Creative achievement and intelligence in student entrepreneurs

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CREATIVE ACHIEVEMENT & INTELLIGENCE AMONG STUDENT ENTREPRENEURS

ABSTRACT (JEE-1159)

This study fills a gap in the entrepreneurship literature by investigating creative achievement and intelligence within students who have been entrepreneurs. The study looks at differences in the levels of creative achievement and intelligence between students who have been entrepreneurs versus those who have not been entrepreneurs.

The study used the Creative Achievement Quotient (CAQ) (Carson, Peterson, & Higgins, 2005) and college entrance exam scores and grades as measures of intelligence. There were several significant findings. First, students who had been entrepreneurs had significantly lower college entrance exam scores. Secondly, students that had been entrepreneurs had significantly higher CAQs. Finally, students that had been entrepreneurs performed significantly higher on four measures of the CAQ: Architectural Design, Inventions, Scientific Inquiry, and Theater and Film. The findings and their implications are discussed.

INTRODUCTION

According to the Kauffman Index of Entrepreneurial Activity (Kauffman Foundation, 2014), since 1996, America’s overall business creation rate declined from .31% of American adults per month starting businesses to .28% in 2013. People have been trying to understand the causes for such a drop. Is it government intervention and/or regulation? Is it big companies purchasing smaller companies? This research focuses on trying to understand more about student entrepreneurs, creativity and intelligence. These relationships are all under investigated in the field of entrepreneurship.

Much attention has been focused on the importance of creativity to the success of organizations and individual careers. Creativity and innovation are essential ingredients that entrepreneurs bring to organizations to create new products, services, and ways of thinking differently that allows organizations to create competitive advantages within the global marketplace. A 2010 American Management Association study identified creativity and innovation as one of the four critical skills needed for business success today and in the future (Schmidt, Soper, & Facca, 2012). CEOs identified creativity as the number one leadership competency of the future (Bronson & Merryman, 2010). As a result of the increased rate of change in technology today, creativity is a critical skill for recognizing and creating opportunities to satisfy customer needs (Allen, 2012).

Despite the obvious importance of creativity to economic growth and welfare, Bronson and Merryman (2012) noted a consistent decline in the creativity scores of U.S. students since 1990. Sternberg (2010) stated that the greatest problem facing colleges today in admissions, instruction and assessment is that administrators are locked into an archaic notion of what it means to be intelligent. The U.S. higher educational system has relied on standardized tests that measure cognitive and memorization-based intelligence for a long time. Unfortunately, these tests have created a learning environment that rewards the traditional methods of thinking and
discourages creative thinking. The U.S. needs a better instrument to measure a student’s creative ability. Furthermore, schools need to do a better job of fostering creativity within students in higher education. But how can we do this? Sternberg and Lubart (1995) stated that a person’s level of creativity could be developed in varying degrees. But what about intelligence? And how does creativity and intelligence relate to entrepreneurs? It is evident that creativity and intelligence exist in all people to varying degrees.

It is at this point that we investigate these relationships at a critical juncture; during a person’s higher educational experience. Given the importance of creativity to the economy and the field of entrepreneurship, we investigate two research questions that will assist us in understanding creativity and intelligence within students that have been entrepreneurs. The first research question is: Is there a difference between the Creative Achievement Quotient (Our measure of creativity) of students that have been entrepreneurs versus students that have not been entrepreneurs? We measure whether or not a student has been an entrepreneur by asking them: Have you ever been an entrepreneur of a startup? The second research question is: Is there a difference between intelligence scores for students that have been entrepreneurs versus students who have not been entrepreneurs? A discussion of the findings and their implications follows.

**BACKGROUND ON CREATIVITY**

Creativity has been investigated by numerous scholars in fields such as psychology, education, cognitive science, philosophy, business, linguistics, history, theology, sociology, and economics. One result of this is that there is not a high degree of standardized thoughts on creativity. Meusburger (2009) stated that there are over 100 definitions of creativity. Examples include Boden’s (1994) assertion that creativity is producing something that is novel or different. Barringer and Ireland (2012) and Gryskiewicz (1987) state that creativity is the process of generating a novel or useful idea. Rhodes (1961; 1987) suggested that the definition of creativity is related to four different potential areas: (a) the person who creates, (b) the cognitive processes involved in the creation of idea/product, (c) the environment in which creativity occurs, and (d) the end products of creative activities. An individual is regarded as creative if he or she solves problems frequently and is capable of displaying content in a certain domain in a flexible and novel manner (Gardner, 2006; Wodtke, 1964) and eventually will be recognized and agreed upon by others regardless of culturally setting differences (Yi, Sulaiman & Baki, 2011).

Individuals who are creative in nature tend to utilize their cognitive and affective resources and abilities to resolve difficulties and challenges in life (Helson & Srivastava, 2002). Creative individuals are believed to exhibit a style of living and thinking that leads to a regularity of breakthroughs in specific domains or disciplines rather than across the board (Gardner, 1993). According to Gardner (2006), “Creativity is a characterization reserved to those whose products are initially seen to be novel within a domain but are ultimately recognized as acceptable within an appropriate community.”

Despite all of the definitions of creativity, there is no one set definition that we can use. Amabile and Tighe’s (1993), theory of creativity stated that there are three basic components within an individual that are required for creativity in any given domain or discipline. The three components are namely domain-relevant skills, creativity-relevant skills and task motivation.
Domain-relevant skills refer to elements related to the individual’s level of expertise in a specific domain which includes basic intelligence or talent in the domain, knowledge acquired through education, experience and technical skills in the domain. Creativity-relevant skills consist of cognitive and personal styles that are important in producing novel and useful ideas in any domain. The creativity component is task motivation where it involves one’s self-perceived motivation for engaging in a particular task in a specific domain at a particular point in time. The task motivation portion exists in two forms, intrinsically and extrinsically.

Creativity and Intelligence

Multiple studies have examined the relationship between creativity and intelligence. Results have been mixed. Wallach and Kogan (1965) found no relationship between creativity and intelligence in fifth grade children. Eysenck (1995) and Taylor (1995) believe that only geniuses can be creative. Srivastava and Thomas (1991), Sarsani (2008) and Yi, Sulaiman and Baki (2011) found a positive relationship between creativity and intelligence. However, Getzels and Jackson (1962) found no relationship between the two.

Emami, Bardai, and Ismail (2013) examined the relationship between entrepreneurship and IQ in the Graduates Bio-technology entrepreneurial program at UNIRAZAK. Their findings showed that there was a weak positive correlation between entrepreneurship traits and creativity and with leadership while the correlation with emotional quotient (EQ) was quite strong. The findings also showed that EQ and IQ had weak positive correlations with creativity.

Amabile (1996) suggests that there is no relationship between creativity and intelligence as measured through IQ tests or grades in school. Sternberg and Lubart (1995) suggest that creativity is similar to intelligence in that everyone possesses it in some (non-fixed) amount that, importantly, can be further developed in varying degrees. DeBono (1992) also suggests that creativity can be developed in individuals. These last two studies, combined with Amabile’s (1996) results, have important implications for entrepreneurship educators. If there is no strong direct relationship between creativity and intelligence, educational efforts to stimulate creativity may be more successful across a broad spectrum of students.

INTELLIGENCE AND ENTREPRENEURSHIP

The relationship between intelligence quotient (IQ) and entrepreneurship is an understudied area in the field of entrepreneurship. Few researchers have looked at how intelligence affects the odds that a person will become an entrepreneur. Research on IQ has been performed in other areas. For example, higher IQ is associated with higher earnings (See Bowles, Gintis, & Osborne, 2001; Strenze, 2007; Jones & Schneider, 2010).

But how important is IQ when it comes to determining if someone becomes an entrepreneur? de Wit and Van Winden (1989) and de Wit (1993) found that IQ scores, when measured at age 12, had a positive significant effect on a person’s propensity to become self-employed later in life. Van Praag and Cramer (2001) examined 1763 schoolchildren and found entrepreneurial talent was positively related to IQ measured at age 12.

Shane (2009) reports that students who got “mostly A’s” in college are about 2 percent less likely than other students to be working for themselves. That is, better students were less likely to
become self-employed. For a lot of majors — foreign languages, computer science and business — grades in college did not seem to have an impact on whether people became entrepreneurs. In comparisons among graduates in these majors, the self-employed had statistically the same grade point averages as those who worked in other professions (Shane, 2009). But for three majors — math, science and engineering, and statistics — the results were different. Graduates in these majors, who ended up self-employed, did slightly worse in school than those who did something else for a living. There was no significant difference between the average G.P.A. of statistics majors who became self-employed. They had an average 2.76 G.P.A., while the whole sample was 2.84 (Shane, 2009).

Based on existing research, we hypothesize (H1a) that entrepreneurship students will have significantly higher college entrance exams. We expect higher IQ scores to be associated with students who become entrepreneurs. This leads to H1a:

H1a: Students that have been entrepreneurs will have significantly higher college entrance scores than students who have not been entrepreneurs.

We also examined students’ current GPAs. Similar to Shane (2009), we are of the opinion that just because a student has a high GPA does not necessarily mean that they are an entrepreneur or have been an entrepreneur. As such, we propose the following:

H1b: There will be no significant difference between entrepreneurship students’ college GPA versus students who have not been entrepreneurs.

CREATIVITY AND ENTREPRENEURSHIP

Entrepreneurship and innovative business behavior have long been associated with creativity (Amabile, 1996; Nyström, 1979; Walton, 2003) and the two are often used interchangeably. Previous research has been done on the characteristics associated with the entrepreneurial mind-set. Hornaday (1982) listed creativity and innovativeness as a characteristic often attributed to entrepreneurs.

In the business context creative novelty and appropriateness is often translated into idea development (Ward, 2004), new product innovations (Amabile, 1996) and adapting or improving existing innovations (Kirton, 1987). Methodologically, creativity in entrepreneurship and innovation has been explained through cognitive processes, attitudes, motivation, existing knowledge, work environment and personality traits (Amabile, 1996; Walton, 2003; Ward, 2004).

Creativity plays an important part of the entrepreneurial process where it integrates within the opportunity recognition process (see Figure 1). Figure 1 shows how environmental trends (e.g., economic, social, technological and political) integrate with an entrepreneur’s personal characteristics (e.g., prior experience, cognitive factors, social networks and creativity). As a result of this intersection, the entrepreneur seeks an opportunity or problem in the marketplace and develops a solution through the creation of a new product, process or service. However, creativity is important throughout the entire entrepreneurial process.

There are also several personality attributes that have been shown to be traits of persons considered to be creative: (a) tolerance for ambiguity, (b) willingness to surmount obstacles and
persevere, (c) willingness to grow, (d) willingness to take risks, and (e) courage of one’s convictions and belief in oneself (Sternberg & Lubart, 1991). Wennberg (2004) stated that preliminary psychometric creativity testing has indicated that there were greater differences between students with different disciplinary backgrounds (e.g., entrepreneurship versus engineering students). This leads to our second hypothesis:

H2: Students who have been entrepreneurs will have a significantly higher Creativity Achievement Quotient (CAQ) than students who have not been entrepreneurs.

**METHODOLOGY**

**Sample**

The sample consisted of 126 undergraduate students located at a private West coast university. The students were enrolled in two entrepreneurship courses and three finance courses. All of the students completed the survey except for two students who overlapped both classes. They were only asked to take the survey once.

**Procedure**

The students were given the Creative Achievement Questionnaire (Carson, et. al., 2005) (see Appendix). A few questions were added on measures of intelligence, demographics and whether the student had been an entrepreneur and for how long. The survey was 28 questions long and the students had as much time as they wanted to finish the survey. The survey was done in the middle of the semester.

The two part study was evaluated into three categories: (1) the entire sample; (2) entrepreneurship students; and (3) finance students. For the second part of the study, we broke down our sample into (1) the entire sample; (2) students who had been entrepreneurs; and (3) students who had not been entrepreneurs. Utilizing t-tests and chi-square analysis, we examined the differences between the sample populations.

**Measures**

One of the main issues in the research on creativity is whether to categorize creativity as domain-specific or domain-general (Han & Marvin, 2002). Research (see Gardner, 2006; Yi et. al., 2011) suggests that creativity may be domain specific. Similar to intelligence being domain specific in Math, English, Science, researchers have stated that creativity may foster within specific areas.

This study investigates a proven measure of creativity called creative achievement. Carson, Peterson, & Higgins’ (2005) study on Harvard University and the University of Toronto students created a new self-report measure of creative achievement that assesses achievement across 10 domains of creativity (Visual Arts, Music, Dance Architectural Design, Creative Writing, Humor, Inventions, Scientific Inquiry, Theater and Film, and Culinary Arts). The
Appendix shows the achievements that the students were to rate. The directions on how to score the questionnaire is also listed in the Appendix.

To measure intelligence we used two measures. The first was the percentile that a student scored on their SAT or ACT college entrance test. Students were asked to report both of their scores. These scores were then broken down into their respective percentiles. If both scores were received, they were averaged. If only one was received, we used that percentile.

Another measure of intelligence that was used was the student’s current GPA.

Validity and Reliability

Carson, et. al., (2005) found the CAQ to be both reliable and valid and can provide a criterion to efficiently measure and study the varied components of creativity. When they gave the CAQ test at two different occasions to the same sample, all of the internal consistency reliability scores for the 10 domains were above the .70 minimum standard for research instruments (Hocevar & Bachelor, 1989).

Furthermore, Carson et. al., (2005) characterized the CAQ by solid convergent validity, when compared to other measures of creativity, including divergent thinking tests and personality scales. Finally, they found that the CAQ demonstrated good discriminant validity when tested against IQ indicating its separability from intelligence and proved unrelated to self-enhancement, indicating that self-report scores on the CAQ were not inflated due to a desire to inflate personal image.

RESULTS & HYPOTHESES

Table 1: Characteristics of Students Who Have Been Entrepreneurs versus Students Who Have Not Been Entrepreneurs

Table 1 shows there were a total of 19 entrepreneurs in the entire sample versus 117 that have never been an entrepreneur. The average age for all of the students in the study was 21.5 years old with the entrepreneurs averaging 21.3 and non entrepreneurs averaging 21.6. There were no significant differences in age between the two samples of students.

There was no significant difference in sex with the mean male percentage for the entire sample at 66%. Sixty-three percent of the students who were entrepreneurs were male while 66% were male for the students that were not entrepreneurs.

The survey broke down the year in school for the students. We found significant differences at the senior and junior levels. Eighty-three percent of the students who were not entrepreneurs were seniors versus 53% for the students who were entrepreneurs \( (p < .003) \). Forty-seven percent of the entrepreneurs were juniors versus 17% for the non entrepreneurship students \( (p < .003) \).

There was a significant difference between the average college entrance percentiles for entrepreneurship students \( (74\%) \) versus 81% for the finance students \( (p < .03) \). However, there were no significant differences between GPAs.
It was hypothesized (H1a) that students that had been entrepreneurs would have significantly higher college entrance scores than students who have not been entrepreneurs. This hypothesis was not supported. In fact, we found a negative significant relationship where the entrepreneurship students actually had significantly lower college entrance exams.

We also hypothesized (H1b) that there would be no significant difference between students who had been entrepreneurs versus students who had not been entrepreneurs. This hypothesis was supported. There was no significant difference between grades of the two samples.

Table 2: Creativity Achievement Quotient of Students Who Have Been Entrepreneurs versus Students Who Have Not Been Entrepreneurs

Table 2 examines the differences in the Creativity Achievement Quotient between students that have been entrepreneurs versus students that have never been entrepreneurs. Additionally, the table examines if there are any significant differences between the 10 constructs that make up the CAQ. Overall, there were several significant differences between the populations. The entrepreneurs had a significantly higher CAQ score (11.1) versus finance students (6.9) at the $p < .03$ level.

There were four significant differences out of the 10 constructs of creativity that were evaluated. Entrepreneurship students were significantly more likely to have expertise in Architectural Design ($p < .006$); Inventions ($p < .04$); Scientific Inquiry ($p < .003$); and Theater and Film ($p < .005$). There were no significant differences between Visual Arts, Music, Dance, Creative Writing, Humor, and Culinary Arts.

We hypothesized (H2) that students who had been entrepreneurs would have significantly higher CAQs versus students that had not been entrepreneurs. This hypothesis was supported.

DISCUSSION

This study evaluated data on 126 undergraduate students from a West coast university during the spring of 2014. The study fills a gap in entrepreneurship research by looking at differences in the levels of creative achievement and intelligence between students who have been entrepreneurs versus those who have not been entrepreneurs.

Specifically, the first hypothesis examined if there were any differences between college entrance exams and GPAs of students who had been entrepreneurs versus students who had not been entrepreneurs. We found that current students that had been entrepreneurs had significantly lower college entrance scores versus current students that had not been entrepreneurs.

Our findings indicate that there may be other factors involved in becoming entrepreneurs besides IQ. Sternberg (2004) stated that successful entrepreneurship requires a blend of analytical, creative, and practical aspects of intelligence, which he terms successful intelligence. Furthermore, we propose that IQ alone cannot measure a person’s aptitude to become an entrepreneur. There
are many factors that are needed to become an entrepreneur that cannot be measured through an exam such as motivation (or hunger/drive for success), ability to lead others (leadership), ability to relate to others (social skills), creativity, vision and perseverance.

We also hypothesized (H1b) that there would be no significant difference in GPAs between students that had been entrepreneurs versus students who had not been entrepreneurs. This hypothesis was supported. There was no significant difference between grades of the two samples. This finding is in tune with previous research.

Our final hypothesis (H2) found that students who had been entrepreneurs had a significantly higher Creativity Achievement Quotient than students that had not been entrepreneurs. This is supported in the existing literature. For example, entrepreneurship and innovative business behavior have long been associated with creativity (Amabile, 1996; Nyström, 1979; Walton, 2003) and the two are often used interchangeably. Previous research has been done on the characteristics associated with the entrepreneurial mind-set. Hornaday (1982) listed creativity and innovativeness as a characteristic often attributed to entrepreneurs. Wennberg (2004) stated that preliminary psychometric creativity testing has indicated that there were greater differences between students with different disciplinary backgrounds (e.g., entrepreneurship versus non-entrepreneurship students).

Our findings show that students that have been entrepreneurs have a significantly higher CAQ level. Furthermore, when we broke down our CAQ scale and examined each construct we found that entrepreneurship students were significantly more likely to have expertise in Architectural Design, Inventions, Scientific Inquiry and Theater and Film.

**IMPLICATIONS**

The U.S.’s level of creativity has been declining for decades along with its level of entrepreneurship. How can we make a difference? We can start in the classroom by educating our students more about creativity. Schools and instructors do poorly in providing environments that spark creativity, rarely allowing students to “pursue projects that encourage them to develop their creative thinking” (Sternberg & Lubart, 1991, p. 613). Creativity, despite its importance, is not generally rewarded in the classroom. Educators need to improve their environmental to stimulate creativity in the classroom.

Hennessey and Amabile (1987) discuss the issue of intrinsic versus extrinsic motivators and their effects on creativity. They state that they can be applied to any classroom at any grade level. That is, creative people are intrinsically motivated to complete a task. Thus, educators must be aware that, if they implement an extrinsic reward structure with these students, this will undermine their intrinsic motivation. In other words, allowing students to pursue their own passions should stimulate creativity within students. Runco and Nemiro’s study (cited in Runco & Chand, 1995) suggest that motivation is important for creative thinking and that problem finding would facilitate intrinsic motivation in individuals. In other words, students will be more motivated when they choose their own tasks. This would make the task meaningful to the individual. They further suggested that educators devote more time to problem-finding skills to communicate to students that this ability is as important as problem solving. Often, though, extrinsic motivators must be used to foster intrinsic motivation.

Hennessey and Amabile (1987) reported that extrinsic rewards undermine intrinsic
motivation and creative production. In addition, when students expect an evaluation, their focus switches from intrinsic motivation to extrinsic motivation, especially if they are being observed. Hennessey and Amabile cautioned that when convergent thinking is a teacher’s goal, then extrinsic rewards can improve performance on a task. However, when students understand that their teachers “value” creativity, then this message has a positive effect on creativity. Schools also should have a continuing evaluation program to determine the effectiveness of their educational programs in developing creative abilities in their students.

A developmental theory of creativity proposed by Renzulli (1992) suggests that students should be provided with opportunities to engage in “ideal acts of learning” (p. 171). The learner, teacher, and curriculum must all be involved for these ideal acts of learning to occur. Renzulli’s major concern was in how educators can promote a disposition for creative productivity. Renzulli (1992) stated that one way to enhance someone’s creative production is to have them focus on their own interest. Their interests can be tasks or objects. Renzulli reported that the more consistent and intense the interests, the more creative were the students (Fasko, 2001).

Torrance (1981) noted several signs that indicate when creative learning occurs, such as improved motivation, alertness, curiosity, concentration, and achievement. The art of being a great teacher comes into play here where teachers have the innate ability to read their students to enhance the learning environment. The instructor has to realize the importance of positive energy, being a mentor, role model and advocate for the students.

Sternberg and Lubart (1991) suggest that instructors give more long-term assignments to develop students’ tolerance for ambiguity. Schools typically do provide a fertile ground for students to learn to overcome obstacles. Schools, and specifically instructors, need to encourage students more to take risks with their newly acquired skills. Taking risks is difficult for creative students because creativity is not always rewarded with good grades (Sternberg & Lubart, 1991). Perhaps this is due to the negative attitudes teachers hold toward creative students, which is supported by the findings of Westby and Dawson (1995). Thus, educators must be more aware of this potential negative outcome of their grading. Instructors need to emphasize that it is alright to fail. Learning takes place during failure as well as success.

Creative people are rarely the superstars in any organization. Today, the creative work is achieved by people that we are not aware of in most organizations. They are people with high levels of creative thinking skills, expertise and are intrinsically motivated. Instructors must be aware of this and structure their courses so that creativity flourishes. Instructors need to build relationships with their students to understand their intrinsic motivations. Thus, they can serve as mentors to the students and give them direction in their future entrepreneurial pursuits.

REFERENCES


Emami, M., Bardai, B., & Ismail, W. K. (2013). The interrelationship between entrepreneurial trait-E.Q (Emotional Quotient), I.Q (Intelligence Quotient), ADHD (Attention Deficit-Hyperactivity Disorder), creativity, and leadership talent. Journal of Entrepreneurship & Management. 2(1).


Figure 1: The Opportunity Recognition Process

**Environmental Trends**
- Economic Factors
- Social Factors
- Technological Advances
- Political and Regulatory Changes

+ \[ \rightarrow \]

**Business, Product or Service Opportunity Gap**
- Difference between What’s Available and what’s possible

\[ \rightarrow \]

**New Business, Product and Service Ideas**

**Personal Characteristics**
- Prior Experience
- Cognitive Factors
- Social Networks
- Creativity

Table 1: Characteristics of Students Who Have Been Entrepreneurs versus Students Who Have Not Been Entrepreneurs (N=126)

<table>
<thead>
<tr>
<th></th>
<th>All Students N=124</th>
<th>Entrepreneurs N=19</th>
<th>Have Not Been Entrepreneurs N=115</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Students (yrs)</td>
<td>21.5</td>
<td>21.3</td>
<td>21.6</td>
<td>.32</td>
</tr>
<tr>
<td>Male (%)</td>
<td>.66</td>
<td>63</td>
<td>66</td>
<td>.79</td>
</tr>
<tr>
<td>Year in School (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>79</td>
<td>53</td>
<td>83</td>
<td>.003**</td>
</tr>
<tr>
<td>Junior</td>
<td>21</td>
<td>47</td>
<td>17</td>
<td>.003**</td>
</tr>
<tr>
<td>Percentile SAT and/or ACT</td>
<td>80</td>
<td>74</td>
<td>81.2</td>
<td>.03*</td>
</tr>
<tr>
<td>Average GPA</td>
<td>3.39</td>
<td>3.34</td>
<td>3.40</td>
<td>.41</td>
</tr>
</tbody>
</table>

* p  < .05.
** p  < .01.
*** p < .001.
Table 2: Creativity Achievement Quotient of Students Who Have Been Entrepreneurs versus Students Who Have Not Been Entrepreneurs (N=126)

<table>
<thead>
<tr>
<th></th>
<th>All Students N=124 Mean</th>
<th>Entrepreneurs N=19 Mean</th>
<th>Have Not Been Entrepreneurs N=115 Mean</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity Achievement Quotient (CAQ)</td>
<td>7.5</td>
<td>11.1</td>
<td>6.9</td>
<td>.03*</td>
</tr>
<tr>
<td>Visual Arts</td>
<td>1.2</td>
<td>2.2</td>
<td>1.1</td>
<td>.12</td>
</tr>
<tr>
<td>Music</td>
<td>.92</td>
<td>.61</td>
<td>.97</td>
<td>.47</td>
</tr>
<tr>
<td>Dance</td>
<td>.50</td>
<td>.11</td>
<td>.56</td>
<td>.51</td>
</tr>
<tr>
<td>Architectural Design</td>
<td>.18</td>
<td>.61</td>
<td>.10</td>
<td>.006**</td>
</tr>
<tr>
<td>Creative Writing</td>
<td>.71</td>
<td>.44</td>
<td>.76</td>
<td>.38</td>
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<tr>
<td>Humor</td>
<td>1.2</td>
<td>1.3</td>
<td>1.1</td>
<td>.73</td>
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<tr>
<td>Inventions</td>
<td>.98</td>
<td>1.8</td>
<td>.84</td>
<td>.04*</td>
</tr>
<tr>
<td>Scientific Inquiry</td>
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<td>.42</td>
<td>.002**</td>
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<tr>
<td>Theater and Film</td>
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<td>.005**</td>
</tr>
<tr>
<td>Culinary Arts</td>
<td>.63</td>
<td>.83</td>
<td>.59</td>
<td>.12</td>
</tr>
</tbody>
</table>

* p < .05.
** p < .01.
*** p < .001.
Appendix
Creative Achievement Questionnaire

1. Place a check mark beside sentences that apply to you. Next to sentences with an asterisk (*), write the number of times this sentence applies to you.

1. Visual Arts (painting, sculpture)
   __ 0. I have no training or recognized talent in this area. (Skip to Music).
   __1. I have taken lessons in this area.
   __2. People have commented on my talent in this area.
   __3. I have won a prize or prizes at a juried art show.
   __4. I have had a showing of my work in a gallery.
   __5. I have sold a piece of my work.
   __6. My work has been critiqued in local publications.
   * 7. My work has been critiqued in national publications.

2. Music
   __0. I have no training or recognized talent in this area (Skip to Dance).
   __1. I play one or more musical instruments proficiently.
   __2. I have played with a recognized orchestra or band.
   __3. I have composed an original piece of music.
   __4. My musical talent has been critiqued in a local publication.
   __5. My composition has been recorded.
   __6. Recordings of my composition have been sold publicly.
   * 7. My compositions have been critiqued in a national publication.

3. Dance
   __0. I have no training or recognized talent in this area (Skip to Architecture).
   __1. I have danced with a recognized dance company.
   __2. I have choreographed an original dance number.
   __3. My choreography has been performed publicly.
   __4. My dance abilities have been critiqued in a local publication.
   __5. I have choreographed dance professionally.
   __6. My choreography has been recognized by a local publication.
   * 7. My choreography has been recognized by a national publication.

4. Architectural Design
   __0. I do not have training or recognized talent in this area (Skip to Writing).
   __1. I have designed an original structure.
   __2. A structure designed by me has been constructed.
   __3. I have sold an original architectural design.
   __4. A structure that I have designed and sold has been built professionally.
   __5. My architectural design has won an award or awards.
   __6. My architectural design has been recognized in a local publication.
   * 7. My architectural design has been recognized in a national publication.

5. Creative Writing
   __0. I do not have training or recognized talent in this area (Skip to Humor).
   __1. I have written an original short work (poem or short story).
   __2. My work has won an award or prize.
   __3. I have written an original long work (epic, novel, or play).
   __4. I have sold my work to a publisher.
   __5. My work has been printed and sold publicly.
6. My work has been reviewed in local publications.
*7. My work has been reviewed in national publications.

6. **Humor**
   0. I do not have recognized talent in this area (Skip to Inventions).
   1. People have often commented on my original sense of humor.
   2. I have created jokes that are now regularly repeated by others.
   3. I have written jokes for other people.
   4. I have written a joke or cartoon that has been published.
   5. I have worked as a professional comedian.
   6. I have worked as a professional comedy writer.
   7. My humor has been recognized in a national publication.

7. **Inventions**
   0. I do not have recognized talent in this area.
   1. I regularly find novel uses for household objects.
   2. I have sketched out an invention and worked on its design flaws.
   3. I have created original software for a computer.
   4. I have built a prototype of one of my designed inventions.
   5. I have sold one of my inventions to people I know.
   6. I have received a patent for one of my inventions.
   7. I have sold one of my inventions to a manufacturing firm.

8. **Scientific Discovery**
   0. I do not have training or recognized ability in this field (Skip to Theater)
   1. I often think about ways that scientific problems could be solved.
   2. I have won a prize at a science fair or other local competition.
   3. I have received a scholarship based on my work in science or medicine.
   4. I have been author or coauthor of a study published in a scientific journal.
   5. I have won a national prize in the field of science or medicine.
   6. I have received a grant to pursue my work in science or medicine.
   7. My work has been cited by other scientists in national publications.

9. **Theater and Film**
   0. I do not have training or recognized ability in this field.
   1. I have performed in theater or film.
   2. My acting abilities have been recognized in a local publication.
   3. I have directed or produced a theater or film production.
   4. I have won an award or prize for acting in theater or film.
   5. I have been paid to act in theater or film.
   6. I have been paid to direct a theater or film production.
   7. My theatrical work has been recognized in a national publication.

10. **Culinary Arts**
    0. I do not have training or experience in this field.
    1. I often experiment with recipes.
    2. My recipes have been published in a local cookbook.
    3. My recipes have been used in restaurants or other public venues.
    4. I have been asked to prepare food for celebrities or dignitaries.
    5. My recipes have won a prize or award.
    6. I have received a degree in culinary arts.
    7. My recipes have been published nationally.
Scoring of the Creative Achievement Questionnaire

1. Each check marked item receives the number of points represented by the question number adjacent to the checkmark.

2. If an item is marked by an asterisk, multiply the number of times the item has been achieved by the number of questions to determine points for that item.

3. Sum the total number of points within each domain to determine the domain score.

4. Sum all 10 domain scores to determine the total CAQ score.