that in order for creativity to be empirically studied, researchers must have a product to evaluate. According to Csikszentmihalyi (1999), creative products cannot be creative unless they are judged to be so by an audience, whether it is peers or experts. In an educational setting, assignments and projects are judged by an audience, which may be peers or teachers. Therefore, an individual's creative product can only be judged as creative through the subjectivity of this audience.

In the present study, creativity will be classified as a decision, thus necessitating the need for evaluating what classroom settings assist in encouraging students to make the decision to be creative. Creativity will also be defined as the ability to produce novel ideas that are judged to be creative by an audience of peers. Creative ability will be measured through the use of seven peer raters judging four tasks on six criteria set forth by Sternberg and Lubart (1995).

Major Approaches to Creativity

There have been seven major approaches that have attempted to explain creative production (Sternberg, 1999). These are the mystical, psychoanalytic, pragmatic, psychometric, social-personality, cognitive, and confluence approaches. The earliest accounts of creativity relate the concept to mysticism. In theory, people were filled with inspiration, then their Muse or Daemon guided them to make creations. This, however, was not a scientifically testable approach and could not further the research into the concept of creativity.

A more sophisticated look at creativity was found in the pragmatic approach, which dealt with developing creativity and understanding it. Edward De Bono (1992) proposed that creativity was more about practice than construct, focusing more on the cognitive processes involved in creative production rather than the creative product itself. He tried to help individuals provoke ideas about creativity, instead of judging them. However, these approaches had no ground in psychology because no empirical evidence could be analyzed to provide a basis for their validity.

Psychoanalytic theories include both unconscious wishes, through which creativity is expressed, (Freud, 1964, as cited in Sternberg, 1996) and the concepts of adaptive regression and elaboration (Kris, 1952). Adaptive regression includes the primary process where ideas are formulated in the unconscious. Elaboration consists of the ego-controlled thinking that expresses the ideas into creative productions. Again, this approach was not

testable and has not been favorably reviewed in the current scientific literature.

Guilford (1950) argued that a new approach, the psychometric approach, allowed for a convenient testing of creativity using a paper and pencil method. The idea that divergent thinking was a good predictor of creative talent made this approach seem promising. Torrance (1964) furthered the study of psychometric creativity by developing the Torrance Test of Creative Thinking, a test that focused on divergent thinking and problem-solving skills. Others in the field, Bal (1988) and Sternberg and Lubart (1991), however, believed that these methods failed to encompass the concept of creativity because they could not evaluate expert levels of creativity.

Two of the most recent accepted theories are the social-personality and cognitive approaches. Personality traits, motivational aspects, and a sociocultural environment are the basics of the social-personality approach to creativity. Certain traits (e.g. boldness, courage, spontaneity, self-acceptance, as well as intrinsic motivation and a need for order and achievement) have been identified as encouraging an individual's creative process. The cognitive approach relates creativity to mental representation and cognitive processes. Finke and colleagues (as cited in Lubart and Sternberg, 1995) proposed the Geneplore model, which consists of two phases: the generative and exploratory phases. The generative phase involves the individual constructing mental representations with properties

that promote creativity. Then, in the exploratory phase, these properties are used to create. Although these last two approaches provide valuable insights into the study of creativity, they seem to look at two different aspects of creativity. Similar to DeBono (1992), the generative phase can be viewed as similar to the model in which cognitive processes precede actual creative production and the exploratory phase as the process of constructing the product. Perhaps a combination of the social-personality and cognitive approaches may lead to a more complete construct of creativity by looking at multiple aspects (i.e. personality, thinking styles, etc). These approaches are incorporated in the confluence approach, to be described shortly, which is the basis for the present study (Sternberg, 1996).

The first four approaches discussed have similar methodological flaws, and so were not considered as a base for the present study. Some approaches were scientifically untestable (mystical and psychoanalytic approaches) or lacked empirical support (pragmatic approach). The only theory that was testable, the psychometric approach, has not been accepted by many researchers due to methodological problems. The use of the *Torrance Test of Creative Thinking* used a Likert format, which was thought to limit creative expression. The last two approaches discussed, the social-personality approach and the cognitive approach, show promise for explaining certain aspects of the concept of creativity. However, the

confluence approach is the most thorough in incorporating all aspects of creativity.

Confluence Approach & Investment Theory

Confluence approaches emphasize that multiple aspects combine to influence creative production but vary in terms of which aspects are most important. The following systems theories approach creativity as a problem solving process (Amabile, 1983), a developmental process (Gruber, 1988), or as a contextual process (Csikszentmihalyi, 1996). These perspectives of the confluence approach that have been identified in research to encompass the creative process; however, none fully define and incorporate all aspects of creativity. Amabile (1983) theorized that the framework for creativity included domain-relevant skills, creativity-relevant skills, and task motivation. Gruber (1988, as cited in Sternberg & Lubart, 1996) argued that an individual's purpose, knowledge, and affect to guide the creative process. Domain, field, and the individual factor into Csikszentmihalyi's (1996) main resources for explaining the confluence theory. In a more complete theory, Sternberg and Lubart's (1991) *investment theory of creativity*, multiple components must converge for creativity to occur.

Sternberg and Lubart (1991) proposed the investment theory of creativity, also referred to as the "buy low, sell high" concept. In this model, an individual initially pursues unknown or unpopular ideas, builds them even in spite of criticism, emerges with a creative project, and then repeats the process. A common analogy to this idea is that of an investor in the

stock market. A person investing in the stock market may take a chance on some small, unknown company. Then, when the company grows and becomes an extremely profitable organization, the investor will sell with a considerable profit. The investor might then begin investing in another little known company, starting the process over once again.

Sternberg and Lubart define six resources that are integrated to achieve a creative production. These resources are intellectual ability, knowledge of field, legislative thinking, certain personality traits, intrinsic motivation, and a supportive and rewarding environment. First, intellectual ability consists of three aspects: the ability to see problems in new ways, the ability to recognize which ideas are worth pursuing and which are not, and the ability to persuade others that one's ideas are creative. Second, in order for one to be creative, there must exist a basic knowledge of the field in which work is being done. This means that one must know what is already known and what needs to be known in the field in order to make any further and useful advancements. Third, creative individuals must also have a legislative style of thinking, in which they can see ideas both locally and globally, think along new lines, and be able to decide what is a good idea and what is not. Fourth, certain personality traits such as self-efficacy, willingness to grow, risk, and overcome obstacles, ability to tolerate ambiguity, perseverance, and courage about convictions are essential for the creative process to occur. Fifth, intrinsic motivation is defined by an individual who engages in an activity for its own sake and focuses on the

challenge and enjoyment of the work, instead of engaging in the task because of factors such as promise of rewards and punishments, dictates from superiors, and competition (Deci & Ryan, 1985, as cited in Moneta & Siu, 2002). High levels of intrinsic motivation have been shown to increase creative potential (Collins & Amabile, 1999) and therefore are necessary in order to produce creative products. Finally, creativity cannot occur without a supportive and rewarding environment. A supportive environment completes the creative process by accepting and recognizing products as creative. Only with support from peers and rewards for creative production (e.g. recognition, compliments), will an individual's creativity continue to flourish.

Environmental Factors of Creativity

Sternberg (1996) have studied the first five resources (intellectual ability, knowledge of field, legislative thinking, personality traits, and intrinsic motivation) and concluded that when the resources are combined, creative performance can be significantly predicted, and account for unique portions of variance. As for the sixth element, the environment, they concluded that students who tested high in creativity and who were placed in an instructional condition that encouraged creativity performed better in the course than those that were identified as creative but not placed in such a condition. However, this study assessed performance in the class, not level of creativity. They did not assess any changes in creativity levels across different classroom styles.

The environments in which individuals are placed can greatly affect their levels of creativity (Mumford, 1988; Sternberg & Lubart, 1996; Sternberg & O'Hara, 1999; Sternberg, Ferrari, Clinkenbeard, & Grigorenko, 1996). Csikszentmihalyi (1996, 1999) suggest that environments that offer scope, promise rewards and autonomy, and are ideologically open are more likely to foster creativity.

Sternberg and Lubart (1991) propose three reasons why environment is essential to creative performance. First of all, the environment can spark ideas, especially if other individuals in the environment are creative. Ideas can be bounced off each other and thus, foster creativity. Second, environments that allow for a confluence of ideas from many domains, are more likely to yield creative products more so than those given a restricted domain, thus creative ideas can either be fostered or suppressed depending on the surrounding environment. Lastly, the environment evaluates creative ideas and whether they are ultimately accepted within the social context or not.

Educational System as an Environmental Factor

Other environments may impact creativity as well. It is speculated that the development of creativity is greatly impacted by aspects of the education system such as the amount of structure in assignments, teaching style, motivation, amount of transfer of subject information, and socialization processes (Sternberg & Lubart, 1991). Schools tend to separate subjects, not allowing for overlap of the disciplines in order to bring in new

perspectives. Also, the school setting in general may negatively affect the personality traits associated with creativity, such as discouraging risk-taking.

A common environment for students is the classroom; however, not every classroom may encourage creative production. Unfortunately, many education systems are highly competitive, examination oriented, characterized by large classes, expository teaching, and excessive amounts of homework, which result in the suppression of creativity (Spinks et al., 1996). Some schools socialize students to be conforming and to avoid risk-taking. Students don't have time to generate and restructure their ideas because the high structure and short time span of assignments result in a quick resolution of ambiguity. Amabile (1979) suggests that some control in the classroom is necessary; however, care must be taken so as not to quell student's interest or restrict their creative flow.

Classroom settings that have been hypothesized to facilitate creativity are conducted informally, welcome unorthodox views, allow students to choose topics to investigate, express enthusiasm for what they are doing, and interact more with students outside of class (Chambers, 1973, as cited in Sternberg & Lubart, 1991). Individuals in this less structured environment, to be described more thoroughly shortly, have been found to express more creativity (Thomas & Berk, 1981).

Students are not freely given the opportunity to express their own ideas or bring new views to existing ideas as a result of structured classroom styles. Researchers who study creative expression in the classroom posit that many schools fail to operate as environments that encourage the development and expression of creativity in individuals (Cheung et al., 2003; Collins & Amabile, 1999; Moneta & Siu, 2002; Sternberg & Lubart, 1991; Treffinger et al., 1968). In schools, tests and papers are often structured; and students that do not adhere to the structure may not receive recognition for expressing creativity, but rather receive correction and possibly criticism. According to the executive style of teaching, students are rewarded for doing what they are told and doing it well, which contrasts with the legislative style that nurtures creativity (Sternberg & Lubart, 1995). Another element is motivation. In schools, a goal-oriented (extrinsic) motivation towards grades, class rank, and prizes are valued more so than the actual content of the work and student's desire to learn (intrinsic motivation).

Three types of settings have been hypothesized to either foster or inhibit the creative process: formal, intermediate, and informal (Thomas & Berk, 1981). Formal settings can be described as the “traditional” educational setting, consisting of lectures and structured assignments. Informal settings are more discussion based, allowing for interaction among students. Intermediate settings are a combination of the informal and formal settings.

Table 1

Dimensions of Classroom Styles as Described by Thomas & Berk (1981)

	Extremely Informal	Intermediate	Extremely Formal
<i>Fact acquisition</i>	No formal presentation of factual material	Both rote practical and experimental approaches are used	Fact acquisition is rote exercise and restricted to formal presentation by the teacher
<i>Peer relationships</i>	Peer relationships are haphazard and valued for their own sake, above circular goals	Peer relationships are integrated with and dependent on academic goals	Academic goals take precedence over and are not integrated with peer relationships
<i>Range of group behavior exhibited</i>	Size and composition of groups haphazard and unplanned	Size and composition of groups both teacher planned and spontaneous	Size and composition of groups highly limited and determined by the teacher

As discussed previously, Sternberg and Lubart's (1991) three explanations of the relationship between environment and creativity can be applied to these three formats. Formal settings would inhibit creativity for the following reasons; 1) there is no interaction between peers and the norm is held as standard, 2) creative ideas are rejected because they are not the norm, and 3) creative ideas are subjectively evaluated in a negative light and therefore, not allowed to develop. Informal settings, however, would foster some creativity because 1) individuals can interact with one another, 2) all ideas are accepted regardless of norms, and 3) every idea is evaluated positively and nothing is seen as "wrong". Creativity may also be hindered by the lack of knowledge that is needed in order to establish a basis for creativity, as in a domain. Intermediate formats combine the two and would be expected to foster creativity at the maximal level. Ogilvie (1974) found

that there was a curvilinear relationship between the degree of school formality and children's creativity, with schools midway between the extremes offering the most favorable environments for the development of creative ability. This follows from Ogilvie's reasoning that highly informal environments do not provide for non-conformity whereas highly informal environments offer insufficient information reservoirs for creative production.

Thomas and Berk (1981) also studied the three settings, previously discussed, with first and second grade children and found that creativity depended on the type of schooling and the sex of the child. Similar to the present study, the children were tested both before and after the experimental session. The sessions lasted for 26-28 weeks and the effects were assessed using the *Torrance Test of Creative Thinking with Pictures-Forms A & B*. Overall, both intermediate and informal classroom styles resulted in higher creativity, with intermediate styles fostering the most creativity.

Creativity research on classroom structure has not been expanded beyond elementary and secondary educational settings. Students in college are typically placed into settings in which one may believe fosters support from professors and reward through academic achievement. Although professors are generally supportive and rewarding, the position they hold in their field may have an impact on student's creativity. Sternberg and Lubart (1991) assert that individuals who are experts in a domain might be

restricted by their years of experience because of the constraints of the domain. Their knowledge may actually hinder their creativity because they become entrenched in a mental set where novel ideas are not supported. Therefore, "creativity in a well-developed area is likely to require some prerequisite knowledge of what is going on in that area, but also the ability to free oneself of the confines of that knowledge" (Sternberg & Lubart, 1991, p. 9).

College students may actually express more creativity than experts in a field because they have some prerequisite knowledge, but can still "see outside the box". However, because of the assignment restrictions, the student's creativity may be hindered if the educational system views their work as "nonconforming" instead of creative. For example, when a student is given a structured assignment with specific guidelines to follow, creativity can be suppressed through the lack of opportunity to express one's own perspective. Therefore, if students try to be creative, and are corrected or criticized for their work, it will most likely result in fewer attempts to express creativity. College students placed in an intermediate setting would show the most creativity because they have some background knowledge, but also are supported for their creative expression.

The Present Study

The current study will examine the environmental aspect of the investment theory of creativity, which is classified under the confluence approach. An advantage to the investment theory is that by using the six

different resources, many of the diverse aspects of creativity can be considered. There are also three advantages of using the confluence approach to explain creativity (Sternberg & Lubart, 1996). First, this multiple factor approach offers more explanatory power because there is no omission of a dimension, as in single factor approaches. Rather than considering only individual factors (such as personality or cognitive), investment theory encompasses six resources. Second, this theory suggests one way of viewing creativity as an ordinary rather than extraordinary process. Lastly, it relates to a number of different areas of psychology (e.g. cognitive, social, and developmental) because it integrates the different approaches to the study of creativity. As stated previously, the investment theory of creativity would predict formal classrooms to inhibit creativity, informal classrooms to foster some creativity, and intermediate classrooms to be the ideal for fostering the most creativity.

The focus of this study is on the impact the educational environment has on creativity in college students. Specifically, this study researches the effects of three different teaching environments on college student's creative production. The formal, intermediate, and informal settings will be implemented and open-ended, non-structured questions will be used. By using abstract concepts, participants will be allowed to express their creativity. Through allowing the use of multiple product domains for the expression of creativity, a more comprehensive score for creativity will be assessed (Amabile, 1983; Sternberg & Lubart, 1995). Similar to Amabile

(1979), this study will examine differences between groups of subjects exposed to different environmental manipulation. Thus, it is desirable to use a method of assessing creativity that will minimize individual differences in performance, and consequently, a simple, subjective method of assessing creativity was used.

Studying the college student population provides multiple benefits because there is limited research on the environmental effects on creativity. In general, the college-aged population has only been recently investigated. Teachers and students alike would benefit from the knowledge of classroom formats and their effects on creativity. Especially at the college level, students are in a position where they have a considerable amount of knowledge and can begin to formulate their own ideas. For teachers, knowing what formats work best for fostering creativity can help them to bring out the creative potential in their students. Teachers agree there is a need to see examples of how research and theory could actually be implemented in the classroom (Treffinger, Ripple, & Dacey, 1968). It is hypothesized that creativity will decrease in students after inclusion in a formal setting, will increase in students after inclusion in an informal setting, and will increase the most after inclusion in an intermediate setting. This study has set out to apply three environments (formal, intermediate, and informal) in a university setting in order to expand the increasing research on creativity and enhance the educational system to further promote creativity.

Methods

Participants

The present study involved 91 subjects enrolled in general psychology classes at Illinois Wesleyan University who participated on a volunteer basis. A total of 89 participants were included in the analysis after the exclusion of two due to incomplete data sets. The participants included 42 males and 49 females, all of college-age (18-22 years old; 67% freshman, 26% sophomore, 3% junior, and 3% senior), of varying ethnic backgrounds.

Materials

Subjects were tested on creative ability using the Sternberg and Lubart's (1991) creativity assessments. These were retitled "thought process assessments" to control for expectancy effects. Four domains (writing, art, advertising, and science) were tested, testing one question from each domain once before the experimental session and once after. The writing session included composing a short story with the given titles of "Beyond the Edge" and "The Octopus's Sneakers". In the art domain, subjects were asked to draw a picture of what they believed "Hope" and "Earth from an Insect's Point of View" to represent. Subjects were asked to produce a TV commercial for "Bow Ties" and "The IRS (depicting a positive image)". Finally, in the science domain, subjects were asked to try to answer the questions "How can we find out if extraterrestrial aliens are living among us?" and "How might we determine if someone has been on the moon in the past month?"

Procedure

Subjects were divided by year in school and gender, then randomly assigned to one of three classroom settings and given informed consent forms to sign. Then students were given either Form A or Form B of the pretest measure of the Sternberg and Lubart (1991) creativity assessment. The problem sets were counterbalanced, so that half of the participants completed the assessments in A-B order, and half completed the assessments in B-A order. The assessments were administered in this counterbalanced manner in a group testing session both before and after the instructional session. They then took part in a 30-minute teaching session, implementing one of three teaching styles. The general topic of "games" was used for all classrooms. This topic allowed for a basic level of knowledge for all participants, while controlling for the possibility of any increased domain relevant knowledge they may have obtained from their major field of study. Past research has defined creativity as domain-specific (Csikszentmihalyi, 1999; Sternberg & Lubart, 1991, 1995); therefore, this study controlled for any domain-specific knowledge among participants in order to experiment exclusively the differences attributed to classroom settings. Classroom settings, the independent variable, were classified as follows, adhering to Thomas and Berk's (1981) classroom style dimensions:

Classroom A: Formal (Lecture). Subjects were informed that at the end of the session, they would be asked to recall what they have learned to encourage them to pay attention to the lecture. They were then given, in

lecture form using a power point presentation, a history of games including card games, board games, video games, the lottery, and casino games. They were then introduced to the card game "Replay Whist" and instructed on the rules and regulations of the game. A handout was given on the rules and method of playing the game. At the end of the session, the subjects wrote a summary of what they learned in the lecture.

Classroom B: Intermediate (Lecture & Discussion). Subjects were informed that at the end of the session, they would be asked to recall what they have learned. They were also given the history of games in lecture form. Then, they were then broken up into groups of five after being numbered off by five's. They were instructed to create an original board game for 2-4 players, ages five and older, that could be played in teams. They were also told this game should be one that could be mass-produced. They were allowed to discuss and create a game as a group. After they finished, were asked to write up a description of their game and a summary of what they learned in the lecture.

Classroom C: Informal (Discussion). Subjects were asked to brainstorm a list of games. After breaking into groups of 4-5 of their own choosing, they were then asked to create an original game, without restrictions on type of game, number of players, etc. At the end of the session, they were asked to write up their description of the game.

Once the teaching sessions were completed, students completed the alternate form of the Sternberg and Lubart (1995) creativity assessment.

The responses to the assessments were rated on the following criteria: novelty, appropriateness of topic choice, integration of diverse elements, technical goodness, aesthetic value, and effort- to determine overall creativity, the dependent variable (Sternberg & Lubart, 1991). Since creative products must be judged by peers to be creative in order to be considered creative, these criteria were rated by research assistants on a 5-point Likert-scale, using subjective definitions. Using Amabile's (1979) *Consensual Assessment Technique*, definitions of the six criteria are given in Table 2. The ratings on each of the six criteria were then combined to equal a final creative score, discussed shortly.

Table 2

Dimensions of Judgment for Raters (Amabile, 1996)

<u>Criteria</u>	<u>Descriptive Definition Given Raters</u>
Novelty	The degree to which the product itself shows a novel idea.
Appropriateness of topic choice	The degree to which the topic choice is appropriate in regards to the topic.
Integration of diverse elements	The degree to which diverse elements are integrated into the product
Technical goodness	The degree to which the work is good technically.
Overall aesthetic appeal	In general, the degree to which the design is aesthetically appealing.
Effort	The amount of effort that is evident in the product.

The pre- and post-test creativity scores in the three classrooms were determined using the following method. First, the seven raters' scores were averaged for each of the six criteria within each domain. Second, the averaged scores for the six criteria were collapsed across domains, resulting in six scores (one for each criteria) for each classroom. Third, these six scores were added for an overall creativity score, thus resulting in three scores (one for each classroom) for pre-tests and three for post-tests. Pre-testing established the subject's baseline creativity level and assessed if there were any preexisting differences. Any overall change in creativity scores shown in the post-tests could then be attributed to the independent variable.

Results

Preliminary analyses.

An independent groups research design is used in this study. One of the rater's data set was incomplete due to time constraints so it was discarded.

One-way ANOVA. An ANOVA was run on the pre-test creativity scores of the three classrooms to assure no significant differences between classes prior to the experimental session. This would assure any changes in creativity scores on post-test analysis would be due to the experimental session. Results indicated no significant differences $F(2,87)=.346, p=.709$.

Reliability. The seven rater's scores correlated highly with the overall creativity scores in both pretest and posttest scores (see Table 3).

Correlations ranged between .732 and .894 on pretest scores and between .713 and .781 on posttest scores.

Classroom Analyses

The hypothesis that the formal classroom would show a decrease, the informal classroom a slight increase, and the intermediate classroom the greatest amount of increase in creativity scores, was not supported. Results indicated no significance between classes on mean post-test scores, $F(2,87)=2.592, p=.081$. However, the differences between classes after the experimental session approached significance. Further analysis with Tukey post-hoc tests revealed that the difference in post-test means is mainly due to the difference in amount of decrease between the formal ($M= 17.9, SD= 2.2$) and intermediate classrooms ($M= 16.7, SD = 2.2; p=.066$).

A paired-samples t-test was conducted for each classroom to determine which constructs contributed to the change in scores (see Table 4). Formal classroom data using paired-samples t-tests indicated the criteria of integration of diverse elements was not significant, but approaching significance, $t(28)= 2.011, p=.054$, showing a decrease in scores. No significant differences were found in the five remaining criteria (novelty, appropriateness of topic choice, technical goodness, overall aesthetic value, and effort) or in the overall creativity score.

In analyzing the intermediate classroom, the overall change in creativity scores were found to be significant $t(30)=2.608, p<.05$. The criterion integration of diverse elements and effort were also found to be

significant, $t(30)=6.38$, $p<.001$ and $t(30)=3.92$, $p<.001$, respectively. All changes were seen as a decrease in scores after the experimental session. All other criterion were not significant.

Informal classrooms demonstrated a significant decrease in the difference of integration of diverse elements scores, $t(28)=2.22$, $p<.05$. All other criterion, as well as overall creativity scores, were not significant.

Discussion

Classroom structure was not found to be a fostering environment for creativity, regardless of setting, in this study. In fact, the mean overall creativity score differences in pre-test and post-test scores for all three classrooms declined, especially in the intermediate classroom, where the decrease in overall creativity was significant. Reasons for the greater decline in the intermediate classroom are unclear; for younger children, this type of classroom is associated with increases in creativity (Ogilvie, 1974). It has been observed and suggested that the increasing specificity and complexity of higher education diminishes a student's creativity (Dacey & Lennon, 1998; Simonton, 2000). Past research has supported the hypothesis that creativity declines with years spent in formal education (Cheung et al., 2003; Dacey & Lennon, 1998; Sternberg & Lubart, 1995). Due to the lack of research in the area, it is not known exactly what situational factors can be attributed to fostering creativity or hindering it. College students may be merely affected by their entrenchment in the traditional educational system as a whole. By the time students begin

higher education, classroom settings, regardless of style incorporated, take on little effect, and detrimental effects at that. Sternberg (1997) suggests that college and universities ill prepare students because they are not challenged enough, as they will be in the working world. He states that "given the demands of schooling, this reduction in spontaneous creativity is not surprising; neither is it appealing, however" (1997, p. 127). Drawing from conclusions regarding overall decreases, creativity is further hampered due to a lack of creativity research conducted with college students. A thorough literature search yielded few studies (Cheung et al., 2003). On the other hand, the statement of a definite relationship of creativity and classroom settings is extremely tenuous due to the complexity of the concept.

Creativity as a concept, according to the *investment theory of creativity* (Sternberg & Lubart, 1995) requires the confluence of six major resources. Although the environment of a classroom may have an effect on creative production, the overall creativity of an individual requires the interaction of five other resources, namely intellectual processes, knowledge, intellectual styles, personality, and motivation. For instance, students perform better in a class where the teaching style of the teacher matches the learning style of the students (Grigorenko & Sternberg, 1997). Therefore, the classroom environment may require an analysis with the other six resources taken into account as well; however, an investigation of the confluence of all resources was beyond the scope of this study.

The sample size for the various analyses is small, so that the statistical power of the tests and the generalizability of findings are limited. Due to the ambiguous definition of creativity, the lack of an operationally defined construct has hindered the process to develop an instrument that can reliably assess creativity. The present findings, therefore, may have resulted from the absence of such a measure resulting in the inconsistent replications of past results. Another factor may have been the teaching styles of the instructors in the sessions. Some studies have found that teaching styles of the professor can affect creative production in their students (Chambers, 1973, as cited in Amabile, 1996). Due to the conciseness of this study, the effects due to teaching styles over the course of a college semester could not be assessed. Also, one testing session may be inadequate to determine long-term effects of the classroom environment such as what may occur over the course of a college semester.

Implications of research

Further research into the effects of the classroom environment on creativity in students is clearly needed; however, this study has continued to expand the field into new dimensions. It has opened the doors in research for determining how higher education may differ from elementary and secondary schools in fostering or inhibiting student's creative products. The implications, from further research, for teachers and professors could be immense. Additional research with classroom settings will educate instructors to implement the classroom structures that work best for

fostering creativity, which in turn, can help them to bring out the creative potential in their students. Treffinger and colleagues (1968) reported that teachers agreed that there is a need to see examples of how research and theory could actually be implemented in the classroom. By defining exactly what part of each of these classroom environments aids in fostering creativity, instructors can implement them into their classrooms. Students could also benefit from the research in a similar way, by learning how the environment affects their creativity, so they can adjust to the classroom situation.

Future Research

The present study is an initial investigation into the research of environmental effects, specifically classroom structure, on college student's creative productions. From this, further research is essential to address factors limited in this study. A more comprehensive intervention, such as a longitudinal design, would yield more reliable results, as would replications of the current study. As creativity is considered to be domain-specific, an experimental design could be examined that incorporates creative tasks following an instructional session, both with the same domain-specific focus. Although many creativity measures are available, there is yet to create a measure that is accepted by the field of creative research as the standard. In general, more definitive research into what constitutes creativity (whether it is evaluated as a state, trait, or decision) would lead to

more applicable research when deciding which implementations work best in regards to environmental factors.

References

- Amabile, T. (1996). *Creativity in context*. Colorado: Westview Press.
- Amabile, T. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, 45, 357-376.
- Amabile, T. (1979). Effects of external evaluation on artistic creativity. *Journal of Personality and Social Psychology*, 37, 221-233.
- Bal, S. (1988). Creativity, cognitive style and academic achievement amongst university students. *Psychological Studies*, 33, 10-13.
- Cheung, C., Rudowicz, E., Yue, X., & Kwan, A. (2003). Creativity of university students: What is the impact of field and year of study? *Journal of Creative Behavior*, 37, 42-63.
- Collins, M. & Amabile, T. (1999). Motivation and creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 297-312). Cambridge: Cambridge University Press.
- Csikszentmihalyi, M. (1996). *Creativity*. New York: HarperCollins Publishers.
- Csikszentmihalyi, M. (1999). Implications of a systems perspective for the study of creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 313-335). Cambridge: Cambridge University Press.
- Dacey, J., & Lennon, K. (1998). *Understanding creativity: The interplay of biological, psychological, and social factors*. San Francisco, CA: Jossey-Bass.

- De Bono, E. (1992). *Serious creativity: Using the power of lateral thinking to create new ideas*. New York: HarperCollins.
- Friedman, R. S., & Forster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology*, 81, 1001-1013.
- Gardner, H. (1982). *Art, mind, and brain: A cognitive approach to creativity*. New York: Basic Books, Inc.
- Grigorenko, E. L., & Sternberg, R. J. (1997). Styles of thinking, abilities, and academic performance. *Exceptional Children*, 63, 295-312.
- Gruber, H.E. (1988). The evolving systems approach to creative work. *Creativity Research Journal*, 1, 27-51.
- Guilford, J. P. (1950). Creativity. *American Psychologist*, 5, 444-454.
- Kris, E. (1952). *Psychoanalytic exploration in art*. New York: International Universities Press.
- Lubart, T. I. (1994). Creativity. In R. J. Sternberg (Ed.), *Thinking and problem solving* (pp. 289-332). San Diego, CA: Academic Press.
- Lubart, T.I., & Sternberg, R. J. (1995). An investment approach to creativity: Theory and data. In Smith, Ward, & Finke (Eds.). *The creative cognition approach* (pp.271-302). Cambridge, MA: MIT Press.
- Moneta, G.B., & Siu, C.M. (2002). Trait intrinsic and extrinsic motivations, academic performance, and creativity and Hong Kong college students. *Journal of College Students Development*, 43, 664-683.

- Mumford M.D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin*, 103, 27-43.
- Ochse, R. (1990). *Before the gates of excellence: The determinants of creative genius*. New York: Cambridge University Press.
- Ogilvie, E. (1974). Creativity and curriculum structure. *Educational Research*, 16, 126-132.
- Shalley, C. E. (1991). Effects of productivity goals, creativity goals, and personal discretion on individual creativity. *Journal of Applied Psychology*, 76, 179-185.
- Simonton, D. K. (2000). Creativity: Cognitive, personal, developmental, and social aspects. *American Psychologist*, 55, 151-158.
- Spinks, J. A., Yu-Ku, H. H. Y., Shek, D. T. L., & Bacon-Shone, J. H. (1996). Recent developments of creative thinking in Hong Kong. In S. Dingli (Ed.), *Creative thinking: New perspectives*. La Valletta, Malta: Malta University Press.
- Sternberg, R. J. (1997). *Thinking styles*. New York, NY: Cambridge University Press.
- Sternberg, R. J. (2001). What is the common thread of creativity?: Its dialectical relation to intelligence and wisdom. *American Psychologist*, 56, 360-362.
- Sternberg, R. J. (2002). Creativity as a decision: Comment. *American Psychologist*, 57, 376.

- Sternberg, R. J., Ferrari, M., Clinkenbeard, P., & Grigorenko, E. L. (1996). Identification, instruction, and assessment of gifted children: A construct validation of a triarchic model. *Gifted Child Quarterly*, 40, 129-137.
- Sternberg, R. J., & Lubart, T. I. (1991). An investment theory of creativity and its development. *Human Development*, 34, 1-31.
- Sternberg, R. J., & Lubart, T. I. (1995). *Defying the crowd: Cultivating creativity in a culture of conformity*. New York: The Free Press.
- Sternberg, R. J. (1996). Investing in creativity. *American Psychologist*, 51, 677-688.
- Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 3-15). Cambridge: Cambridge University Press.
- Sternberg, R. J., & O'Hara, L. A. (1999). Creativity and intelligence. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 251-272). Cambridge: Cambridge University Press.
- Thomas, N., & Berk, L. (1981). Effects of school environment on the development of young children's creativity. *Child Development*, 52, 1153-1162.
- Torrance, E. P. (1964). *Guiding creative talent*. New Jersey: Prentice-Hall, Inc.
- Treffinger, D. J., Ripple, R. E., & Dacey, J. S. (1968). Teachers' attitudes about creativity. *The Journal of Creative Behavior*, 2, 242-248.

Table 3

Correlations of Raters on Overall Pre- and Post-test Creativity Scores

	Pretest	Posttest
Rater 1	.781**	.894**
Rater 2	.765**	.809**
Rater 3	.831**	.797**
Rater 4	.709**	.787**
Rater 5	.713**	.732**
Rater 6	.767**	.793**
Rater 7	.781**	.804**

** $p < .01$, two tailed.

Table 4

T-tests Comparing Mean Creativity Scores Before and After Classroom Instruction

	Classroom					
	Formal		Intermediate		Informal	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
<i>Novelty</i>						
<u>M</u>	2.78	2.86	3.00	2.73	3.00	2.98
<u>SD</u>	.41	.55	.54	.70	.51	.65
t(df)		-.73(28)		1.79(30)		.15(28)
<i>Appropriateness of topic choice</i>						
<u>M</u>	3.68	3.69	3.54	3.47	3.53	3.55
<u>SD</u>	.38	.37	.49	.38	.41	.30
t(df)		-.09(28)		.82(30)		-.22(28)
<i>Integration of diverse elements</i>						
<u>M</u>	2.75	2.57	2.82	2.24	2.60	2.36
<u>SD</u>	.46	.38	.36	.43	.37	.44
t(df)		2.01(28)		6.33(30)**		2.22(28)*
<i>Technical goodness</i>						
<u>M</u>	2.91	2.86	2.84	2.79	2.83	2.91
<u>SD</u>	.48	.37	.49	.36	.36	.33
t(df)		.53(28)		.58(30)		-.76(28)

Table 4

	Classroom					
	Formal		Intermediate		Informal	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
<i>Overall Aesthetic Value</i>						
<u>M</u>	2.94	2.97	2.96	2.93	2.88	2.98
<u>SD</u>	.47	.42	.50	.35	.42	.38
t(df)		-.30(28)		.27(30)		-.87(28)
<i>Effort</i>						
<u>M</u>	2.96	2.93	2.95	2.57	2.86	2.68
<u>SD</u>	.59	.43	.44	.49	.40	.45
t(df)		.31(28)		3.92(30)**		1.50(28)
<i>Overall Creativity</i>						
<u>M</u>	18.04	17.89	18.13	16.74	17.70	17.46
<u>SD</u>	2.58	2.19	2.25	2.16	2.03	2.07
t(df)		.31(28)		2.61(30)*		.40(28)

* $p < .05$, two-tailed. ** $p < .01$, two-tailed.