

EXPLORING THE RELATIONSHIPS AMONG PERSONALITY TRAITS AND
NONTECHNICAL SKILLS IN COLLEGE STUDENTS

by

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ABSTRACT

Previous research established that traditional indicators of academic achievement, such as GPA, serve as insufficient predictors of success outside the academic environment. Employers find many graduates ill-prepared for the expectations of the corporate world because they lack skills such as creativity and critical thinking. The present study explores the relationship among personality, creativity, and critical thinking. Identifying personality traits that correlate with the presence of creativity and critical thinking may help employers identify job candidates who possess these much desired skills. In this study, 97 participants completed the NEO PI-R as a measure of personality, the Cornell Critical Thinking Test, and the Torrance Test of Creative Thinking. Like previous research findings openness to experience was significantly related to creativity, including a majority of its facets as well. Facets of agreeableness also had significant relationships to creativity.

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INTRODUCTION

What makes a student successful after graduation? This question is important to those in the higher education system including researchers, administrators, students, and instructors. Certainly, students strive for a generous portfolio consisting of a degree, a solid GPA, and a handful of gleaming letters of recommendation, but how do these achievements facilitate a successful transition from college to career? Together they epitomize an accomplished graduate, but often these achievements are not enough to entice potential employers within a stiff job market. This is because academic achievement alone is not always the sole predictor of the skills employers want (Jackson, 2011).

In a world that greatly values education, many students are ecstatic when they complete their educational programs. They enter the world of job hunting with high expectations, only to find it difficult to secure employment. Considering how competitive the work force has become, a significant reason for many unemployed graduates is that they lack skills desired by employers, leaving them unprepared for the work environment (Wickramasinghe, 2010). College students complete their educational journeys having developed many skills like the utilization of specific software or how to write a paper in APA format, yet they still fail to impress employers. What is it about the educational system's graduates that leave employers unsatisfied? A rather substantial cause is the absence of *nontechnical* skills. The present paper adopts Saurin's (2012) definitions of technical and nontechnical skills. Technical skills include using intellect, dexterity and motor coordination to deal with materials, tools and procedures. "Nontechnical skills involve personal, social and cognitive skills." p. 37). Technical skills are domain-specific knowledge and facts such as the definition of schizophrenia and operating equipment. Nontechnical skills are not job

specific, and students need them in order to apply their education in an actual job environment (Coll, 2006; Jackson, 2011). Examples of nontechnical skills include effective communication ability, flexibility, creativity, and critical thinking. To illustrate using the previous example, a professional would need cognitive flexibility to determine whether or not a patient should be diagnosed with schizophrenia given a complex history and medical profile, and would need to think critically to interpret patterns of data and have the communication skills to describe the results of the statistical analysis. These skills are all examples of highly desired yet deficient skills among graduates in advanced economies like the United States, Australia, and U.K. (Jackson, 2011; Wickramasinghe, 2010).

According to Jackson (2011), employers have been communicating with educational institutions about developing possible ways to enhance these underdeveloped abilities by altering the college curriculum to better prepare graduates for future careers (Jackson 2011). Higher education has made developing such skills a priority, but these nontechnical skills have proved difficult to develop in students. As a result, college programs continue to struggle with developing their students into highly desirable employees according to business' standards (Litchfield, 2010).

An alternative to assuming that all college graduates have achieved a standard degree of nontechnical skills is to look at how individual differences among graduates predict these skills. To this end, personality has proven to be a formidable predictor of college achievement; perhaps it can also be used as an indicator of the likely presence or absence of the non-technical skills. Prior research has established what it is that employers look for within potential prospects aside

from level of education, and personality measures have emerged as useful tools because of their reliability in predicting future performance (Oswald, 2013).

Not surprisingly, a substantial amount of research has investigated which individual differences contribute to successful post-secondary education outcomes, and personality traits have been established as accounting for a significant amount of the variance in post-secondary success (Ackerman, 2010; Blanch 2004; Chamorro-Premuzic, 2003; Oswald, 20103; Rothstein, 1994). Various personality measures have proven useful in predicting future performance of individuals, particularly measures of the Big Five which are five chief personality traits in psychology: openness, conscientiousness, extraversion, agreeableness, and neuroticism. Oswald (2013) found that conscientiousness consistently and strongly relates to academic performance and thus academic achievement. People who score high in this area tend to be organized, have more self-discipline, and strive for achievement. As for the four remaining personality traits: neuroticism (mental stability, anxiety) is negatively associated with academic performance, and agreeableness (friendliness), extraversion (sociability), and openness (imaginative, open-minded) have mixed or minimal relationships with academic performance (Oswald, 2013).

Why consider personality as a predictor for success in post-secondary school? As students spend more time in their post-secondary or tertiary education, the importance of intellect is replaced by non-ability traits such as personality and motivation (Ackerman, 2010). That is not to say that intelligence becomes insignificant. However, abilities like intelligence, although initially great for predicting an individual's performance at the start of a program, become superseded by non-ability traits, such as personality, as time progresses. Research supports this idea that the relationship between time in school and measures of intellect decrease as students

spend more time in the educational setting (Ackerman, 2010), and this process repeats itself each time an individual begins a new educational program or any other type of similar experience.

The present research investigates whether certain personality traits better predict specific nontechnical skills, and attempts to identify individuals with traits that may exemplify these skills. Specifically, the current study explores the relationship between personality and two kinds of nontechnical skills: critical thinking and creativity which are mentioned more often than other skills within the literature (Jackson, 2011; Coll, 2006). Critical thinking, according to Ennis (1993) is “reasonable reflective thinking focused on deciding what to believe or do” (p.180). Creativity is the fabrication of novel ideas that are useful (Furnham 2009). This trait has gained increased interest over the years as well as value in the eyes of researchers (Sung, 2009). Creative people, according to Sung (2009), are said to be high in openness, and believed to be more flexible than most. The creative individual is thought to have a high tolerance for new ideas that may challenge current standards, and they are willing to experience new perspectives. Many careers put individuals within diverse works environments in which quick, adaptive thinking and innovation are essential.

Critical thinking ability has even been referred to as the “cornerstone of graduate education” (Jackson, 2011, p.107), yet literature investigating its attributes and origins is sparse (Clifford, 2004). The small amount of research relating to this subject supports the idea that critical thinking is composed of two components: ability and personality disposition (Zhang, 2003). Ability, in this case, refers to one’s cognitive capabilities, and personality disposition involves the ability to think critically. This trait combination is known as the “two-factor theory” (Clifford, 2004). According to Facione (2001) “the ideal critical thinker is defined as habitually

inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused on inquiry and persistent in seeking results which are precise as the subject and the circumstances of inquiry permit.” (p.1). Researchers have taken this comprehensive definition and broken it down into a handful of critical thinking dispositions. According to Ku (2009) there are seven critical thinking dispositions: open-mindedness, inquisitiveness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity. Of these, the relationship between critical thinking and openness/inquisitiveness seems to have the most empirical support, while the dispositions that resemble the Five Factor Model’s definition of conscientiousness (systematicity, analyticity) have less empirical support. Maturity, truth-seeking, and critical thinking self-confidence have the least research. Zhang (2003) supported these findings when he found a relationship between Sternberg’s cognitively complex and creative thinking styles and critical thinking. These findings suggest that critical thinking is clearly related to higher levels of cognitive abilities like creativity giving support to the two factor theory’s claim that the trait of cognitive capability is a component of critical thinking ability.

Clifford’s (2004) research between personality traits and critical thinking found that the five factor model’s domain of openness had the highest correlation with critical thinking, while the remaining four had either a negative association (conscientiousness) or none at all (neuroticism, extroversion, agreeableness). These findings seem only to support specific parts of the formerly mentioned definition of critical thinking, namely the dispositions that suggest

creativity as a part of the ideal critical thinker. These previously mentioned findings propose the bold consideration that the lengthy list of requirements of the ideal critical thinker may be a bit too long and unnecessary.

Throughout the literature, the personality domain of openness consistently correlates with critical thinking and creativity (Furnham, 2009; Kelly, 2006; King, 1996; Sung, 2009). Some studies report a positive correlation with the domain of extraversion, but only openness paralleled critical thinking reliably within each study analyzed (Clifford, 2004; Ku, 2010; Zhang, 2003). So it would be sensible to consider creativity as well as critical thinking ability when comparing personality dispositions because they seem to be related to the domain of openness. This research will take things a step further by looking for more detailed relationships between nontechnical skills and personality by utilizing the thirty personality facets of the big five personality types. These facets are specific subsets of the five general personality domains (neuroticism, openness, agreeableness, conscientiousness, and extraversion) and possibly more beneficial because they are thought to have higher validities (Costa, 1992). Using the specific facets of the NEO PI-R makes this research unique and may provide new insight among the relationships of personality, creativity, and critical thinking ability.

HYPOTHESIS

H1: Consistent with prior research (Furnham, 2009; Kelly, 2006; King, 1996; Sung, 2009), scores on openness to experience are expected to correlate positively with creativity scores. In addition, a set of hypotheses have been derived from Sung's (2009) analysis about the specific facets of Openness predicted to correlate positively with creativity:

H1a: Creativity is predicted to positively correlate with openness to fantasy.

H1b: Creativity is predicted to positively correlate with openness to actions

H1c: Creativity is predicted to positively correlate with openness to ideas.

H1d: Creativity is predicted to positively correlate with openness to values.

H2: General openness to experience scores is expected to correlate positively with critical thinking. Two hypotheses will be tested related to specific facets of openness that are consistent with Facione's (2001) description of critical thinking

H2a: Critical thinking ability will be positively correlated with openness to actions.

H2b: Critical thinking ability will be positively correlated with openness to ideas. H3:

Consistent with prior research (Facione, 2001; Oswald, 2013), conscientiousness is predicted to significantly correlate with critical thinking.

METHODS

Participants

Participants consisted of undergraduate psychology students, recruited through the standardized SONA online research management system at the University of Central Florida. Of the students who participated in the study, 73% of them were female and 25% were males, and the remaining 2% did not wish to specify. Sixty percent identified themselves as Caucasian, 20% as Hispanic or Latino, 10% as black or African American, 5% as Asian, 1% as Alaskan native or American Indian, and 4% as other. Three percent were currently in their freshman year, 33% in their sophomore year, 32% in their junior year, and 32% in their senior year. The average age of participants was 22 years old with a standard deviation of 5.5. Each participant was awarded extra or required course credit points for their participation.

Measures

NEO Personality Inventory Revised (Costa & McCrae, 1992). The NEO Personality Inventory Revised (NEO PI-R, Costa & McCrae, 1992) was used to determine the personality of participants. The NEO PI-R consists of 240 items which are rated on a five point Likert-type scale (1:Strongly Disagree to 5:Strongly Agree) in order to measure 6 facets within each of the five domains of personality for a total of 30 consisting of anxiety, angry hostility, depression, self-consciousness, impulsiveness, vulnerability (Neuroticism facets); warmth, gregariousness, assertiveness, activity, excitement seeking, positive emotions (Extraversion facets); fantasy, aesthetics, feelings, actions, ideas, values (Openness facets); trust, straightforwardness, altruism, compliance, modesty, tender-mindedness (Agreeable facets); competence, order, dutifulness,

achievement striving, self-discipline, deliberation (Conscientiousness facets). Internal consistency of the scale ranges from .68 (A) to .89 (N) (Costa & McCrae, 1992)

Torrance Test of Creative Thinking (Torrance, 1990) Creativity was operationalized by using 2 sections of the Torrance Test of Creative Thinking (TTCT) Verbal form A. The first exercise administered is called the “Just Suppose” section, in which participants imagined strings tied to clouds. The participants then were asked to list potential consequences of this phenomenon. The second exercise is labeled “Unusual Uses” and required individuals to come up with uses for a cardboard box. Responses are scored by analyzing the fluency, flexibility, and originality of participant’s responses. Fluency consists of the number of relevant responses given by participants as defined by the TTCT manual. The response flexibility is measured by how many “flexibility categories” from the TTCT manual are represented by the participants’ responses. Originality, for the purposes of this study, was specifically used to express creativity. Scores were marked as either a (0) or a (1). A zero was received when a response matches one from a pre-determined list of common responses, and a score of one when responses did not resemble anything within the list. The criterion validity of the Torrance Test is .51 (King 1996)

The Cornell Critical Thinking Test, Level Z: (CCTT Ennis, 2005). The CCTT is a 52-item test that measures the 6 components of critical thinking. They are as follows: induction, credibility, deduction, observation, assumptions, and meaning. Some questions are presented in a statement and conclusion fashion. First a statement about a topic is made followed by a conclusion. The tester determines if the conclusion is supported by the statement, contradicts the statement, or neither. Test consistency has been reported to range from .49-.87 (Ennis, 2005), and has an internal consistency value of .76.

Demographics Participants completed a demographics survey at the end of testing which collected information concerning their age, race, ethnicity, gender, major, GPA, and year in college.

Procedure

Participants logged into the SONA website and then a link took them to an external survey website. There, participants gave informed consent.. Participants were first administered the NEO Five-Factor inventory, then the Torrance Test of Creative Thinking and the Cornell Critical Thinking Test. Finally, participants completed the demographics form.

RESULTS

Pearson Bivariate Intercorrelations were performed on the data for the Torrance subscore of originality, the five factors and the 30 facets of the NEO PI-R, and the CCTT. An alpha level of .05 was applied to the analyses. All intercorrelations between personality and critical thinking and creativity are reported in tables 1 through 5.

The first hypothesis that openness would be positively correlated with creativity was supported. The correlation between originality and overall openness was significant, $r = .34, p = .001$. Three of the four specific facets of openness significantly correlated with the Torrance test: Openness to Fantasy, $r = .27, p = .008$, Openness to Ideas, $r = .28, p = .005$, and Openness to Values $r = .22, p = .04$. Hypothesis 1b predicted a positive relationship between openness to actions and creativity, and was not supported by the data. However, unexpectedly a significant, positive relationship was found between creativity and Openness to Feelings, $r = .28, p = .007$.

The hypothesis that there would be a positive correlation between overall openness to experience and critical thinking was not supported. Neither openness to experience in general nor openness to ideas or actions was significantly correlated with critical thinking. However two facets of openness were surprisingly significantly correlated with the CCTT: Openness to Feelings and the CCTT $r = .29, p = .004$, and Openness to Values, $r = .23, p = .02$. The results reporting the correlations among openness, the 6 facets of openness, the TTCT and the CCTT are reported in Table 1.

The hypothesis that conscientiousness' facet of order would positively correlate with critical thinking was not supported, no significant correlation was found. Overall

conscientiousness was not significantly correlated with critical thinking or originality. The results are reported in Table: 2.

As seen in Table: 3 there were no significant correlations with extraversion.

Overall agreeableness was not significant. Two facets of agreeableness significantly correlated with the TTCT: Agreeableness to Trust, $r = .28, p = .01$ and Agreeableness to Tender mindedness, $r = .24, p = .02$. There was no significant correlation between agreeableness and critical thinking. The results are reported in Table: 4.

Neuroticism was not significantly correlated with originality or critical thinking. No significant correlation was found between facets of neuroticism and critical thinking or originality. The correlations between neuroticism scores and scores on the TTCT and CCTT are reported in Table 5.

Table 1

Intercorrelations between Creativity (TTCT), Critical Thinking (CCTT), and the five facets of Openness.

Measure		1	2	3	4	5	6	7	8	9
1.CCTT	Pearson Correlation	1	.210*	.031	-.015	.291**	.149	.125	.234*	.200
2.Originality	Pearson Correlation	.210*	1	.269**	.181	.275**	.087	.284**	.216*	.341**
3.Fantasy	Pearson Correlation	.031	.269**	1	.092	.136	.211*	.366**	.302**	.533**
4.Aesthetics	Pearson Correlation	-.015	.181	.092	1	.221*	.374**	.598**	.189	.660**
5Feelings	Pearson Correlation	.291**	.275**	.136	.221*	1	.122	.392**	.426**	.580**
6.Actions	Pearson Correlation	.149	.087	.211*	.374**	.122	1	.440**	.273**	.589**
7.Ideas	Pearson Correlation	.125	.284**	.366**	.598**	.392**	.440**	1	.427**	.850**
8.Values	Pearson Correlation	.234*	.216*	.302**	.189	.426**	.273**	.427**	1	.671**
9.Openness	Pearson Correlation	.200	.341**	.533**	.660**	.580**	.589**	.850**	.671**	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2

Intercorrelations between Creativity (TTCT), Critical Thinking (CCTT), and the five facets of Conscientiousness.

Measure		1	2	3	4	5	6	7	8	9
1.CCTT	Pearson Correlation	1	.210*	.186	.002	.116	.184	.003	.042	.111
2.Originality	Pearson Correlation	.210*	1	.107	.149	.142	.044	.122	-.043	.115
3.Competence	Pearson Correlation	.186	.107	1	.347**	.618**	.587**	.577**	.536**	.783**
4.Order	Pearson Correlation	.002	.149	.347**	1	.493**	.352**	.626**	.447**	.717**
5.Dutifulness	Pearson Correlation	.116	.142	.618**	.493**	1	.607**	.707**	.435**	.830**
6.Achievement Striving	Pearson Correlation	.184	.044	.587**	.352**	.607**	1	.650**	.321**	.756**
7.Self-Discipline	Pearson Correlation	.003	.122	.577**	.626**	.707**	.650**	1	.426**	.868**
8.Deliberation	Pearson Correlation	.042	-.043	.536**	.447**	.435**	.321**	.426**	1	.677**
9.Conscientiousness	Pearson Correlation	.111	.115	.783**	.717**	.830**	.756**	.868**	.677**	1

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

Table 3

Intercorrelations between Creativity (TTCT), Critical Thinking (CCTT), and the five facets of Extraversion.

Measure		1	2	3	4	5	6	7	8	9
1.CCTT	Pearson Correlation	1	.210*	-.002	.011	-.060	.135	-.066	.077	.019
2.Originality	Pearson Correlation	.210*	1	.118	.189	.107	.117	.118	.150	.187
3.Warmth	Pearson Correlation	-.002	.118	1	.451**	.267**	.402**	.401**	.659**	.747**
4.Gregariousness	Pearson Correlation	.011	.189	.451**	1	.504**	.440**	.550**	.470**	.805**
5.Assertiveness	Pearson Correlation	-.060	.107	.267**	.504**	1	.504**	.379**	.318**	.679**
6.Activity	Pearson Correlation	.135	.117	.402**	.440**	.504**	1	.302**	.365**	.665**
7.Excitement-seeking	Pearson Correlation	-.066	.118	.401**	.550**	.379**	.302**	1	.347**	.677**
8.Positive emotions	Pearson Correlation	.077	.150	.659**	.470**	.318**	.365**	.347**	1	.746**
9.Extraversion	Pearson Correlation	.019	.187	.747**	.805**	.679**	.665**	.677**	.746**	1

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4

Intercorrelations between Creativity (TTCT), Critical Thinking (CCTT), and the five facets of Agreeableness.

Measure		1	2	3	4	5	6	7	8	9
1.CCTT	Pearson Correlation	1	.210*	.150	.130	.075	-.007	-.003	-.017	.078
2.Originality	Pearson Correlation	.210*	1	.276**	.135	.158	.089	.044	.240*	.210*
3.Trust	Pearson Correlation	.150	.276**	1	.371**	.390**	.316**	.288**	.478**	.658**
4.Straightforwardness	Pearson Correlation	.130	.135	.371**	1	.528**	.520**	.488**	.397**	.786**
5.Altruism	Pearson Correlation	.075	.158	.390**	.528**	1	.355**	.348**	.517**	.703**
6.Compliance	Pearson Correlation	-.007	.089	.316**	.520**	.355**	1	.411**	.313**	.695**
7.Modesty	Pearson Correlation	-.003	.044	.288**	.488**	.348**	.411**	1	.446**	.726**
8.Tender-mindedness	Pearson Correlation	-.017	.240*	.478**	.397**	.517**	.313**	.446**	1	.703**
9.Agreeableness	Pearson Correlation	.078	.210*	.658**	.786**	.703**	.695**	.726**	.703**	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5

Intercorrelations between Creativity (TTCT), Critical Thinking (CCTT), and the five facets of Neuroticism.

Measure		1	2	3	4	5	6	7	8	9
1.CCTT	Pearson Correlation	1	.210*	.067	.021	-.071	.155	.020	-.193	-.006
2.Originality	Pearson Correlation	.210*	1	-.036	-.021	-.100	.077	-.033	-.109	-.058
3.Anxiety	Pearson Correlation	.067	-.036	1	.246*	.287**	.223*	.433**	.331**	.584**
4.Angry Hostility	Pearson Correlation	.021	-.021	.246*	1	.381**	.266**	.472**	.369**	.686**
5.Depression	Pearson Correlation	-.071	-.100	.287**	.381**	1	.502**	.390**	.481**	.789**
6.Self- Consciousness	Pearson Correlation	.155	.077	.223*	.266**	.502**	1	.159	.286**	.614**
7.Impulsiveness	Pearson Correlation	.020	-.033	.433**	.472**	.390**	.159	1	.278**	.665**
8.Vulnerability	Pearson Correlation	-.193	-.109	.331**	.369**	.481**	.286**	.278**	1	.679**
9.Neuroticism	Pearson Correlation	-.006	-.058	.584**	.686**	.789**	.614**	.665**	.679**	1

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

The present study explored the relationships between personality and the nontechnical skills of creativity and critical thinking ability. It was originally hypothesized that 4 facets of the personality domain of openness (Fantasy, Actions, Ideas, and Values) would have a significant relationship with creativity, and only two facets would significantly relate to critical thinking ability (Actions and Feelings). Additionally, conscientiousness was predicted to be correlated with critical thinking. Agreeableness was not predicted to correlate with either skill. These predictions proved to be only partially true after analysis. Interestingly, the unpredicted results demonstrate relationships between feelings and agreeableness with these skills, suggesting emotional management or expression may have a relationship with the two nontechnical skills that were explored.

Consistent with prior research, openness to experience overall was positively correlated with creativity. More illuminating was that four specific facets of openness had significant relationships with creativity: fantasy, feelings, ideas, and values. Openness to feelings was not a part of the original hypotheses, whereas openness to actions was uncorrelated with creativity in this sample.

The focus on external, rather than internal stimulation is a possible explanation for the weak relationship between openness to action and creativity. The Actions facet involves quest for novel stimulations, which according to Sung (2009) is a part of creativity. In contrast, Furnham (2009) said that creativity must be manufactured, i.e. something fabricated internally. Perhaps individual construction is the key for creativity to be momentous, and not the seeking of stimulating events.

Two of the Openness facets (Openness to Feelings, Openness to Values) related to critical thinking; however neither facet was predicted. It is unclear why Openness to Feelings and Openness to Values correlate positively with critical thinking. Possibly the reason why Openness to Values positively correlated with critical thinking is because it describes characteristics in individuals with a more diligent mind; i.e. one who is open to questioning assumptions. Perhaps this finding reflects Facione's (2001) definition of critical thinking. Someone scoring higher on the Feelings facet is more likely to empathize with others and process their emotions. It is unclear how this facet supports critical thinking.

Although agreeableness was not included in the hypotheses, two facets of the agreeableness domain, trust and tendermindedness, correlated positively to critical thinking. Individuals scoring high on the trust facet are predisposed to believe that people are well intentioned (Costa, 1992). Those who score low in this facet are thought to be cynical and even somewhat closed-minded, whereas those who score high are open-minded and higher in creativity. In addition, those who score high on tendermindedness were also more likely to score high on creativity. Tenderminded people self-report as forgiving and sympathetic.

No facet from the domain of conscientiousness was related to critical thinking which goes against the hypothesis. Although organization is a part of Facione's (2001) definition of critical thinking, perhaps being organized is an insignificant part of the definition. Also, previous results correlate conscientiousness with GPA, not with critical thinking (Rothstein, 1994). These results suggest that the ideal critical thinker is intended to be sharp minded but may not necessarily be organized and disciplined.

Applications of the Research

Nontechnical skills are desired by employers. Some aspects of personality are found within those who possess these nontechnical skills. That is not to say that personality is the sole reason for this skill development, only that individuals with these personality traits are more likely to possess or develop the desired skills. Industries that need workers who possess these skills should consider using personality evaluations in order to assist in identifying the aforementioned personality traits in their job candidates. This may help employers identify the perfect candidate for the job they are looking to fill or at least someone who has a greater chance at succeeding in the specific position. This research helps to reveal specific personality traits that relate to creativity and critical thinking, which are the foundation of nontechnical skills sought by employers.

Limitations

The current research was not without its drawbacks. Although a handful of students participated in the research in a short amount of time, the sample size was too small. Also there was not enough diversity in the sample, more than 50% of the participants were Caucasian, and more than 70% of the overall sample consisted of females. In addition all participants came from the same university as well as the same college which is another factor limiting participant diversity. Additionally, this research was correlational. Other variables could have some effects on the results.

Future Research

Further research should increase the sample size by a minimum of 200 participants, and attempt to use ways other than a convenience sample in order to acquire a more diverse sample of participants. Also future research could use pools of potential employees seeking work. The research suggests the employers should be searching for those who can stray from the designated path and manufacture fresh creations whether they are tangible or not. They should be searching for individuals who seek out new experiences, are not afraid to reevaluate their current state of affairs, are more in touch with themselves, are content with who they, and possess a sense compassion. People who hold traits like these will be more likely to possess and develop the nontechnical skills like creativity and critical thinking that are so strongly desired by employers.

APPENDIX A: IRB APPROVAL LETTER



University of Central Florida Institutional
Review Board Office of Research &
Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2012 or
407-882-2276
www.research.ucf.edu/compliance/irb.html

Acknowledgment of Study Closure

From : **UCF Institutional
Review Board #1
FWA00000351,
IRB00001138**

To : **Shannon N. Whitten** and Co-PIs: **John Doyle & Karen E. Mottarella**

Date : **February 26, 2014**

Dear Researcher:

On 2/26/2014 the IRB conducted an administrative review of the FORM: Study Closure Request that you submitted in iRIS. The study has been closed within the system.

This report is in regards to:

Type of Review: Study Closure
Project Title: Personality, Critical Thinking
and Creativity Study
Investigator: Shannon N Whitten
IRB Number: SBE-14-10015
Funding Agency:
Grant
Title:
Research
ID: N/A

As part of this action:

- The research is permanently closed to enrollment.
- All participants have completed all research-related interventions.
- Collection of private identifiable information is completed.

- Analysis of private identifiable information is

completed. Thank you for notifying the IRB of this modification.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Kamille Chaparro on 02/26/2014 10:31:36 AM EST

A handwritten signature in black ink that reads "Kamille Chaparro". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

IRB Coordinator
Submission Reference Number: 020095

APPENDIX B: REVISED NEO PERSONALITY INVENTORY (NEO PI-R)

Revised NEO Personality Inventory (NEO PI-R)

NEO PI-R Scale

Please read each item carefully and circle the one answer that best corresponds to your agreement or disagreement.

Strongly Disagree (SD) Disagree (D) Neutral (N) Agree (A) Strongly Agree (SA)

SD D N A SA

1. I am not a worrier
2. I really like most people I meet.
3. I have a very attractive imagination.
4. I tend to be cynical and skeptical of others' intentions.
5. I am known for my prudence and common sense.
6. I often get angry at the way people treat me.
7. I shy away from crowds of people.
8. Aesthetic and artistic concerns aren't very important to me.
9. I am not crafty or sly.
10. I would rather keep my options open than plan everything in advance.
11. I rarely feel lonely or blue.

12. I am dominant, forceful, and assertive.
13. Without strong emotions, life would be uninteresting to me.
14. Some people think I am selfish and egotistical.
15. I try to perform all the tasks assigned to me consistently.
16. In dealing with other people, I always dread making a social blunder.
17. I have a leisurely style in work and play.
18. I am pretty set in my ways.
19. I would rather cooperate with others than compete with them.
20. I am easy-going and lackadaisical.
21. I rarely overindulge in anything.
22. I often crave excitement.
23. I often enjoy playing with theories or abstract ideas.
24. I don't mind bragging about my talents and accomplishments.
25. I am pretty good about pacing myself to get things done on time.
26. I often feel helpless and want someone else to solve my problems.
27. I have never literally jumped for joy.
28. I believe letting students hear controversial speakers can only confuse and mislead them.

29. I think political leaders need to be more aware of the human side of their policies.
30. Over the years, I have done some pretty stupid things.
31. I am easily frightened.
32. I do not get much pleasure from chatting with people.
33. I try to keep all of my thoughts directed along realistic lines and avoid flights of fancy.
34. I believe that most people are basically well-intentioned.
35. I don't take civic duties like voting very seriously.
36. I am an even tempered person.
37. I like to have a lot of people around me.
38. I am sometimes completely absorbed in music I am listening to.
39. If necessary, I am willing to manipulate people to get what I want.
40. I keep my belongings neat and clean.
41. Sometimes I feel completely worthless.
42. I sometimes fail to assert myself as much as I should.
43. I rarely experience strong emotions.
44. I try to be courteous to everyone I meet.
45. Sometimes I am not as dependable or reliable as I should be.

46. I seldom feel self-conscious when I'm around people.
47. When I do things, I seldom do them vigorously.
48. I think it is interesting to learn and develop new hobbies.
49. I can be sarcastic and cutting when I need to be.
50. I have a clear set of goals and work toward them in an orderly fashion.
51. I have trouble resisting my cravings.
52. I wouldn't enjoy vacationing in Las Vegas.
53. I find philosophical arguments boring.
54. I'd rather not talk about myself and my achievements.
55. I waste a lot of time before settling down to work.
56. I feel I am capable of coping with most of my problems.
57. I have sometimes experienced intense joy or ecstasy.
58. I believe that laws and social policies should change to reflect the needs of a changing world.
59. I am hard-headed and tough-minded in my attitudes.
60. I think things through before coming to a decision.
61. I rarely feel fearful or anxious.

62. I am a warm and friendly person.
63. I have an active fantasy life.
64. I believe that most people will take advantage of you if you let them.
65. I keep myself informed and usually make intelligent decisions.
66. I am hot-blooded and quick tempered.
67. I usually prefer to do things alone.
68. Watching ballet or modern dance bores me.
69. I couldn't bring myself to deceive anyone if I wanted to.
70. I am not a very methodical person.
71. I am seldom sad or depressed.
72. I have often been a leader of groups I have belonged to.
73. How I feel about things is important to me.
74. Some people think of me as cold and calculating.
75. I pay my debts promptly and in full.
76. At times I have been so ashamed I just wanted to hide.
77. My work is likely to be slow but steady.
78. Once I find the right way to do something, I stick to it.

79. I hesitate to express my anger even when it is justified.
80. When I start a self improvement program, I usually let it slide after a few days.
81. I have little difficulty resisting temptation.
82. I have sometimes done things just for "kicks" or "thrills."
83. I enjoy solving problems or puzzles.
84. I think I am better than most people.
85. I am a productive person who always gets the job done.
86. When I'm under a great deal of stress, sometimes I feel like I am going to pieces.
87. I am not a cheerful optimist.
88. I believe we should look to our religious authorities for decisions on moral issues.
89. I feel we can never do too much for the poor and elderly.
90. Occasionally I act first and think later.
91. I often feel intense and jittery.
92. Many people think of me as somewhat cold and distant.
93. I don't like to waste my time daydreaming.
94. I think most people I deal with are honest and trustworthy.
95. I often come into situations without being fully prepared.

96. I am not considered a touchy or temperamental person.
97. I really feel the need for other people if I am by myself for long.
98. I am intrigued by the patterns I find in art and nature.
99. I think being perfectly honest is a bad way to do business.
100. I like to keep everything in its place so I'll know just where it is.
101. I have sometimes experienced a deep sense of guilt or sinfulness.
102. In meetings, I usually let others do the talking.
103. I seldom pay much attention to my feelings of the moment.
104. I generally try to be thoughtful and considerate.
105. Sometimes I cheat when I play solitaire.
106. It doesn't embarrass me too much if people ridicule and tease me.
107. I often feel as if I'm bursting with energy.
108. I often try new and foreign foods.
109. If I don't like people, I let them know it.
110. I work hard to accomplish my goals.
111. When I am having my favorite foods, I tend to eat too much.
112. I tend to avoid movies that are shocking or scary.

113. I sometimes lose interest when people talk about very abstract, theoretical matters.
114. I try to be humble.
115. I have trouble making myself do what I should.
116. I keep a cool head in emergencies.
117. Sometimes I bubble with happiness.
118. I believe that the different ideas of right and wrong that people in their societies have may be valid for them.
119. I have no sympathy for panhandlers.
120. I always consider the consequences before I take action.
121. I am seldom apprehensive about the future.
122. I really enjoy talking about the future.
123. I enjoy concentrating on a fantasy or daydream and exploring all possibilities, letting it grow and develop.
124. I am suspicious when someone does something nice for me.
125. I pride myself on my sound judgment.
126. I often get disgusted with people I have to deal with.
127. I prefer jobs that let me work alone without being bothered by others.

128. Poetry has little or no effect on me.
129. I would hate to be thought of as a hypocrite.
130. I never seem to be able to get organized.
131. I tend to blame myself when anything goes wrong.
132. Other people often look to me to make decisions.
133. I experience a wide range of emotions or feelings.
134. I am known for my generosity.
135. When I make a commitment, I can always be counted on to follow through.
136. I often feel inferior to others.
137. I am not as quick and lively as other people.
138. I prefer to spend my time in familiar surroundings.
139. When I have been insulted, I just try to forgive and forget.
140. I don't feel like I am driven to get ahead.
141. I seldom give into my impulses.
142. I like to be where the action is.
143. I enjoy working on the "mind-twister"-type puzzles.
144. I have a very high opinion of myself.

145. Once I start a project, I almost always finish it.
146. It's often hard for me to make up my mind.
147. I am not especially "light-hearted."
148. I believe that loyalty to one's ideals and principles is more important than "open-mindedness."
149. I believe that human need should always take priority over economic considerations.
150. I often do things on the spur of the moment.
151. I often worry about things that might go wrong.
152. I find it easy to smile and be outgoing with strangers.
153. If I feel my mind starting to drift off into daydreams, I usually get busy and start concentrating on some work or activity instead.
154. My first reaction is to trust people.
155. I don't seem to be completely successful at anything.
156. It takes a lot to get me mad.
157. I'd rather vacation at a popular beach than an isolated cabin in the woods.
158. Certain kinds of music have an endless fascination for me.
159. Sometimes I trick people into doing what I want.

160. I tend to be somewhat fastidious or exacting.
161. I have a low opinion of myself.
162. I would rather go my own way than be a leader of others.
163. I seldom notice the moods or feelings that different environments produce.
164. Most people I know like me.
165. I adhere strictly to my ethical principles.
166. I feel comfortable in the presence of my bosses or other authorities.
167. I usually seem to be in a hurry.
168. Sometimes I make changes around the house just to try something different.
169. If someone starts a fight, I'm ready to fight back.
170. I strive to achieve all I can.
171. I sometimes eat myself sick.
172. I love the excitement of roller coasters.
173. I have little interest in speculating on the nature of the universe or the human condition.
174. I feel that I am no better than others, no matter what their condition.
175. When a project gets too difficult, I'm inclined to start a new one.
176. I can handle myself pretty well in a crisis.

177. I am a cheerful, high-spirited person.

178. I consider myself broad-minded and tolerant of other people's lifestyles.

179. I believe all human beings are worthy of respect.

180. I rarely make hasty decisions.

181. I have fewer fears than most people.

182. I have strong emotional attachments to my friends.

183. As a child, I rarely enjoyed games of make believe.

184. I tend to assume the best about people.

185. I am a very competent person.

186. At times, I have felt bitter and resentful.

187. Social gatherings are usually boring to me.

188. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.

189. At times I bully or flatter people into doing what I want them to.

190. I'm not compulsive about cleaning.

191. Sometimes things look pretty bleak and hopeless to me.

192. In conversations, I tend to do most of the talking.

193. I find it easy to empathize - to feel myself what others are feeling.
194. I think of myself as a charitable person.
195. I try to do jobs carefully, so they won't have to be done again.
196. If I have said or done the wrong thing to someone, I can hardly bear to face them again.
197. My life is fast paced.
198. On a vacation, I prefer going back to a tried and true spot.
199. I am hard-headed and stubborn.
200. I strive for excellence in everything I do.
201. Sometimes I do things on impulse that I later regret.
202. I am attracted to bright colors and flashy styles.
203. I have a lot of intellectual curiosity.
204. I would rather praise others than be praised myself.
205. There are so many little jobs that need to be done that sometimes I ignore them all.
206. When everything seems to be going wrong, I can still make good decisions.
207. I rarely use words like "fantastic!" or "sensational!" to describe my experiences.
208. I think that if people don't know what they believe in by the time they're 25, there is something wrong with them.

209. I have sympathy for others less fortunate than me.
210. I plan ahead carefully when I go on a trip.
211. Frightening thoughts sometimes come into my head.
212. I take a personal interest in the people I work with.
213. I would have difficulty just letting my mind wander without control or guidance.
214. I have a good deal of faith in human nature.
215. I am efficient and effective at my work.
216. Even minor annoyances can be frustrating to me.
217. I enjoy parties with lots of people.
218. I enjoy reading poetry that emphasizes feelings and images more than story lines.
219. I pride myself on my shrewdness in handling people.
220. I spend a lot of time looking for things I've misplaced.
221. Too often, when things go wrong, I get discouraged and feel like giving up.
222. I don't find it easy to take charge of the situation.
223. Odd things-like certain scents or the names of distant places-can evoke strong moods in me.
224. I go out of my way to help others if I can.

225. I'd have to be really sick before I'd miss a day of work.
226. When people I know do foolish things, I get embarrassed for them.
227. I am a very active person.
228. I follow the same route when I go someplace.
229. I often get into arguments with my family and co-workers.
230. I am something of a "workaholic."
231. I am always able to keep my feelings under control.
232. I Like being part of the crowd at sporting events.
233. I have a wide range of intellectual interests.
234. I think I am a superior person.
235. I have a lot of self-discipline.
236. I am pretty stable emotionally.
237. I laugh easily.
238. I believe that the "new morality" of permissiveness is no morality at all.
239. I would rather be known as "merciful" than as "just."
240. I think twice before I answer a question.

**APPENDIX C: TORRANCE TEST OF CREATIVE THINKING FORM A
ACTIVITIES 5 AND 7.**

Torrance Test of Creative Thinking Form A

TORRANCE TEST

1. UNUSUAL USES (Cardboard boxes)

Most people throw their empty cardboard boxes away, but they have thousands of interesting and unusual uses. In the space below, list as many of these interesting and unusual uses as you can think of. Do not limit yourself to any one size of box. You may use as many boxes as you like. Do not limit yourself to the uses you have seen or heard about; think about as many possible new uses as you can.

2. JUST SUPPOSE

You will now be given an improbable situation – one that will probably never happen. You will have to *just suppose* that it has happened. This will give you a chance to use your imagination to think out all of the other exciting things that would happen IF this improbable situation were to come true.

In your imagination, just suppose that the situation described were to happen. THEN think of all the other things that would happen because of it. In other words, what would be the consequences? Make as many guesses as you can.

The improbable situation – JUST SUPPOSE clouds had strings attached to them which hang down to the earth. What would happen? List your ideas and guesses on the next page.

APPENDIX D: CORNELL CRITICAL THINKING TEST: LEVEL Z

Cornell Critical Thinking Test Level Z

SECTION IA.

In the first five items, two men are debating about voting by eighteen-year-olds. Mr. Pinder is the speaker in the first three items, Mr. Wilstings in the last two. Each item presents a set of statements and a conclusion. In each item, the conclusion is in brackets. Do not be concerned with whether or not the conclusions or statements are true.

Mark items 1 through 5 according to the following system:

If the conclusion follows necessarily from the statements given, mark A.

If the conclusion contradicts the statements given, mark B.

If the conclusion neither follows necessarily nor contradicts the statements given, mark C.

If a conclusion follows necessarily, a person who accepts the statements is unavoidably committed to accepting the conclusion. When two things are contradictory, they cannot both be correct.

CONSIDER EACH ITEM INDEPENDENTLY OF THE OTHERS.

1. “Mr. Wilstings says that eighteen-year-olds haven’t faced the problems of the world, and that anyone who hasn’t faced these problems should not be able to vote. What he says is correct, but eighteen-year-olds still should be able to vote. They’re mature human beings, aren’t they?”
2. “Furthermore, eighteen-year-olds should be allowed to vote because anyone who will suffer or gain from a decision made by the voters ought to be permitted to vote. It is clear that eighteen-year-olds will suffer of gain from the decisions of the voters.”

3. “Many eighteen-year-olds are serving their country. Now there can be no doubt that many people serving their country ought to be allowed the vote. From this you can see that many eighteen-year-olds ought to be allowed to vote.”
4. “I agree with Mr. Pinder that anyone who will suffer or gain from a decision made by the voters ought to be permitted to vote. And it is true that eighteen-year-olds will suffer or gain from these decisions. But so will ten-year-olds. Therefore, eighteen-year-olds shouldn’t be allowed to vote.”
5. “Most eighteen-year-olds don’t know the difference between right and wrong. The right to vote shouldn’t be possessed by the members of a group if most of them don’t know this difference. It is obvious then that eighteen-year-olds shouldn’t have the right to vote.”

SECTION IB.

In items 6-10, the two men are debating about immigration. Mr. Pinder is speaking in the first three items, Mr. Wilstings in the last two.

Use the same system to mark items 6 through 10:

- A. Conclusion follows necessarily from the statements given.
- B. Conclusion contradicts the statements given.
- C. Neither.

CONSIDER EACH ITEM INDEPENDENTLY OF THE OTHERS.

6. “Mr. Wilstings has proposed that we open our doors to all the foreigners who want to enter our beloved country. But foreigners always have made trouble and they always will.

Most of them can't even speak English. Since anybody who makes trouble is bad, it follows that foreigners are bad."

7. "You may not know it, but for the past ten years the Communists in our country have been supporting a policy of unrestricted immigration, it is obvious why they support this policy of opening our doors to foreigners. Now I hate to this say, but Mr. Wilsting's support of this policy leaves us but one conclusion: Mr. Wilstings is a Communist."
8. "Mr. Wilstings has said that most foreigners have made positive contributions to our country. This is true. I will also admit that a group is not bad if most of its members do make positive contributions. But don't be deceived by Mr. Wilstings' fine-sounding language. Foreigners are a bad group and shouldn't be admitted."
9. "I'm sorry that Mr. Pinder feels that way about it. Sure, foreigners make trouble and most of them can't speak English. But even though it's true that people who make trouble ought not to be admitted, we still ought to admit foreigners to our country. You don't want to be selfish, do you?"
10. "All of you think it was all right to open our doors to all people from distant lands in the nineteenth century. Any person who thinks it was all right to do so at that time should also be in favor of doing so now. Thus, you ought to be in favor of opening our doors now to those from distant lands who are seeking admission to our country."

SECTION II.

The discussion that follows is divided into parts to correspond to items 11 through 21. There is faulty thinking going on in each part. Your job for each item is to pick the best reason why the thinking is faulty.

To take this part of the test, you need not know anything about the chlorination of water supplies.

11. DOBERT: I hear that you and some other crackpots are trying to get Gallton to chlorinate its water supply. You seem to think that that will do some good. There can be no doubt that either we should chlorinate or we shouldn't. Only a fool would be in favor of chlorinating the water, so we ought not do it.

ALGAN: You are correct at least in saying that we are trying to get the water chlorinated.

Pick the one best reason why some of this thinking is faulty.

- A. Dobert is mistakenly assuming that there are only two alternatives.
- B. Dobert is using a word in two ways.
- C. Dobert is using emotional language that doesn't help to make his argument reasonable.

12. DOBERT: I guess you know that to put chlorine in the water is to threaten the health of every one of Gallton's citizens, and that, you'll admit, is bad.

ALGAN: What right do you have to say that our health will be threatened?

DOBERT: "Healthy living" may be defined as living according to nature. Now, we don't find chlorine added to water in nature. Therefore, everyone's health would be threatened if chlorine were added.

Pick the one best reason why some of this thinking is faulty.

- A. Dobert is using emotional language that doesn't help to make his argument reasonable.
- B. Dobert's thinking is in error.
- C. Dobert is using a word in two different ways.

13. DOBERT: Furthermore, Gallton's water is pure already. I know this from the report, which you haven't seen yet, that will soon be released by the State Water Survey.

ALGAN: You can't know that Gallton's water is pure. The State Water Survey didn't test all the water that have available to us. They only took samples. Furthermore, you can't know that they didn't make an error in their investigation. Therefore, you could never know that Gallton's water is pure.

Pick the one best reason why some of this thinking is faulty.

Algan is not using "know" in its ordinary sense, yet he is expecting the effect that follows from its being used in the ordinary sense.

Dobert, in using secret evidence, is not being fair, since this evidence is not available to everyone for inspection.

Algan can't know that an error was made in the investigation.

14. DOBERT: I understand that you look on this thing as an experiment. I'm sure that the citizens of Gallton don't want to be guinea pigs in this matter.

ALGAN: This is a demonstration. Nobody ought to object to a demonstration, since the purpose of a demonstration is not to find out something, but rather to show us something that is already

known. An additional value of this demonstration of chlorination is that its purpose is also to test for the long-range effects of chlorination on the human body. This objective of the demonstration is a worthy one.

Pick the one best reason why some of this thinking is faulty.

Algan has not shown that knowing the long-range effects of chlorination is a worthy objective.

Algan is using a word in two ways.

There is an error in thinking in this part.

15. ALGAN: The question boils down to two alternatives. Either we want clean, chlorinated water or we want bad-smelling, disease-ridden water. The citizens of Gallton certainly don't want bad-smelling, disease-ridden water. What is left but to chlorinate?

Pick the one best reason why some of this thinking is faulty.

Algan hasn't shown that there are only two alternatives.

Algan is using emotional language that doesn't help to make the argument reasonable.

Algan is using the same word in two ways.

16. DOBERT: Laying aside the question of either medication is bad or good, wouldn't you say that you are proposing a plan for medication?

ALGAN: Not at all. Is killing germs in the water supply the same as treating a disease of the human body? Certainly not. Therefore, my plan cannot be called a plan for medication.

DOBERT: Oh, but it is medication. Isn't one of your stated goals the prevention of disease? Medication is the process of trying to restore or preserve health in any manner whatsoever. Whether your plan actually would result in preserving or restoring health doesn't matter. The point is that you would be trying to do so and thus would be medicating people.

Pick the one best reason why some of this thinking is faulty.

There is a serious mistake in the thinking in this part.

Dobert's conclusion doesn't necessarily follow the reasons he gives.

Dobert and Algan are using the same word differently.

17. DOBERT: Can you prove that chlorination is useful in making water safe?

ALGAN: Yes, I can. Devton gets its water from the same place that we do. Three years ago, Devton had nine cases of typhoid fever. Two years ago they started to chlorinate and they had only two cases that year. That's proof enough.

Pick the one best reason why some of this thinking is faulty.

Algan is using the same word in two ways.

That's not a big enough reduction. If there were no typhoid at all the second year, then Algan would have proven his statement.

One such comparison is not enough to prove such a statement.

18. DOBERT: In reality, you are proposing to poison our water supply when you propose to put

chlorine gas in the water. Chlorine gas has been used in war to kill human beings. It is a deadly poison. Nobody wants to be poisoned.

ALGAN: But when chlorine is mixed 3 ½ parts per million, nobody will be hurt at all.

DOBERT: That's not the point. You'd still be putting a deadly poison in the water. That's what it means to poison the water. So anyone drinking the water would necessarily be poisoned.

Pick the one best reason why some of this thinking is faulty.

Algan is missing the point.

Dobert is using the same word in two ways.

Dobert's thinking is in error.

19. DOBERT: Furthermore, Gallton's water is safe now.

ALGAN: That's not true. Nothing is safe as long as there's a conceivable chance for something to go wrong. From this it follows that Gallton's water is not safe.

Pick the one best reason why some of this thinking is faulty.

Algan has made the word "safe" useless for communicating information.

Algan hasn't said what he means by "safe".

There is a flaw in Algan's thinking.

20. DOBERT: The citizens of Gallton will have to make a choice. Either we want absolutely pure water or we should keep our present setup. Now any chemist can tell you that from a

practical point of view it is impossible to remove all the impurities from a water supply. So we should leave things the way they are.

Pick the one best reason why some of this thinking is faulty.

Dobert hasn't shown that there are only two alternatives.

Dobert is using the same word in two ways.

The conclusion doesn't necessarily follow the reasons given.

21. DOBERT: To add chlorine is to add a drug to Gallton's water supply. Obviously, we don't want our citizens to be drugged every time they take a drink of water.

ALGAN: What right do you have to say that chlorine is a drug?

DOBERT: The term "drug" is defined in section 201 (g) of the Federal Food, Drug, and Cosmetic Act as an article intended for use in the diagnosis, cure, treatment, or prevention of disease in man or other animals. Now, since chlorine is intended for use in the prevention of disease, it is a drug.

Pick the one best reason why some of this thinking is faulty.

Dobert's thinking is in error.

Algan should realize that a person has right to use a word in a special way. The important thing is that there be understanding of what is said.

Dobert is using a word in two different ways.

SECTION III.

An experiment was performed by Drs. E. E. Brown and M. R. Kolter in the veterinary laboratory of the British Ministry of Agriculture and Fisheries. The doctors were interested in what happens to ducklings that eat cabbage worms. Several cases had been reported to them in which ducklings had “mysteriously” died after being in cabbage patches containing cabbage worms.

Three types of ducklings were secured (Mallards, Pintails, and Canvasbacks), two broods of each. Each brood was then split into two equal groups as much alike as possible. For a one-week period, they were provided an approved diet for ducklings. All had this diet, except that half of each brood were provided something more: two cabbage worms daily per duckling. The condition of the ducklings at the end of the week was observed and is reported in the following table:

Type of Duckling	Original Number of Brood	Regular Diet			Regular Diet Plus Worms		
		Healthy	Ill	Dead	Healthy	Ill	Dead
Mallard	8	3	1			2	2
	6	3					3
Pintail	6	2		1			3
	8	3	1		1		3
Canvasback	8	4				1	3
	8	3	1			1	3

The doctors drew this conclusion: CABBAGE WORMS ARE POSIONOUS TO DUCKLINGS.

The experiment attracted a great deal of attention. Many statements were made about the experiment and about the protection of ducklings.

Items 22 through 25 each contain a pair of statements (A & B). Read both, then decide, which, if either, is more believable.

Mark items 22 through 25 according to the following system:

If you think the first is more believable, mark A.

If you think the second is more believable, mark B.

If neither statement is more believable than the other, mark C.

In making your decisions, use the information already provided and the information in parentheses after each statement.

22. A. Cabbage worms are poisonous to ducklings (said by Dr. Kolter).

B. Six Canvasbacks died during the week of the experiment (said by Dr. Kolter).

C. Neither statement is more believable.

23. A. Six pintails were healthy at the end of the experiment (said by Dr. Brown).

B. Four worm-fed ducklings were ill at the end of the experiment (said by Dr. Brown).

C. Neither statement is more believable.

24. A. During the week following the experiment, all of the ill ducklings died. (From an article in a magazine that can be found on almost every newsstand. The author, a popular international writer, stated that he obtained his information from Drs. Brown and Kolter.)

B. During the week following the experiment, the rest of the worm-fed ducklings died (from the report written by Drs. Brown and Kolter).

C. Neither statement is more believable.

25. A. Independent laboratory studies have shown conclusively that ducklings sprayed with Wrodane will not be harmed by eating cabbage worms (from an article in a magazine published by a chemical company that makes Wrodane).

B. No satisfactory way has yet been found to counteract the poisonous effects of cabbage worms on ducklings (from the magazine article mentioned in Item No. 24, which appeared two months after the Wrodane article).

C. Neither statement is more believable.

APPENDIX E: DEMOGRAPHIC SURVEY

Demographic Survey

1. Please indicate your gender:

·Male

·Female

2. What is your age?

3. What is your major?

4. What is your academic year?

·Freshman

· Sophomore

·Junior

·Senior

5. Please indicate your ethnicity:

·American Indian or Alaskan Native

· Asian

·Black or African American (Not of Hispanic Origin)

· Hispanic or Latino

·Native Hawaiian or Other Pacific Islander

· White or Caucasian (Not of Hispanic Origin)

6. What is your GPA?

7. Have you ever taken a Critical Thinking course in college?

8. Have you ever taken a personality quiz?

9. Have you ever failed a class?

10. Have you ever withdrawn from a college level class?

REFERENCES

- Ackerman, P., Chamorro-Premuzic, T., & Furnham, A. (2011). Trait complexes and academic achievement: Old and new ways of examining personality in educational contexts. *British Journal of Educational Psychology, (81)*, 27-40.
- Blanch, A. (2004). Socialized personality, scholastic aptitudes, study habits, and academic achievement: Exploring the link. *European Journal of Psychological Assessment, 20(3)*, 157-165.
- Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality, 37*, 319-338.
- Clifford, J. S., Boufal, M. M., & Kurtz, J. E. (2004). Personality traits and critical thinking skills in college students. *Assessment, 11(2)*, 169-176.
- Coll, R., & Zegwaard, K. (2006). Perceptions of desirable graduate competencies for science and technology new graduates. *Research in Science & Technological Education, 24(1)*, 29-58.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *NEO Five-Factor Inventory (NEO-FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.
- Ennis, R. H. (1993). Critical thinking assessment. *Theory into Practice, 32(3)*, 179-186.

- Ennis, R. H., Millman, J. & Tomko, T. N. (2005). *Cornell critical thinking tests level X & Level Z Manual*, (5th Edition, Revised). Seaside, CA: The Critical Thinking Co.
- Facione, P., Facione, N., & Giancarlo, C. (2001). *California Critical Thinking Disposition Inventory – Inventory Manual*. Millbrae, CA: The California Academic Press.
- Furnham, A., Crump, J., & Swami, V. (2009). Abstract reasoning and big five personality correlates of creativity in a british occupational sample. *Imagination, Cognition and Personality*, 28(4), 361-370.
- Jackson, D., & Chapman, E. (2011). Non-technical skill gaps in Australian business graduates. *Education + Training*, 54(2), 95-113.
- Kelly, K. E. (2006). Relationship between the five-factor model of personality and the scale of creative attributes and behavior: a validation study. *Individual Differences Research*, 4(5), 299-305.
- King, L. A., Walker, L. M., & Broyles, S. J. (1996). Creativity and the big five-factor model. *Journal of Research in Personality*, 30, 189-203
- Ku, K. Y. L., & Ho, I. T. (2010). Dispositional Factors predicting Chinese students' critical thinking performance. *Personality and Individual Differences*, 48, 54-58.
- Litchfield, A., Frawley, J., & Nettleton, S. (2010). Contextualizing and integrating into the curriculum the learning and teaching of the work-ready professional graduate attributes. *Higher Education Research & Development*, 29(5), 519-534.

Oswald, F. (2013). The criterion-related validity of personality measures for predicting gpa: A meta-analytic validity competition. *Psychological Assessment, 25*(2), 532-544.

Rothstein, M., Paunonen, S., & Rush, J., & King, G. (1994). Personality and cognitive ability predictors of performance in graduate business school. *Journal of Educational Psychology, 86*(4), 516-530.

Saurin, T. A., Wachs, P., Henriqson, E. (2012). Identification of non-technical skills from the resilience engineering perspective: A case study of an electricity distributor. *Safety Science 51*, 37-48.

Sung, S. Y., Choi, J. N. (2009). Do big five personality factors affect individual creativity? The moderating role of extrinsic motivation. *Social Behavior and Personality, 37*(7), 941-956.

Wickramasinghe, V., & Perera, L. (2010). Graduates, university lecturers, and employers perceptions towards employability skills. *Education & Training, 52*(3), 226-244

Zhang, L. (2003). Contributions of thinking styles to critical thinking dispositions. *The Journal of Psychology, 137*(6), 517-544.