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I am a critical thinker: exploring the relationship between self-concept and critical thinking ability

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"I AM A CRITICAL THINKER": EXPLORING THE RELATIONSHIP BETWEEN SELF-CONCEPT AND CRITICAL THINKING ABILITY

by

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ABSTRACT

Critical thinking is an academically coveted skill important to all areas of education (Halpern, 1998). The ability to think critically requires an individual to question and possibly reject accepted ideals and authorities. A strong self-concept may play an important role in this process. The present study hypothesized a positive relationship between total self-concept and critical thinking ability. An additional purpose of this study was to explore whether self-concept accounted for more of the variance in critical thinking than other correlates of the ability, such as metacognition (Halpern, 1998; Magno, 2010) and openness to experience (Clifford, Boufal, & Kurtz, 2004). The hypothesis was supported; total self-concept significantly and positively correlated with the total score of critical thinking. Regression analyses revealed self-concept was a better predictor of critical thinking, accounting for 19.2% more variance in critical thinking than metacognition and openness to experience. Overall, the results suggest that nourishing students' self-concept may support their ability to think critically.

ACKNOWLEDGMENTS

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INTRODUCTION

Consider this scenario: '*An undergraduate student is assigned a research paper on a controversial topic such as the relationship between vaccination and autism. He heads directly to his favorite search engine to begin collecting information. The student browses through pages of listed websites, clicks on one that looks most applicable to the topic, and references this site for the majority of information to be included in the research paper. The website includes a startling statistic; so startling, in fact, he questions whether it is or is not true. For a brief moment, the student considers the validity of the statistic, but concludes that the site looked credible, reasoned that the publisher of the website would know more about the topic than he did, and, well, numbers don't lie*'.' What is wrong with this scenario? One might immediately assume the student is simply careless; however, previous research demonstrates that this scenario is far too common (Paul, 2004). In fact, this scenario serves as an example of an underdeveloped skill: critical thinking. Had the student developed and prioritized critical thinking skills, he would have questioned the credibility of the source, considered alternative interpretations, and sought other perspectives from reliable sources.

Although many acknowledge the importance of critical thinking, some researchers and educators fear the skill is far from a ubiquitous one. The critical thinking deficit in education has been noted for quite some time (Paul, 2004). The idea of critical thinking as a rare skill is startling given the fact that critical thinking ability is

regarded as an essential educational objective (Candy, 1991) and an overall vital characteristic of higher education (Paul, 2004). Critical thinking has also been proposed as a prospective predictor of academic success (Williams, 2001) and particularly, success in graduate school (Garett & Wulf, 1978). For all of these reasons, critical thinking is one of the most crucial elements in the educational process and ultimately, for future professional success (Halpern, 1998). Thus, a discrepancy between the importance and the prevalence of critical thinking exists.

Perhaps some of this discrepancy stems from the belief that critical thinking is important only for scientists and philosophers; however, critical thinking is relevant to all aspects of life and not limited to any one domain. Simply entering the term "critical thinking" in a search engine yields hundreds of results ranging from critical thinking skills applied to the study of nursing, technology, and business. In everyday life, situations requiring critical thought constantly present themselves such as deciding who to vote for or whether the product on late night television, making outrageous promises, is actually worth purchasing.

Because critical thinking encompasses many skills and domains, it has been defined in various ways. The present research will use one of the most accepted definitions of critical thinking proposed by Robert Ennis (1962, 1993). Ennis initially conceptualized critical thinking as the accurate assessment of statements (1962), but later modified his definition to the "reasonable reflective thinking focused on deciding

what to believe or do" (1993, p. 180). Ennis elaborated on this definition with a list of skills an individual must develop and apply in order to think critically:

1. Judge the credibility of sources.
2. Identify conclusions, reasons and assumptions.
3. Judge the quality of an argument, including the acceptability of its reasons, and assumptions
4. Develop and defend a position on an issue.
5. Ask appropriate clarifying questions.
6. Plan experiments and judge experimental designs.
7. Define terms in a way appropriate for the context.
8. Be open-minded.
9. Try to be well-informed.
10. Draw conclusions when warranted, but with caution.

(Ennis, 1987, 1991, in press; as cited by Ennis, 1993, p. 180).

Additionally, critical thinking is difficult to define because of variation in the conceptualization of the ability as either innate or learned. Halonen (1995) categorized definitions of critical thinking into three perspectives: dispositional, emergent, and state (as cited by Barnett & Francis, 2012). The dispositional perspective views critical thinking as an innate, intellectual characteristic and also explores traits thought to be fixed in an individual such as emotional and cognitive attributes, like open-mindedness and inquisitiveness. This particular perspective focuses on natural ability and prospective components of critical thinking. On the other hand, the emergent perspective emphasizes that thinking patterns can be altered by certain experiences and focuses on the cognitive development of critical thinking, rather than just innate skill. Lastly, the state perspective provides a set of guidelines that can be followed to

successfully exercise critical thought (Halonen, 1995; as cited by Barnett & Francis, 2012). This perspective assumes that critical thinking is a skill that can be learned and applied at any time the effort is put forth. The aforementioned definition by Ennis (1962; 1993) used in the present research is an example of this perspective. Critical thinking ability is also viewed as a part of self-directed learning, which suggests that one quality of an autonomous, self-directed learner is a positive self-concept (Candy, 1991).

Educators and psychologists have been concerned with variables that may support the development and use of critical thinking skills. These researchers have explored correlates of critical thinking in students from grade to graduate school. The most extensively studied demographic variables of critical thinking are gender, academic discipline, and educational level (Williams, 2001). Other variables that have an established relationship with critical thinking include personality factors (Clifford, Boufal, & Kurtz, 2004; Garett et. al., 1978), metacognition (Halpern, 1998; Magno, 2010), age (Friend & Zubek, 1958), and differences amongst cultures (Lun, Fischer, & Ward, 2010).

Amongst the aforementioned variables, metacognition and openness to experience have been shown to play a role in critical thinking. Metacognition refers to the awareness one has of the learning process, for example someone high in metacognitive awareness would know whether or not they truly understand a subject

they are attempting to learn (Schraw & Dennison, 1994). Openness to experience is a personality trait that embraces imagination and curiosity (Costa & McCrae, 1992). Magno (2010) explored the relationship between metacognitive awareness, using two different models of the variable, a two-factor and eight-factor model, and critical thinking. The two-factor model includes Knowledge and Regulation of Cognition, while the eight-factor model encompasses specific aspects of metacognition, such as planning and procedural knowledge. Results from this study found that both models of metacognition were significant to critical thinking, however, the eight-factor model, which encompasses very specific aspects of metacognition, was found to be more significant (Magno, 2010). Openness to experience has also been explored as a correlate of critical thinking; in particular, Clifford, Boufal and Kurtz (2004) conducted a study exploring the two-factor theory of critical thinking, which incorporates both personality factors and cognitive aptitude, as well as differences in each individual when investigating the ability. The study demonstrated that the trait Openness to Experience accounted for more of the incremental variance in scores on the Watson-Glacier Critical Thinking Appraisal than certain cognitive abilities, such as the 'Similarities' subtest of the Wechsler Adult Intelligence Scale (Clifford et al., 2004). Though demographic, cognitive, and personality variables have been explored as predictors of critical thinking, psychosocial variables, like self-concept, have not been extensively explored.

Although total self-concept, or the 'inner picture' about oneself including beliefs about personal abilities and attributes, has not been examined as a direct predictor of critical thinking, certain dimensions of the construct have been correlated with academic achievement. Specifically, academic self-concept has been explored extensively and successfully, as a predictor of academic achievement (Kubiniec, 1970; Marsh & Craven, 2006; Kornilova, Kornilova, & Chumakova, 2009, Marsh & Martin, 2011). Self-concept enrichment has also been proposed as a ambition of education (Shavelson & Bolus, 1982). Shavelson et al., (1976) suggest self-concept to be a multidimensional construct containing a hierarchical structure, with a global, general self-concept that is divided into nonacademic and academic categories. These categories are further divided into smaller subgroups such as Physical Self-Concept and Parent Relations. In 1985, Marsh and Shavelson elaborated on this model, specifically, in terms of academic self-concept, and added several more explicit academic categories, such as math and verbal portions.

Furthermore, a person's self-concept is influenced by his or her environment (Shavelson et al., 1976). Shavelson et al., also suggest "one's perceptions of himself are thought to influence the ways in which he acts, and his acts in turn influence the ways in which he perceives himself" (1976, p. 411). Essentially, self-concept can be viewed as cyclic event, based on this work. Let's consider this in relevance to academic achievement: A student feels she will do well on an upcoming test because she has

determined the most effective study strategy for her particular learning style and has the drive to succeed. In turn, she does well on each test she takes, and ultimately each class, which will allow her to perceive herself as academically successful. This could also work in a negative context; if a student feels she cannot do well in school, she may not. Her poor grades will further solidify her feelings of a negative academic self-concept, and once again, the cycle continues.

Much emphasis has been placed on the influence of *academic* self-concept in relation to academic success because it is thought the more specific the self-concept, the more applicable it will be to a certain subject (Shavelson et al., 1976). However, a few studies have investigated both general and specific self-concepts. Dickhauser and Reinhard (2006) explored both general and specific self-concepts in success based on the level of "Need for Cognition" (NFC) in varied tasks. It was ultimately found cognitive motivation and NFC played a role in whether general or specific self-concepts were channeled for each task (Dickhauser et al., 2006). Kubiniec (1970) conducted a study specifically focusing on dimensions of self-concept and their roles in predicting academic success. Her results indicated a *global* self-perception serves as a predictor of academic achievement (Kubinec, 1970). In regard to specific areas of self-concept, Gerardi (1990) conducted a study on minority and low-socioeconomic status students in technical college to determine if academic self-concept could predict academic success. Results from the study supported the hypothesis that academic self-concept predicts

academic success (Gerardi, 1990). Similarly, Kornilova et. al., (2009) explored intelligence, academic self-concept, and academic achievement and found that academic self-concept accounted for more of the variance (50%) in predicting academic success than measures of intelligence (Kornilova et. al., 2009). With the knowledge that self-concept and critical thinking can both be viewed as potential predictors of academic success, and are therefore, both important to academia, it seems logical to explore how these two concepts may be related. The present study explores the relationship between these two variables.

No studies directly examine the relationship between total self-concept and critical thinking. However, there are relevant studies that have incorporated these two variables in specific contexts. Rodriguez (2009) conducted an experiment using business students that focused on the effect of two self-regulation factors on learning tactics: academic self-concept and outcome expectations. The learning strategies discussed in this experiment included deep, strategic, and surface (Entwistle, 1998; Tait & Entwistle, 1996, as cited by Rodriguez, 2009). In particular, the deep learning approach is connected with creative and critical thinking (Rodriguez, 2009). Deep learners utilize critical reflection and understanding (Leung & Kember, 2003; Peltier, Hay & Drago, 2006; as cited by Rodriguez, 2009), which can be viewed as factors of critical thinking. Focusing specifically on academic self-concept, it was concluded that a strong, high academic self-concept allows for students to embrace more complicated, complex styles

of learning. Furthermore, the combination of academic self-concept and outcome perception was suggested to "set the direction for students' intellectual growth and become motivational drivers that encourage critical thinking" (Rodriguez, 2009, p. 536).

The art of critical thinking, as suggested by Ennis (1993), requires the assessment of credibility of sources, as well as the requirement of creating and supporting counter-arguments. Such activities may require certain amount of valor in an individual – the ability to evaluate information that has been well-established by authoritative figures and potentially opposing what is generally passively accepted by most can be a daunting task. From this perspective, combined with the idea that critical thinking extends beyond the classroom, one must question if there is a psychosocial element to critical thinking. What if there is a variable related to critical thinking skills that can be nurtured in an indirect and compelling way, as opposed to variables such as general intelligence and personality factors? Multiple methods for teaching critical thinking ability have been proposed by educators across cultures, but what if a strong self-concept amongst students could play a role in the foundation for instilling these skills? What if efforts to teach critical thinking are lost on students who do not have a self-concept strong enough to apply them? Having a strong general self-concept may help facilitate the necessary effort to not only utilize critical thought, but to put forth and stand by an assessment, even if it may be wrong. While self-concept is thought to be subject-specific, critical thinking, as mentioned previously, can be heavily applied

outside of the educational world. It is imperative to observe all areas of, and for the purposes of this research, total self-concept, in relation to critical thinking. The present research hypothesizes a positive relationship between critical thinking ability and self-concept.

HYPOTHESES

The present study hypothesized that individuals scoring higher on self-concept as measured by the Self-Description Questionnaire III will score higher on the Cornell Critical Thinking Test, Level Z. In addition to the proposed hypothesis, the present study also explored an additional research question: does self-concept explain more variance in critical thinking compared to variables which have been previously established to correlate with critical thinking, specifically, openness to experience and metacognition?

METHODS

Participants

Thirty-three psychology students from the University of Central Florida were recruited to participate in this study. All participants were recruited through the University of Central Florida's Psychology Research Participation System, SONA and could apply extra credit earned for their participation to certain psychology classes in accordance with course syllabi. The sample consisted entirely of females, with an average age of age of 24.88 (*SD* = 8.24). Participants' class standing varied, with 43.8% of participants in their Senior year.

Materials

Three different psychological measures and one test of critical thinking ability were used followed by a set of demographic questions. The measures are listed in the order they were presented to the participants:

Self-Description Questionnaire III: The SDQIII is a 136-item scale that assesses multiple dimensions of self-concept (Marsh, 1992). These dimensions include a general measure of self-concept based on the Rosenberg (1965-1979) self-esteem scale, 4 areas that measure academic self-concept (Verbal, Mathematics, Problem Solving, and General – Academic), and 8 areas that measure non-academic self-concept (Physical Ability, Physical Appearance, Peer Relations – Same Sex, Peer Relations – Opposite Sex,

Parent Relations, Emotional Stability, Honesty/Trustworthiness, and Spiritual Values/Religion). Participants are asked to respond to declarative statements such as "Overall, I have a lot of respect for myself"; "I worry a lot"; and "My parents understand me" using an 8-point likert-type scale (Definitely False; False; Mostly False; More False Than True; More True Than False; Mostly True; True; Definitely True). Participants are also asked to rate the Importance and Accuracy of a statement, such as "I am good at sports and physical activities", on a scale from 1-9 (1 being very inaccurate or very unimportant and 9 being very accurate or very important). The measure has been shown to be reliable (r = .89) and have good construct validity (r = .08, Marsh & O'Neil, 1984). The SDQIII takes about 20-30 minutes to complete. The SDQ-III is presented in Appendix C.

NEO Five Factor Inventory, Form S: The NEO-FFI, Form S (Costa & McCrae, 1989, 1992, 2010) is a 60-item inventory used to assess five domains of personality: Neuroticism, Extroversion, Openness to Experience, Agreeableness, and Consciousness. Participants are given a variety of statements such as "I am not a worrier"; "Some people think I'm selfish and egotistical"; and "I am a cheerful, high-spirited person." Participants then rate each statement using a scale ranging from 1-5, with (1) indicating "Strongly Disagree", (2) "Disagree", (3) "Neutral", (4) "Agree", and (5) "Strongly Agree." Internal consistency values of .68 to .89 have been previously documented (Costa et al., 1992). The FFI is presented in Appendix D.

Metacognitive Awareness Inventory: The Metacognitive Awareness Inventory (MAI, Schraw & Dennison, 1994) is a 52-item inventory assessing metacognitive awareness, or the ability to know what is required to do well on learning tasks, using the 8-factor model of metacognition. The two major scales are Knowledge and Regulation of Metacognition, each with several subscales: Declarative Knowledge, Procedural Knowledge, Conditional Procedure, Planning, Information Management Strategies, Comprehension Monitoring, Debugging Strategies, and Evaluation. Statements are presented such as "I reevaluate my assumptions when I get confused" and "I am a good judge of how well I understand something" and participants must indicate whether they regard the statement as true or false on a 5-point likert-type scale, (1) indicating Always False, (2) Sometimes False, (3) Neutral, (4) Sometimes True, and (5) Always True. The internal consistencies between the Regulation and Knowledge of Metacognition ranged from .93 - .88 and the coefficient alpha ranged from .88- .90 in a factor replication analysis (Schraw et al., 1994). The MAI is expected to take about 10 minutes to complete. The MAI is presented in Appendix D.

Cornell Critical Thinking Test, Level Z: The CCTT, Level Z (Ennis, Millman, & Tomko, 1985) is a 52-item inventory used to assess 6 aspects of critical thinking: induction, deduction, observation, assumptions, meaning, and credibility. In the present study, participants will only complete the Deduction (Items 1-10), Meaning & Fallacies (Items 11-21), Observation and Credibility of Sources (Items 22-25). These

particular subscales were selected because of the expected relationship to self-concept. While Experiment Planning is certainly an important aspect of critical thinking, it is primarily an academic task. As an example of a question in the Meanings & Fallacies portion of the assessment, participants must read a passage and "pick the one best reason why this thinking is faulty." The consistency values for the CCTT-Z have been shown to range from .49-.87. Additionally, an internal consistency value of .76 has been reported. The CCTT-Z has also shown good convergent and construct validity. In terms of convergent validity, the CCTT-Z significantly correlates with the Watson-Glaser Critical Thinking Appraisal (.71), the ACT (.62) and the Henman Nelson Mental Ability Test (.67). The CCTT-Z is presented in Appendix F.

Procedure

Participants accessed the study online through SONA and were directed to the external survey system, SurveyMonkey, to complete the experiment. After clicking the study titled "Personality and Critical Thinking," participants were presented the electronic Informed Consent. Following the consent process, participants began the study with the Self-Description Questionnaire III. Upon completing the SDQ-III, participants then completed the NEO Five Factory Inventory, Form S, followed by Metacognitive Awareness Inventory. Immediately after the psychological inventories, participants began the Cornell Critical Thinking Test starting with Deduction, then Meaning & Fallacies, and finally the Credibility of Sources subscale. Upon completion

of all tests, participants were asked a series of demographic questions. Participants were then debriefed and thanked for their participation.

RESULTS

Pearson Bivariate Correlations were calculated between the scores on each of the dimensions of the SDQ-III, and each subscale of the CCTT-Z. All analyses used a one-tailed test with an alpha level of .05. The correlations are reported in Table 1. The *a priori* hypothesis regarding overall self-concept (Total Self) was supported, $r = .548$, $p < .01$. Exploratory results also revealed several other significant findings amongst the dimensions of self-concept and critical thinking. The total score on the CCTT-Z positively correlated with several specific areas of self-concept, including Mathematical (r .329 = $p < .05$), Verbal (r = .326, $p < .05$), General Academic ($r = .491$, $p < .01$), Problem Solving ($r = .415$ $p < .01$), Physical Ability (r .393= $p < .05$), Honesty/Trustworthiness (r = $p < .05$), Emotional Stability (r .465 = $p < .01$), and General Esteem ($r = .353$, $p < .05$).

Moreover, significant correlations were found among the specific subscales of the CCTT-Z. For example, Mathematical self-concept was significant to the subscale of Meanings & Fallacies, $r = .386$, $p < .05$. Other significant relationships to this subscale include the Total Self score ($r = .532$, $p < .01$), General Academic (r =.315, $p < .05$), Physical Ability ($r = .300$, $p < .05$), Emotional Stability ($r = .420$, $p < .01$), and General Esteem ($r = .365p < .05$). The Credibility of Sources subscale of the CCTT-Z positively correlated with the Emotional Stability subscale (r= .381, p <.05). Deduction subscales correlated negatively with Opposite Sex Peer Relations (r = -.305, $p < .05$).

The research question was investigated using a hierarchical multiple regression analysis to determine if Total Self-Concept predicted the variance in critical thinking scores over and above Openness to Experience and Metacognitive Awareness (MAI) scores. Openness and MAI scores were entered in Step 1, explaining 12.3% of the variance in Critical Thinking scores, which did not reach statistical significance ($p = .14$). When Total Self-Concept was added to the equation in Step 2, the percentage of variance accounted for jumped to 31.5%, a statistically significant shift ($p = .008$). The final regression equation explained a significant amount of the variance as a whole, F (3, 29) = 4.44, $p = .011$. In the final model, only Total-Self Concept is significant, $\beta = .497$, $p = .008$.

DISCUSSION

This study investigated whether there was a relationship between total self-concept (the total score on all dimensions of self-concept) and critical thinking ability. It was hypothesized that self-concept would positively correlate with critical thinking ability. After analyzing the results of the experiment the hypothesis was supported; as total self-concept scores went up, so did total scores on critical thinking. The present study also showed the same relationship between several dimensions of self-concept and to the overall scores of critical thinking, as well as subscales of the Cornell Critical Thinking Test, Level Z, such as Meaning & Fallacies. Studies directly examining the relationship between critical thinking and overall self-concept, as opposed to specific areas of self-concept, are incredibly scarce. One strength of the present study is that it extended previous findings to include self-concept beyond the academic.

Another purpose of this study was to explore how much of the variance self-concept accounted for in critical thinking ability compared with 2 previously researched variables: metacognition and openness to experience. After running a regression analysis, it was found that self-concept accounted for more of the variance than Metacognitive Awareness and Openness to Experience combined. The purpose of this analysis was to explore the relative importance of self-concept in critical thinking. It appears that self-concept is a strong predictor of the ability.

Exploratory findings also revealed several strong relationships between specific dimensions of self-concept and critical thinking ability, such as mathematical, emotional stability, Academic, Honesty/Trustworthiness, General esteem, and Verbal self-concepts. Academic self-concept was expected to correlate highly with critical thinking, considering the results of prior research with academic achievement. The Mathematical and Verbal Subscales are academic in nature, so these findings were also expected. The exploratory findings add to the present and growing amount of research investigating the role self-concept plays in cognitive abilities.

Applications of this Research

Critical thinking is often regarded as an ability that is directly taught to students. While this is undisputed, the present research suggests that nurturing self-concept among students may serve as an indirect method of enhancing critical thinking abilities. Educational methods in tandem with self-concept support could present an entirely new way of approaching the task of increasing critical thinking skills in students. Furthermore, supporting the overall view one has of their self, not just from an academic standpoint, appears to predict critical thinking ability.

Limitations

Several limitations applied to the present study. The most obvious limitation is the extremely small sample of participants who completed the study. Clearly, more participants need to be included to draw generalizations about the relationship between

self-concept and critical thinking ability. Aside from small sample size, the present study consisted entirely of female participants, so results are generalizable to only one gender. Another limitation of the present study was the small amount of questions for the Credibility of Sources subscale. This limitation did not provide much variation in scores.

Additionally, the present study was correlational in nature. Thus, it is not clear that increasing self-concept would directly lead to an increase in critical thinking ability. For example, it could be that those who score higher on a critical thinking test have a stronger self-concept as a result of elevated cognitive abilities. As with any correlational study, other variables cannot be ruled out. For example, those with higher self-concept may perceive a difficult cognitive test as fun or interesting and thus be more engaged in the task. Therefore, engagement may be driving the correlation rather than the ability to think critically.

Future Research

Future research should first and foremost consist of a larger sample size, as well as incorporate more diversity in the sample, specifically including both genders. Future research should assess the many dimensions of self-concept that were found to be significant in the present research, such as the role of general self-esteem in critical thinking, and therefore, academic achievements, considering self-esteem issues are common amongst adolescents. While many different significant relationships were

demonstrated in the present study, the relationship between mathematical self-concept and critical thinking ability is especially interesting, considering the sample consisted entirely of females. Prior research has shown mathematical self-concept to be significantly higher in males then females (Sáinz & Eccles, 2012). In groups of gifted children, males have performed better in science and mathematical courses than females, primarily because females were not expected to do the same (Reis, 1998; as cited by Tirri & Nokelainen, 2011). It has been suggested that women are primed at a very young age to have a negative attitude towards math by authorities, such as teachers and parents (Gunderson & Ramirez, 2011). Will mathematical self-concept be as important to men in critical thinking? Or will these results remain consistent across genders? Further research should address these matters.

Overall, the present research contributes to the ongoing and abundant research investigating critical thinking ability. Despite its limitations, the present study offers some preliminary insight into one potential way to support critical thinking skills in students. Critical thinking is a skill crucial to navigating a democratic and scientifically advanced society. Much importance is placed on critical thinking in the literature because it is crucial to the advancement not only of the individual, but ultimately, society as a whole. Halpern (1998) declares the "enhancement of critical thinking skills the most challenging and personally rewarding task in which psychologists and educators can engage" (p. 455).

Table 1

Correlations among the SDQ-III and the CCTT-Z

	Total Score on CCTT-Z	Deduction Subscale	Meaning & Fallacies Subscale	Credibility of Sources Subscale
Total Self-Concept	.528**	.229	.532**	.243
Mathematical	.329*	.259	.386*	-.099
Verbal	.326*	.008	.068	.244
Academic	.491**	.156	.315*	0.20
Problem Solving	.415*	.093	.237	.251
Physical Ability	.393*	.104	.300*	.261
Physical Appearance	.273	.219	.252	-.051
Same Sex Peer Relations	.261	.115	.246	.261
Opposite Sex Peer Relations	.038	-.305*	.083	-.051
Parent Relations	-.006	-.013	.256	-.060
Spiritual Values/Religion	.049	.187	.287	-.009
Honesty / Trustworthiness	.315*	.135	.184	.121
Emotional Stability	.465**	.259	.420**	.381*
General Esteem	.353*	.189	.365*	.288

** $p < .01$ level.
*$p < .05$ level.

Table 2

Descriptive Statistics for the CCTT-Z

Scale	*M*	*SD*
Cornell Critical Thinking Test Total	0.40	0.11
Deduction	0.52	0.18
Meaning & Fallacies	0.31	0.16
Credibility of Sources	0.36	0.21

Table 3

Descriptive Statistics for the SDQ-III

	M	*SD*
Total Self-Concept	747.33	88.89
Mathematical	5.14	1.79
Verbal	5.88	1.06
Academic	6.1	1.12
Problem-Solving	5.59	1.09
Physical Ability	4.82	1.51
Physical Appearance	5.32	1.32
Same Sex Peer Relations	5.47	1.08
Opposite Sex Peer Relations	5.26	1.01
Parental Relations	5.5	1.42
Spiritual Values/Religion	5.2	1.63
Honesty/Trustworthiness	6.08	0.93
Emotional Stability	4.86	1.19
General Esteem	6.05	1.32

Table 4

Descriptive statistics for the MAI and the NEO subscale Openness to Experience

Scale	*M*	*SD*
Metacognitive Awareness Inventory	193.09	30.58
Openness to Experience	28.6	5.56

Table 5

Hierarchical Multiple Regression Analysis predicting Metacognitive Awareness, Openness to Experience, and Total Self-Concept in Critical Thinking Ability

	Model 1: MAI, O			Model 2: MAI, O, Total Self-Concept		
Predictor	***B***	***SE B***	**β**	***B***	***SE B***	**β**
Constant	-0.559	0.38		-1.42	0.458	
MAI	0.001	0.002	0.135	-0.001	0.002	-0.07
O	0.014	0.009	0.275	0.01	0.008	0.209
Total Self-Concept				0.002	0.001	0.497*

** Significant at alpha - .01*

APPENDIX A: IRB APPROVAL LETTER

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 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

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

To: **Shannon N. Whitten** and Co-PI: **Melissa Antler**

Date: **February 28, 2013**

Dear Researcher:

On 2/28/2013, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	Personality and Critical Thinking
Investigator:	Shannon N. Whitten
IRB Number:	SBE-13-09099
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

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

Signature applied by Patria Davis on 02/28/2013 01:54:45 PM EST

IRB Coordinator

APPENDIX B: EXPLANATION OF RESEARCH

EXPLANATION OF RESEARCH

Title of Project: Personality and Critical Thinking

Principal Investigator: Shannon Whitten, PhD

Other Investigators: Melissa Antler

Faculty Supervisor: Shannon Whitten, PhD

You are being invited to take part in a research study. Whether you take part is up to you.

The purpose of this study is to explore the relationship between personality factors and critical thinking ability.
You will be asked to complete four different online questionnaires. It is important to note there are no right or wrong answers to any of these tests. After these tests are completed, you will be asked to respond to some demographic questions. Although the experiment is not timed, it is not expected to take you longer than 2 ½ hours to complete. A maximum of 3 hours has been allotted, however, so you do not feel rushed. You do not have to answer every question or complete every task if you do not wish to do so. Your only responsibility is to do the best you can.

You must be 18 years of age or older to take part in this research study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, please contact Melissa Antler, Undergraduate student, by e-mail at melissa_antler@knights.ucf.edu or Dr. Shannon Whitten, Principal Investigator, Department of Psychology by e-mail at Shannon.Whitten@ucf.edu.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

APPENDIX C: SELF-DESCRIPTION QUESTIONNAIRE III

SDQIII©

INSTRUMENT

All information supplied will be kept strictly confidential								

NAME:	AGE: (years) (mths)	DATE: / /
MALE / FEMALE (circle one)		GROUP:

PLEASE READ THESE INSTRUCTIONS FIRST

This is not a test - there are no right or wrong answers.

This is a chance for you to consider how you think and feel about yourself. **This is not a test** – there are no right or wrong answers, and everyone will have different responses. The purpose of this study is to determine how people describe themselves and what characteristics are most important to how people feel about themselves.

On the following pages are a series of statements that are more or less true (or more or less false) descriptions of you. Please use the following eight-point response scale to indicate how true (or false) each item is as a description of you. Respond to the items as you now feel even if you felt differently at some other time in your life. In a few instances, an item may no longer be appropriate to you, though it was at an earlier period of your life (e.g., an item about your present relationship with your parents if they are no longer alive). In such cases, respond to the item as you would have when it was appropriate. Try to avoid leaving any items blank.

After completing all the items, you will be asked to select those that best describe important aspects – either positive or negative – of how you feel about yourself. Consider this as you are completing the survey.

1 Definitely False	2 False	3 Mostly False	4 More False Than True	5 More True Than False	6 Mostly True	7 True	8 Definitely True

1 Definitely False	2 False	3 Mostly False	4 More False Than True	5 More True Than False	6 Mostly True	7 True	8 Definitely True

_____ 1	I find many mathematical problems interesting and challenging.	_____ 29	Overall, I am pretty accepting of myself.
_____ 2	My parents are not very spiritual/religious people.	_____ 30	Being honest is not particularly important to me.
_____ 3	Overall, I have a lot of respect for myself.	_____ 31	I have lots of friends of the opposite sex.
_____ 4	I often tell small lies to avoid embarrassing situations.	_____ 32	I have a poor vocabulary.
_____ 5	I get a lot of attention from members of the opposite sex.	_____ 33	I am happy most of the time.
_____ 6	I have trouble expressing myself when trying to write something.	_____ 34	I still have many unresolved conflicts with my parents.
_____ 7	I am usually pretty calm and relaxed.	_____ 35	I like most academic subjects.
_____ 8	I hardly ever saw things the same way as my parents when I was growing up.	_____ 36	I wish I had more imagination and originality.
_____ 9	I enjoy doing work for most academic subjects.	_____ 37	I have a good body build.
_____ 10	I am never able to think up answers to problems that haven't already been figured out.	_____ 38	I don't get along very well with other members of the same sex.
_____ 11	I have a physically attractive body.	_____ 39	I have good endurance and stamina in sports and physical activities.
_____ 12	I have few friends of the same sex that I can really count on.	_____ 40	Mathematics makes me feel inadequate.
_____ 13	I am a good athlete.	_____ 41	Spiritual/religious beliefs make my life better and make me a happier person.
_____ 14	I have hesitated to take courses that involve mathematics.	_____ 42	Overall, I don't have much respect for myself.
_____ 15	I am a spiritual/religious person.	_____ 43	I nearly always tell the truth.
_____ 16	Overall, I lack self-confidence.	_____ 44	Most of my friends are more comfortable with members of the opposite sex than I am.
_____ 17	People can always rely on me.	_____ 45	I am an avid reader.
_____ 18	I find it difficult to meet members of the opposite sex whom I like.	_____ 46	I am anxious much of the time.
_____ 19	I can write effectively.	_____ 47	My parents have usually been unhappy or disappointed with what I do and have done.
_____ 20	I worry a lot.	_____ 48	I have trouble with most academic subjects.
_____ 21	I would like to bring up children of my own (if I have any) like my parents raised me.	_____ 49	I enjoy working out new ways of solving problems.
_____ 22	I hate studying for many academic subjects.	_____ 50	There are lots of things about the way I look that I would like to change.
_____ 23	I am good at combining ideas in ways that others have not tried.	_____ 51	I make friends easily with members of the same sex.
_____ 24	I am ugly.	_____ 52	I hate sports and physical activities.
_____ 25	I am comfortable talking to members of the same sex.	_____ 53	I am quite good at mathematics.
_____ 26	I am awkward and poorly coordinated at many sports and physical activities.	_____ 54	My spiritual/religious beliefs provide the guidelines by which I conduct my life.
_____ 27	I have generally done better in mathematics courses than other courses.	_____ 55	Overall, I have a lot of self-confidence.
_____ 28	Spiritual/religious beliefs have little to do with my life philosophy.	_____ 56	I sometimes take things that do not belong to me.

1 Definitely False	2 False	3 Mostly False	4 More False Than True	5 More True Than False	6 Mostly True	7 True	8 Definitely True

_____ **57**	I am comfortable talking to members of the opposite sex.	_____ **85**	I do not spend a lot of time worrying about things.
_____ **58**	I do not do well on tests that require a lot of verbal reasoning ability.	_____ **86**	My parents treated me fairly when I was young.
_____ **59**	I hardly ever feel depressed.	_____ **87**	I learn quickly in most academic subjects.
_____ **60**	My values are similar to those of my parents.	_____ **88**	I am not very original in my ideas, thoughts, and actions.
_____ **61**	I am good at most academic subjects.	_____ **89**	I have nice facial features.
_____ **62**	I am not much good at problem solving.	_____ **90**	Not many people of the same sex like me.
_____ **63**	My body weight is about right (neither too fat nor too skinny).	_____ **91**	I like to exercise vigorously at sports and/or physical activities.
_____ **64**	Other members of the same sex find me boring.	_____ **92**	I never do well on tests that require mathematical reasoning.
_____ **65**	I have a high energy level in sports and physical activities.	_____ **93**	I am a better person as a consequence of my spiritual/religious beliefs.
_____ **66**	I have trouble understanding anything that is based upon mathematics.	_____ **94**	Overall, I have pretty positive feelings about myself.
_____ **67**	Continuous spiritual/religious growth is important to me.	_____ **95**	I am a very honest person.
_____ **68**	Overall, I have a very good self-concept.	_____ **96**	I have had lots of feelings of inadequacy about relating to members of the opposite sex.
_____ **69**	I never cheat.	_____ **97**	I am good at expressing myself.
_____ **70**	I am quite shy with members of the opposite sex.	_____ **98**	I am often depressed.
_____ **71**	Relative to most people, my verbal skills are quite good.	_____ **99**	It has often been difficult for me to talk to my parents.
_____ **72**	I tend to be highly – strung, tense, and restless.	_____ **100**	I hate most academic subjects.
_____ **73**	My parents have never had much respect for me.	_____ **101**	I am an imaginative person.
_____ **74**	I am not particularly interested in most academic subjects.	_____ **102**	I wish that I were physically more attractive.
_____ **75**	I have a lot of intellectual curiosity.	_____ **103**	I am popular with other members of the same sex.
_____ **76**	I dislike the way I look.	_____ **104**	I am poor at most sports and physical activities.
_____ **77**	I share lots of activities with members of the same sex.	_____ **105**	At school, my friends always came to me for help in mathematics.
_____ **78**	I am not very good at any activities that require physical ability and coordination.	_____ **106**	I am basically an atheist, and believe that there is no being higher than man.
_____ **79**	I have always done well in mathematics classes.	_____ **107**	Overall, I have a very poor self-concept.
_____ **80**	I rarely if ever spend time in spiritual meditation or religious prayer.	_____ **108**	I would feel OK about cheating on a test as long as I did not get caught.
_____ **81**	Overall, nothing that I do is very important.	_____ **109**	I am comfortable being affectionate with members of the opposite sex.
_____ **82**	Being dishonest is often the lesser of two evils.	_____ **110**	In school I had more trouble learning to read than most other students.
_____ **83**	I make friends easily with members of the opposite sex.	_____ **111**	I am inclined towards being an optimist.
_____ **84**	I often have to read things several times before I understand them.	_____ **112**	My parents understand me.

1 Definitely False	2 False	3 Mostly False	4 More False Than True	5 More True Than False	6 Mostly True	7 True	8 Definitely True

____	**113**	I get good marks in most academic subjects.	____	**125**	I like my parents.
____	**114**	I would have no interest in being an inventor.	____	**126**	I could never achieve academic honours, even if I worked harder.
____	**115**	Most of my friends are better looking than I am.	____	**127**	I can often see better ways of doing routine tasks.
____	**116**	Most people have more friends of the same sex than I do.	____	**128**	I am good looking.
____	**117**	I enjoy sports and physical activities.	____	**129**	I have lots of friends of the same sex.
____	**118**	I have never been very excited about mathematics.	____	**130**	I am a sedentary type who avoids strenuous activity.
____	**119**	I believe that there will be some form of continuation of my spirit or soul after my death.	____	**131**	Overall, I do lots of things that are important.
____	**120**	Overall, I have pretty negative feelings about myself.	____	**132**	I am not a very reliable person.
____	**121**	I value integrity above all other virtues.	____	**133**	Spiritual/religious beliefs have little to do with the type of person I want to be.
____	**122**	I never seem to have much in common with members of the opposite sex.	____	**134**	I have never stolen anything of consequence.
____	**123**	I have good reading comprehension.	____	**135**	Overall, I am not very accepting of myself.
____	**124**	I tend to be a very nervous person.	____	**136**	Few, if any of my friends are very spiritual or religious.

Different characteristics, both positive and negative, vary in their importance in determining how you feel about yourself. For example, the statement "I am musically talented" may be very inaccurate as a description of you, but it may also be very unimportant about how you feel about yourself. Below are statements about different characteristics. For each statement please judge: 1) how ACCURATE the statement is as a description of you: and 2) how IMPORTANT the characteristic is in determining how you feel (either positive or negative) about yourself. Please use the following response scale:

1	2	3	4	5	6	7	8	9
Very Inaccurate Very Unimportant		Inaccurate Unimportant		Moderate or Average		Accurate Important		Very Accurate Very Important

ACCURACY: How accurate is this statement about you?		**IMPORTANT:** How important is the characteristic to you?
_____	I am good at sports and physical activities	_____
_____	I am physically attractive/good looking	_____
_____	I have good interactions/relationships with members of the opposite sex	_____
_____	I have good interactions/relationships with members of the same sex	_____
_____	I have good interactions/relationships with my parents	_____
_____	I am an emotionally stable person	_____
_____	I am a spiritual/religious person	_____
_____	I am an honest/reliable/trustworthy person	_____
_____	I have good verbal skills/reasoning ability	_____
_____	I have good mathematical skills/reasoning ability	_____
_____	I am a good student in most academic subjects	_____
_____	I am good at problem solving/creative thinking	_____

APPENDIX D: METACOGNITIVE AWARENESS INVENTORY

METACOGNITIVE AWARENESS INVETORY

Metacognitive Awareness Inventory

We would like you to respond to the questions in this packet by indicating how true or false each statement is about you. If a statement is always true, write the number 5 in the blank provided to the right of each statement. Your responses are scored anonymously, so please answer as truthfully as you can.

ALWAYS FALSE	SOMETIMES FALSE	NEUTRAL	SOMETIMES TRUE	ALWAYS TRUE
1	2	3	4	5

1. I ask myself periodically if I am meeting my goals.

_ 2. I consider several alternatives to a problem before I answer.

_ 3. I try to use strategies that have worked in the past.

_ 4. I pace myself while learning in order to have enough time.

_ 5. I understand my intellectual strengths and weaknesses.

_ 6. I think about what I really need to learn before I begin a task.

_ 7. I know how well I did once I finish a test.

_ 8. I set specific goals before I begin a task.

_ 9. I slow down when I encounter important information.

_ 10. I know what kind of information is most important to learn.

_ 11. I ask myself if I have considered all options when solving a problem.

_ 12. I am good at organizing information.

_ 13. I consciously focus my attention on important information.

_ 14. I have a specific purpose for each strategy I use.

_ 15. I learn best when I know something about the topic.

_ 16. I know what the teacher expects me to learn.

_ 17. I am good at remembering information.

_ 18. I use different learning strategies depending on the situation.

_ 19. I ask myself if there was an easier way to do things after I finish a task.

_ 20. I have control over how well I learn.

_ 21. I periodically review to help me understand important relationships.

_ 22. I ask myself questions about the material before I begin.

_ 23. I think of several ways to solve a problem and choose the best one.

_ 24. I summarize what I've learned after I finish.

_ 25. I ask others for help when I don't understand something.

_ 26. I can motivate myself to learn when I need to.

_ 27. I am aware of what strategies I use when I study.

_ 28. I find myself analyzing the usefulness of strategies while I study.

_ 29. I use my intellectual strengths to compensate for my weaknesses.

_ 30. I focus on the meaning and significance of new information.

_ 31. I create my own examples to make information more meaningful.

_ 32. I am a good judge of how well I understand something.

_ 33. I find myself using helpful learning strategies automatically.

_ 34. I find myself pausing regularly to check my comprehension.

_ 35. I know when each strategy I use will be most effective.

_ 36. I ask myself how well I accomplished my goals once I'm finished.

_ 37. I draw pictures or diagrams to help me understand while learning.

_ 38. I ask myself if I have considered all options after I solve a problem.

_ 39. I try to translate new information into my own words.

_ 40. I change strategies when I fail to understand.

_ 41. I use the organizational structure of the text to help me learn.

_ 42. I read instructions carefully before I begin a task.

_ 43. I ask myself if what I'm reading is related to what I already know.

_ 44. I re-evaluate my assumptions when I get confused.

_ 45. I organize my time to best accomplish my goals.

_ 46. I learn more when I am interested in the topic.

_ 47. I try to break studying down into smaller steps.

_ 48. I focus on overall meaning rather than specifics.

_ 49. I ask myself questions about how well I am doing while I am learning something new.

_ 50. I ask myself if I learned as much as I could have once I finish a task.

_ 51. I stop and go back over new information that is not clear.

_ 52. I stop and reread when I get confused.

APPENDIX E: NEO FIVE FACTOR INVENTORY, FORM S

NEO FIVE FACTOR INVENTORY, FORM S

NEO-Five Factor Scale

Please rate how accurately each of the following statements describes yourself using the 1-5 rating scale where (1) is "Strongly Disagree," (2) is "Disagree," (3) is "Neutral," (4) is "Agree," and (5) is "Strong Agree."

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

I am not a worrier.
I like to have a lot of people around me.
I don't like to waste my time daydreaming.
I try to be courteous to everyone I meet.
I keep my belongings neat and clean.
I often feel inferior to others.
I laugh easily.
Once I find the right way to do something, I stick to it.
I often get into arguments with my family and co-workers.
I'm pretty good about pacing myself so as to get things done on time.
When I'm under a great deal of stress, something I feel like I'm going to pieces.
I don't consider myself especially "light-hearted".
I am intrigued by the patterns I find in art and nature.
Some people think I'm selfish and egotistical.
I am not a very methodical person.
I rarely feel lonely or blue.
I really enjoy talking to people.
I believe letting students hear controversial speaks can only confuse and mislead them.
I would rather cooperate with others than compete with them.
I try to perform all the tasks assigned to me conscientiously.
I often feel tense and jittery.
I like to be where the action is.
Poetry has little or not effect on me.
I tend to be cynical and skeptical of others' intentions.
I have a clear set of goals and work toward them in an orderly fashion.
Sometimes I feel completely worthless.
I usually prefer to do things alone.

I often try new and foreign foods.
I believe that most people will take advantage of you if you let them.
I waste a lot of time before settling down to work.
I rarely feel fearful or anxious.
I often feel as if I'm bursting with energy.
I seldom notice the moods or feelings that different environments produce.
Most people I know like me.
I work hard to accomplish my goals.
I often get angry at the way people treat me.
I am a cheerful, high-spirited person.
I believe we should look to our religious authorities for decisions on moral issues.
Some people think of me as cold and calculating.
When I make a commitment, I can always be counted on to follow through.
Too often, when things go wrong, I get discouraged and feel like giving up.
I am not a cheerful optimist.
Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.
I'm hard-headed and tough-minded in my attitudes.
Sometimes I'm not as dependable or reliable as I should be.
I am seldom sad or depressed.
My life is fast-paced.
I have little interest in speculating on the nature of the universe or the human condition.
I generally try to be thoughtful and considerate.
I am a productive person who always gets the job done.
I often feel helpless and want someone else to solve my problems.
I am a very active person.
I have a lot of intellectual curiosity.
If I don't like people, I let them know it.
I never seem to be able to get organized.
At time I have been so ashamed I just wanted to hide.
I would rather go my own way than be a leader of others.
I often enjoy playing with theories or abstract ideas.
If necessary, I am willing to manipulate people to get what I want.
I strive for excellence in everything I do.

APPENDIX F: 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 underlined. 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 out 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 the next five items, 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 though 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 chorine 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.

    A. 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.

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

    A. Algan has not shown that knowing the long-range effects of chlorination is a worthy objective.
    B. Algan is using a word in two ways.
    C. 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.

    A. Algan hasn't shown that there are only two alternatives.
    B. Algan is using emotional language that doesn't help to make the argument reasonable.
    C. 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 of 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 this thinking is faulty.

A. There is a serious mistake in the thinking in this part.
B. Dobert's conclusion doesn't necessarily follow the reasons he gives.
C. 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 it 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.

A. Algan is using the same word in two ways.
B. That's not a big enough reduction. If there were no typhoid at all the second year, then Algan would have proven his statement.
C. 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.

A. Algan is missing the point.
B. Dobert is using the same word in two ways.
C. 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 is follows that Gallton's water is not safe.

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

A. Algan has made the word "safe" useless for communicating information.
B. Algan hasn't said what he means by "safe".
C. 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.

    A. Dobert hasn't shown that there are only two alternatives.
    B. Dobert is using the same word in two ways.
    C. 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.

    A. Dobert's thinking is in error.
    B. 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.
    C. 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	ORIGNIAL NUMBER IN 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
TOTALS	**44**	**18**	**3**	**1**	**1**	**4**	**17**

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). Which are underlined. 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 G: DEMOGRAPHIC QUESTIONS

Demographic Questions

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 been on academic probation?
10. Have you ever withdrawn from a class?

APPENDIX H: DEBRIEFING FORM

DEBRIEFING FORM

Debriefing Statement For the study entitled: "Personality and Critical Thinking"

Dear Participant;

During this study, you were asked to complete a series of psychological tests assessing personality factors and critical thinking skills. You were told that the purpose of the study was to examine the relationship between personality factors and critical thinking. The actual purpose of the study was to examine the relationship between self-concept and critical thinking skills, as well as answer the research question measuring how much self-concept accounts for the variance in critical thinking when compared with metacognition and the personality factor openness to experience.

We did not tell you everything about the purpose of the study because it may have altered your answers to the questions asked on each test.

If you have any concerns about your participation or the data you provided in light of this disclosure, please discuss this with us. We will be happy to provide any information we can to help answer questions you have about this study.

The responses in this study are de-identified and cannot be linked to you.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints or think the research has hurt you, please contact: Melissa Antler at Melissa_antler@knights.ucf.edu or Dr. Shannon Whitten at Shannon.whitten@ucf.edu.

Thank you very much for your participation!

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