THE RELATIONSHIP BETWEEN MOTIVATIONAL ORIENTATION, MINDSETS AND CRITICAL THINKING IN COLLEGE STUDENTS

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Dissertation Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
December 2018

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ACKNOWLEDGMENTS

I would like to thank all of those whose support and guidance made this work and my education possible. I extend my deepest gratitude and appreciation to the members of my committee, Dr. Jane Vogler, Dr. James R. May, Dr. Laura Barnes and Dr. Linnea Van Eman. Your support, guidance, patience and motivation were critical in my ability to succeed in this program and producing this dissertation. Without you I would not have made it through on this journey.

I wish to acknowledge my love and appreciation for my two children, Grant and Madison. They have had to sacrifice as much or more than I have. Along the way, they have had to forego sometimes little things and sometimes big things so that I could achieve my education. They have done so without complaint, and in fact, often with eagerness, at times reminding me how important it was for me to achieve a specific task even if it meant that I could not attend some of their functions.

I wish to thank my parents for instilling in me from earliest memory the importance of education and of being curious. Although neither had more than a high school education, they were naturally scientists at heart and very rarely made Type I errors in their lives. I especially want to thank both of my brothers. They have always been there to support me and to keep me going when it looked as though I could falter. They have been quick to offer help with personal issues that could have been distractions to my progress. In short, they have been the best brothers any man could ask for.

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Date of Degree: DECEMBER 2018

Title of Study: THE RELATIONSHIP BETWEEN MOTIVATIONAL ORIENTATION, MINDSETS AND CRITICAL THINKING IN COLLEGE STUDENTS

Major Field: EDUCATIONAL PSYCHOLOGY

Abstract:
Scope and Method of Study: The purpose of this study was to explore the relationships between the expression of critical thinking and motivational orientation (i.e. autonomy, controlled and impersonal) and the relationship between expressed critical thinking and self-theories of intelligence mindsets (i.e. entity vs. incremental). Correlation and multiple regression analyses were performed to examine the relationship between motivation orientations and mindsets on critical thinking. The sample for this study consisted of 106 college students recruited from three Midwestern universities with ages from 18 to 25.

Findings and Conclusions: Regression analysis revealed a significant relationship between autonomy and controlled motivation orientations and critical thinking. Autonomy orientations had a positive predictive relationship with critical thinking while controlled orientation had a negative predictive relationship with critical thinking. Neither the impersonal orientation nor mindsets indicated a significant relationship with the expression of critical thinking. This finding is consistent with the interpretation that the autonomy orientation may function similarly to the proposed 'critical thinking disposition' so prevalent in the critical thinking literature. Rather than an inherent psychological trait being responsible for the exhibition of critical thinking (i.e. disposition), the expression of critical thinking may rely rather heavily on motivational factors instead.

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INTRODUCTION TO THE STUDY

> …when the people have lost the ability to set their own agendas or knowledgeably question those in authority; when, clutching our crystals and nervously consulting our horoscopes, our critical faculties in decline, unable to distinguish between what feels good and what's true, we slide, almost without noticing, back into superstition and darkness. (Sagan, 1996, p. 25)

The late Carl Sagan rues what he sees as the decline of critical thought in our modern day societies as a danger that threatens our very civilization. One that if left unchecked may result in a return to a period reminiscent of the medieval Dark Ages in which superstition trumps rationality and learning ceases or even regresses to the detriment of humanity. The potential importance of cognitively related processes for learning within the formal education system, especially for topics such as critical thinking, invites interest in research that addresses the motivational factors, which may be in play with the development of these cognitive skills.

Although Sagan singles out a lack of skeptical thought as a concern, critical thinking is more than simply excessive skepticism; one can view skepticism on a continuum not unlike the standard model describing Type I and Type II research errors. The more that we guard against Type I errors, the more that we increase the likelihood of Type II errors and vice versa. Clearly a healthy balance must be struck, and indeed,

Robert Carroll (2004), philosopher and writer, points directly to this balance when he describes a critical thinker as being neither too gullible nor too skeptical. Consequently a good critical thinker must have both characteristics: skepticism and open-mindedness. This seems to be captured in the definition of critical thinking offered by philosopher Robert Ennis (1993) in which it is described as "reasonable reflective thinking focused on deciding what to believe or do" (p. 180).

Background to the Problem

Critical thinking has long been advocated as a goal of higher education; however, it was not until the 1980s that major attempts at defining and measuring it were undertaken (Ennis, 1993; Facione, 1990). The prevalence of interest in critical thinking is evident with articles addressing its importance that span such diverse disciplines as engineering, music education, physical education, nursing, and medical practice. Examples of errors resulting from poor critical thinking seem all too common, even among highly educated professionals. A recent article in a chemical engineering journal is dedicated to describing the need for better critical thinking skills among its professionals.

> It is surprisingly difficult to recognize we are wrong, once we've made a decision. We're good at spotting patterns, coming up with explanations and theories as to what is going on. What is more difficult is when we've misunderstood something (Crowley, 2015, p. 41).

Crowley (2015) uses examples from offshore oil storage and the accident at the Three Mile Island nuclear plant to illustrate some of these thinking errors. In these cases, it is not the procedural steps that were taken that led to near catastrophic results but the errors

in identifying the real problem to be solved. These examples share a common theme of individuals persisting with a diagnosis of the problem that ignores evidence of an incorrect diagnosis, leading to an escalation of the very conditions they are trying to correct.

Shaw (2014) makes the case for the value of critical thinking in music education. Among the predictable benefits of increasing problem solving skills and determining falsehoods, Shaw (2014) considers that while critical thinking is value-free it may lead to the kind of thinking that identifies social injustices and power imbalances in societies. Shaw also notes that critical thinking in music education may be important to assisting students in bringing abstract concepts into the domain of practical and personal frameworks and connecting the curriculum with the personal experiences, or lives, of the students (2014).

The value of critical thinking in nursing is discussed by Newton and Moore (2013), who point out that it is necessary for nurses to be able to incorporate new practices and approach clinical situations in a variety of ways. The value of good critical thinking among medical students is more self-evident than in some other disciplines. Macpherson and Owen (2010) illustrate the vital necessity of well-developed critical thinking in medical students to avoid misdiagnosis and other errors that lead to medically adverse effects. Human error plays a significant role in nearly 82% of these adverse effects, and error associated with failure of cognitive function (e.g." failure to synthesise [sic] and/or act on information") is second only after "failure of technical performance of an indicated procedure" as the most frequent cause of preventable medical error (Wilson et. al as cited in Macpherson & Owen, 2010, p. 46).

Fairly early, it was acknowledged that there was an additional component to critical thinking, one other than just having the skill set. In 1985, Ennis outlined the importance of a dispositional component in one's overall critical thinking ability. In general terms, a disposition may be thought of as simply the tendency to take some particular action in any particular set of circumstances (Ennis, 1996). The Delphi Report (Facione, 1990) addressed what it called the dispositional dimension of critical thinking. Within this framework it seems clear that in order to demonstrate critical thinking one must not only possess the abilities, or skills, of effective critical thinking, but also the tendency to use them in the appropriate circumstances.

The importance of critical thinking in a democratic society is perhaps highlighted by the 2016 presidential campaign and election, when the U.S. electorate was introduced to concepts such as "fake news" and "alternative facts" in order to challenge the veracity of mainstream media reports. Although a democratic populace that is uninformed has been a long standing concern, it may be that one which is misinformed is an even greater threat to the democratic process (Flynn, Nyhan & Reifler, 2017). Misperceptions in society on issues of politics and health are widespread. In 2010, 54% of Americans believed that only a simple majority of scientists agreed that climate change was occurring and 12% thought that scientists agreed it was not occurring, when in reality, 97% of climate scientists were in accord that climate change was occurring (Ramsay et al., 2010). A similar common misconception can be seen with parents who believe that there is a link between vaccinations and autism despite a marked lack of evidence to this effect (Pluviano, Watt, & Della Sala, 2017).

Particularly salient is the tendency of some questionable beliefs that are divided upon political ideology. According to Ramsay et al. (2010) Republicans believed, by roughly a two-to-one margin, the following misinformation: the economy was getting worse, economists thought that health care would increase the national deficit, the federal stimulus package did not include tax cuts, and, it was not clear that former President Obama was born in the U.S. Misinformation more likely to be believed by Democrats included: the U.S. Chamber of Commerce raised money from foreign powers for Republican candidates, the TARP 'bailout' of 2008 was not supported by most Democrat lawmakers, and that former President Obama did not increase troop levels in Afghanistan. Such broad-scale failure to identify misinformation from true information illuminates an ill-informed electorate who are casting votes for leaders without recognizing factual information for the basis of these decisions.

Beliefs in questionable ideas are not confined to the political sphere. A 2009 Harris poll found that nearly as many Americans believed in ghosts (44%) as did in the theory of evolution (47%). Among other questionable beliefs widely held are the existence of UFO's (36%), witches (31%) and astrology (31%) (Harris Interactive Poll, 2009). These numbers seem to confirm the concerns Sagan (1996) identified above; that a population "unable to distinguish what feels good from what is true" may signal a decline into "superstition and darkness" (p. 25). Framed in this manner, critical thinking becomes important not only as a goal toward an ideal way of thinking, but also one of practical importance to the individual – as well as any society based upon democratic government.

Many critical thinking skills are relatively straightforward. Teaching students to question the credibility of information sources, knowledge about the most common

logical fallacies, and the importance of reviewing decisions in the light of new evidence are not particularly demanding concepts. But the disposition, or tendency, to use these skills seems to be a bigger issue. The term disposition seems to imply an individual trait. Cattell (2009) distinguished between three types of traits in which the dynamic trait included "dispositions." Motivation theory speaks to the level of engagement in goal-directed behavior, the desire to do something (Ryan & Deci 2000a, 2000b; Schunk, Pintrich & Meece, 2008). In light of this, perhaps motivation theory may shed light upon one's motivation, or disposition, to use these skills without invoking a relatively stable trait being required as dispositions imply to be the case.

Self-Determination Theory (SDT) is a theory of motivation that may lend itself towards a salient illumination of critical thinking. According to SDT, one's motivation for a given task is significantly affected by the degree of self-determination, or autonomy, that one perceives themselves to have related to the task (Deci & Ryan, 1985). The orientation of self-determination may vary from impersonal, to controlled, to autonomy. The impersonal level is characterized by a belief that the outcomes of a task are controlled by luck (i.e., the outcome is not controlled by their behavior). In the controlled level, one feels that the task is controlled by an entity outside of the individual. At the autonomy level one believes that they have control over the performance and outcome of the task (Deci and Ryan, 1985).

In a similar vein, another logical connection between critical thinking and its display may be one's mindset of self-theories of intelligence. Dweck (1986) distinguishes between incremental and fixed entity mindsets of intelligence. Incremental mindsets are those in which intelligence is perceived as malleable while entity mindsets represent a

belief that intelligence is relatively fixed. These mindsets have been shown to affect whether one holds a mastery or performance goal orientation (Dweck & Leggett, 1988). Goal orientation is an important factor in motivation in that those oriented toward mastery goals tend to be driven by internal loci and those with performance goal orientations being more likely to be driven by external loci (Ames, 1992; Ames & Archer, 1988; Dweck & Leggett, 1988). Those with mastery orientations tend to seek out challenges and exhibit high persistence on tasks. Those with performance orientations may also demonstrate high persistence but only if their confidence in their own ability is high. Those with low confidence in ability and a performance goal tend to be more likely to avoid challenges and display low persistence on a task (Dweck & Leggett, 1988). An individual with a performance orientation and low-confidence relevant to critical thinking would logically be expected to lack the motivation to display the critical thinking skills which they may have in their repertoire. Overall, those with performance orientations should have a lower display of critical thinking skills than mastery orientations, even when the skills are equally present, due to the universally stronger persistence of mastery performance orientations.

Statement of the Problem

The ability to exercise good critical thinking skills is important not only to higher education but also to the strength of the very fabric of a democratic society (Dewey, 1933; Facione, 1990). However, while teaching the basic skills of critical thinking is relatively straightforward, it does not automatically cause critical thinking to be invoked at the appropriate time. While critical thinking theorists have introduced the concept labeled “disposition” to account for this discrepancy, motivational theorists have

developed more comprehensive models as to why an individual may or may not choose to exercise effort, including possessed skills, toward a given goal. The problem is that what critical thinking theorists have labeled as "dispositions" may be in part, or in whole, a matter of motivation rather than a trait called a "disposition."

Purpose of the Study

This study will explore the relationships between critical thinking and motivational orientation and the relationship between critical thinking and self-theories of intelligence mindsets. The use of critical thinking has been shown to not only depend upon knowledge of critical thinking skills but upon having the inclination to use those skills (Ennis, 1985; Facione, 1990). In order to produce a good critical thinker not only must the skill set be taught but also a good reason, or desire, must be instilled for their use as well. The impetus to exhibit behavior falls within the bounds of motivation theory. Ryan and Deci (2000b) define motivation as being moved "to do something" (p.54).

Organismic integration theory (OIT), a component of SDT, and self-theories of intelligence are two theories of motivation that were examined for a relationship with critical thinking. OIT predicts a higher degree of motivation from those with a relatively more enduring pattern of autonomy (Deci & Ryan, 2000). Self-theories of intelligence predict a higher degree of motivation from those with a tendency towards incremental rather than entity mindsets of intelligence (Dweck, 1999). A significant relationship between OIT and critical thinking and/or self-theories of intelligence and critical thinking may shed light on critical thinking dispositions in that they may, in fact, be artifacts of motivation rather than an inherent trait. The purpose of this study is to examine the

relationships of motivational orientations (Ryan & Deci, 2000a) and self- theories of intelligence (Dweck & Leggett, 1988) with expression of critical thinking.

Research Questions

The logically possible link between motivation and critical thinking, summarized above, raises the following questions this study is designed to address. Does an individual's motivation for a task, as measured by the three factors of autonomy, controlled, and impersonal orientations, affect his or her use of critical thinking skills? Does an individual's self-theory of intelligence, as measured by statements related to entity and incremental mindsets, relate to how likely he or she is to express critical thinking?

Definitions of Terms

For the purposes of this study the following definitions of terms are used. *Critical Thinking* means "reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 1993, p. 180) including "reflective thinking involved in the evaluation of evidence relevant to a claim so that a sound conclusion can be drawn from the evidence" Bensley et al. (2010).

Mindset refers to self-theories of intelligence which an individual holds about the malleability of their intelligence, whether it is more or less incremental or entity in nature. *Incremental mindset* means that an individual believes that his or her intelligence is malleable and changeable over time with effort. *Entity mindset* self-theorists are those who believe that the nature of intelligence is relatively fixed and unchangeable to any meaningful degree, even with effort (Dweck, 2012).

Motivation is to be caused to take an action, "to be moved to do something" with intention (Deci & Ryan, 2000b, p. 54). *Autonomy orientation* is an orientation of motivation in which the individual is regulated by a high degree of self-determination in their initiation and maintenance on a behavior. *Controlled orientation* refers to the orientation of an individual is regulated by external controls or internal controls that while, internalized, have not be developed without the individual's self-determination. *Impersonal orientation* is the orientation in which the individual perceives outcomes on a task as beyond their control and thus feel relatively powerless to affect (Deci & Ryan, 1985).

Summary and Overview

Good critical thinking is important not only for academic outcomes and professional performance but also for the good of society. Indeed, a democratic society is based upon a well-informed and rational electorate. The importance of not only skills, but also dispositions in critical thinking has been discussed since the 1980s. These dispositions have so far been discussed independently of other theories of human behavior, such as motivation theories, and treated more like traits. However, a trait is not the only possible factor that may influence a tendency to engage in a particular behavior or task. Motivation theory speaks to the level of engagement toward tasks. In particular, SDT addresses how one's perceived autonomy on a subject may influence their motivation towards a task, such as investing the extra effort of critical thinking regarding the task. Similarly, one's self-theory of intelligence, or mindset, has been shown to affect motivation. Those with incremental mindsets, that view intelligence as malleable and being able to grow are more likely to be associated with greater levels of motivation.

Those with fixed entity mindsets are more likely to be associated with lower levels of motivation. Both of these motivational theories may shed light on the use of critical thinking skills.

In the following chapter, I discuss the literature related to the importance of good critical thinking. Critical thinking is shown to be important for not only a well-functioning democracy but also for college educated professional performance. I discuss literature that illuminates that critical thinking involves more than just having the skills of a critical thinker but also an impetus to utilize these skills appropriately. The literature in this area has traditionally been in the domain of critical thinking theorists and has neglected to incorporate motivational elements in the impetus to utilize these skills. Possibly for this reason, the impetus to exercise critical thinking skills has largely been deemed a "disposition" rather than as a motivation to exercise them. In order to show the appropriateness in utilizing a motivational framework to address critical thinking use, the literature on SDT (Deci and Ryan, 1985) and Mindsets (Dweck, 1986) is discussed.

In Chapter Two, I present a review of current literature in respect to critical thinking, motivation theory and mindsets. I will explain how these theories may relate to one another and the reason that an examination of their potential relationship is warranted. In Chapter Three, I present the methodology with which I will examine each of the research questions the rationale for each of them. I present the results of the data analysis in Chapter 4. Finally, in Chapter Five I present a summary of the findings, conclusions, implications and limitations of this study, and a discussion of future directions for research.

CHAPTER II

REVIEW OF THE LITERATURE

Critical thinking is frequently linked with positive outcomes in education and other facets of intellectual life including such diverse areas as its vital role in democratic government in respect to the importance of a well-educated and good thinking public electorate (Dewey, 1933; Facione, 1990). There is significant discussion within the field of critical thinking beginning with disagreements about its specific content and definition, proceeding through the philosophical basis of how critical thinking is approached, to the importance of dispositions to think critically. In this chapter, I review the development of critical thinking and examine these particular issues.

Following the discussion of critical thinking through current times, I review the salient literature on motivation, with a focus on intrinsic versus extrinsic orientations and Organismic Integration Theory (OIT), a sub-theory of Self-Determination Theory (SDT). In addition, I present a discussion of self-theories of intelligence and logically link these motivational constructs to potential influence on the expression of critical thinking. This possible connection will have at its nexus the quiescent nature of critical thinking expression as discussed in the literature.

Critical Thinking

To some theorists, critical thinking is a somewhat nebulous concept that can vary depending upon the discipline exercised or the material within focus. Clinchy (1994), former professor of psychology and author of *Women's Ways of Knowing,* discussed two types of critical thinking, separated knowing and connected knowing; the former includes characteristics of detachment and impersonality whereas the latter deals with empathetic connection with the subject. By contrast, Barnett (1997), who approached critical thinking from a higher education perspective, discussed four modes of critical thinking: disciplinary competence, practical knowledge, political engagement, and strategic thinking. Of these, disciplinary competence, practical knowledge, and strategic thinking seem to parallel loosely separated knowing, while political engagement seems more associated with connected knowing. From this political/engagement camp, critical thinking includes concepts such as engagement with others, awareness/empathy of others, and value-laden thought such as political thought.

Other theorists have been inclined to offer more specific, objective, and cognitively focused conceptions of critical thinking. For example, some theorists have defined critical thinking as "…the ability to collect, interpret, analyze, synthesize, and evaluate data" (Maneval et al., 2011, p. 229). However, others have focused more on the cognitive skills specifically directed toward a justifiable outcome, as reflected in the statement, "Critical thinking is reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 1993, p. 180). Bensley et al. (2010) continued this vein of thought in their definition of critical thinking as, "reflective thinking involved in the evaluation of evidence relevant to a claim so that a sound conclusion can be drawn from the evidence"

(p. 91). Regardless of nuanced differences, this cognitive camp has been united in excluding such concepts as empathy and connectedness as elements of critical thought. It was through the lens of the cognitive camp that I approached critical thinking for the bulk of the present work.

Theoretical Development

The modern development of critical thinking theory may be traced to the philosopher Robert Ennis and the educational thinker John McPeck in the 1980s. Ennis (1985) viewed critical thinking as a more precise and practical process than could be clearly described by Bloom's higher-ordered thinking skills. For Ennis, higher-ordered thinking skills were defined too vaguely and without a means of judging outcomes. Rather, he believed critical thinking should be described by four necessary abilities: clarity of thinking, establishing a sound basis for inference, making sound inferences, and making sound and useful decisions (i.e., problem solving). Whereas Ennis (1996) emphasized the components of rationality, reflection, and decision making in key components of critical thinking, McPeck (1981) considered critical thinking to be the ability to appropriately exercise reflective skepticism. He began with an elimination process in defining critical thinking by first examining what he thought that it was not. For example, he would claim that correctly assessing statements could sometimes be accomplished through luck rather than skill and that no one would claim an individual to be a good critical thinker under such circumstances. Furthermore, according to McPeck, there were activities that involved critical thought without having to assess the correctness of statements such as chess. Much like Descartes' skepticism led him to his principle of cogito ergo sum, "I think therefore I am," McPeck exercised a kind of

methodological skepticism and arrived at the conclusion that the one thing we could be sure about critical thinking was that it included thought. That is, because thought must always be *about* something, critical thought must always be about some object or concept. Consequently, as objects and concepts are domain specific, he argued it made little sense to teach critical thinking skills in a generalized manner (McPeck, 1981).

Table 2.1.

Common Elements of Critical Thinking

Evaluate Source	Analysis of Information	Reflective Thinking (Metacognition)	Valid Conclusion
Bensley et al.(2010)	Bensley et al.(2010)	Bensley et al.(2010)	Bensley et al.(2010)
Ennis (1996)	Cotter & Talley (2009)	Cotter & Talley (2009)	Cotter & Talley (2009)
Maneval (2011)	Ennis (1996)	Ennis (1996)	Ennis (1996)
	Maneval (2011)	Maneval (2011)	Norris (1985)
		McPeck (1981)	

These definitions share some important criteria (Table 1), which may be seen as a linear process but should not be construed as prohibiting a loop of re-cogitating information during the process (see Figure 1). This process would begin with the presentation of information at which time the value, including the credibility of the source, would need to be judged.

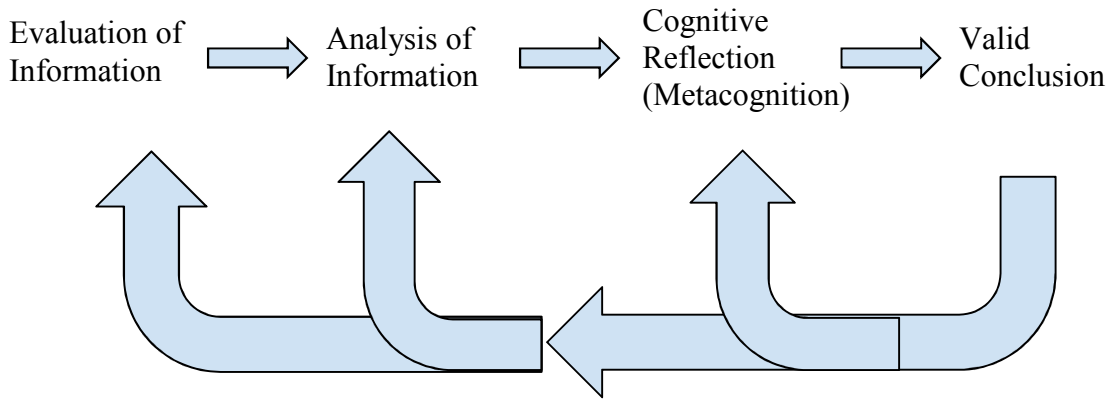

Figure 1. A Process of Critical Thinking

Evaluation of information, including the validity of the source, is seen in the Maneval (2011) and Bensley et al. (2010) definitions. One may also argue that this evaluation of information is captured in Ennis' (1985, 1996) definition with 'reasonable thinking'. Analysis of information, including the avoidance of logical fallacies such as the strawman fallacy, is another common component of these definitions, as this step was captured in the definitions presented by Maneval (2011), Cotter & Talley, (2009) and Bensley et al. (2010) explicitly and by Ennis' (1985, 1996) implicitly. The third common component of critical thinking is some form of synthesis, metacognitive, or reflective oriented cogitation. Maneval (2011) referred to this as synthesizing information. To Cotter & Talley (2009) it was metacognition, while Bensley et al. (2010) captured this concept as reflective thinking, Ennis (1996) incorporates an element called reflection, and McPeck (1981) emphasizes the importance of reflective skepticism. The final step is that of drawing an appropriate conclusion given the information at hand. Cotter & Talley, (2009), Ennis (1996), and Bensley et al. (2010) specifically included this component, but it may be inferred in other, indeed all, definitions of critical thinking. Without the arrival of a decision on what to think or do about given information critical thinking is a process

without a purpose. In the words of Norris (1985), a critical thinker must be productive in developing reliable observations and reasonable hypotheses. Despite the wide variety of elements postulated to comprise critical thinking there is consistency in that they may be classified into the four common elements depicted in Figure 1 above.

Domain Specificity versus Generality

An area of active debate in critical thinking discourse is whether, or how much, the process is field specific or generalizable across domains. The structure offered by Ennis (1985) included at least some aspects of critical thinking being generally available, as he felt it was more about the process than domain specific knowledge. By contrast, McPeck (1981) clearly identified that in his view, critical thinking was very domain specific. Kuncel (2011) discussed critical thinking in terms of two distinct categories: field specific knowledge and general reasoning skills. According to this distinction there is a difference between domain, or field, specific abilities and the general reasoning skills that one might learn to apply in multiple domains. Kuncel (2011) proposes that field-specific critical thinking can be developed only via experience within practice of a particular discipline and does not generalize to other fields. In this model, one could develop effective but specific critical thinking skills in electrical engineering for example, without being particularly proficient in more universal critical thinking abilities of the general type. The second, more general type of critical thinking would include knowledge of particular cognitive skills that are applicable to multiple fields or domains, such as knowledge of and avoidance of logical fallacies. Huber and Kuncel (2016) argued that although these specific skills might be useful, they were not useful in more generalized areas, "it is argued that knowing about the law of large numbers is useful for reasoning

about the law of large numbers and nothing else" (p. 435). This interpretation could be applied too narrowly, however, as specific reasoning skills such as the law of large numbers and logical fallacies can be applied independently of subject matter or domain. For example, the law of large numbers could be applied to any domain in which probability is in play such as in estimating payouts of casino games, establishing actuarial tables, or predicting diffusion of molecules in chemistry. In a nod to this possibility, Huber and Kuncel (2016) then went on to say that even if these skills are indeed domain specific they are still likely to "produce more informed consumers of information" (p. 435).

Critical Thinking Dispositions

Although nearly a century ago, Dewey (1933) pointed out the importance of "good habits of thought," formal discussions about the importance of dispositions in the use of critical thinking skills have been occurring mostly since the mid-1980s (Ennis, 1985). Defined as "a tendency to do something, given certain conditions" (Ennis, 1986, p. 166), Facione (1994) pointed out that without addressing dispositions, critical thinking education was incomplete. To be an effective critical thinker one must have not only the discrete skills of critical thought but also the disposition, or tendency, to use those skills when appropriate (Yang & Chou, 2008). Despite some authors offering broad hints of motivation being involved with critical thinking dispositions, there have been few – if any – efforts to ground these dispositions within a formal motivational framework. Yang and Chou (2008) mentioned that motivation along with attitudes and habits of mind collectively form critical thinking dispositions. Despite this early link with motivation, there is relatively little in the literature discussing possible relationships between critical

thinking and motivational theories. This gap in the literature leaves open the possibility that motivation is an important factor in the exercise of critical thinking rather than a *disposition* to do so. The skills of critical thinking in addition to the disposition (or motivation) to use them will be referred to as critical thinking expression (or expression of critical thinking) for the remainder of this work.

Three Traditions of Critical Thinking

While the characteristics described above in the more holistic, but nebulous, political/engagement camp (Barnett, 1997; Clinchy, 1994) are desirable qualities for one to exhibit, they reflect concepts that are beyond the scope of what the cognitively-focused group has described as critical thinking. Even within the cognitive camp there has been a lack of consensus on specifically what critical thinking may reflect, to what Sternberg (1986) referred to as the three traditions of thought in critical thinking: the philosophical, psychological, or educational tradition. Noting the common influence of John Dewey, philosopher, psychologist and educator, on these three traditions, Sternberg (1986) noted that each tradition developed within its field over time, which may have led to the present-day lack of consensus surrounding how to define critical thinking.

The philosophical tradition of critical thinking tends to focus on the use of formal logic rather than processes in the classroom. However, formal logic systems do not necessarily correspond with the abilities of students in a classroom situation. Furthermore, formal logic systems require a perfect case scenario and do not reflect real world limitations such as time constraints, motivation, or completeness of information. The philosophical branch, therefore, presents an idealistic potential of critical thinking (Sternberg, 1986).

Whereas philosophically based theories reflect the potential of critical thought, the psychological tradition focuses on actual performance of individuals within the constraints of individual and environmental limitations. Two issues related to this tradition include the concern that testing scenarios may require an oversimplification of the critical thinking process, thereby leading to the possibility of differing performance in critical thinking expression from laboratory tests to real-world situations (Sternberg, 1986).

Taking the psychological tradition of observing critical thinking expression out of the laboratory and into the classroom thereby incorporating more of a real-world description is the focus of the education tradition. Theorists in the educational tradition are guided by the skills required of children in the classroom venue for making good decisions, learning concepts, and solving problems correctly (Sternberg, 1986). Bloom's (1956) taxonomy of learning includes three categories under the cognitive domain that are frequently associated with critical thinking: analysis, synthesis and evaluation (Kennedy, Fisher & Ennis, 1990). Whereas philosophical theories focus on idealistic critical thinking and psychological theories focus upon the actual performance of critical thinkers under ideal circumstances; educational theories blend the two in differing proportions and may represent a more practical view of expressing ideal critical thinking as its focus (Sternberg, 1986). It is with the educational tradition that the present study was grounded, which is the actual expression of critical thinking outside of a controlled laboratory setting.

Despite these differences, there are broad areas of agreement between the three traditions, as each includes the following four components (Lai, 2011):

- analyzing arguments
- proper use of deduction or induction
- judging/evaluation of claims or evidence
- problem solving/decision making

The three traditions also share a general convergence on the importance of dispositions in the exercise of critical thinking. Dispositions to think critically have been discussed since the 1980s (Ennis, 1985). Although there is active debate on aspects such as, how many types of dispositions there are and how specifically to define them, there has been some consensus around the idea that dispositions are generally required for one to express their critical thinking skills in an observable way.

There have also been several areas of disagreement amongst critical thinking theorists including the role that the dispositions play, the importance of background knowledge (domain specificity versus generality), transferability to new contexts, and role of criteria (Lai, 2011). The strict procedurists, while agreeing that dispositions are necessary for critical thinking skills to be displayed, disagree with including the dispositions in the actual definition of critical thinking. Most theorists hold the position that dispositions are laudatory in that they are required in order for the skills to be expressed and therefore for someone to be a critical thinker. Other theorists add a normative quality, suggesting that there is a requirement for a disposition to meet a normative standard in order for someone to be said to be a true critical thinker. The laudatory perspective suggests that one may have the requisite skills but if they are not used then one is not lauded to be a critical thinker. The normative position adds the extra quality of dispositions being required to meet a moral or ethical standard. In the latter

case, one who uses correct logical procedures for a nefarious purpose would be excluded from being lauded as a critical thinker. The majority fall into the mainstream laudatory camp stressing that what something is has little to do with how it is used (Facione, 1990). Thus, to a procedurist one may be considered a good critical thinker without ever displaying it; for the laudist one must have not only the ability but must also actively use this skill set; and the normativist adds to the requirements of the laudist to include the use of the skill set for "good" moral or ethical purposes. Thus, dispositions are irrelevant to the strict procedurists but crucial to the laudatory and normative perspectives.

Research

Researchers have considered how much influence instruction can have on students' critical thinking skills, with mixed results. Some research has pointed to significant gains in critical thinking from various interventions at the college level (Hattie, 1992; Heijltjes, Gog & Pass, 2014; Terenzini et al. 1985). For example, Terenzini, Springer, Pascarella & Nora (1985) found that students enrolled in classes with assignments incorporating critical thinking exercises had higher critical thinking scores at the end of one year. Similarly, Heijltjes, Gog, and Paas (2014) found that explicit instruction along with practice improved critical thinking expression. However, a meta-analysis of twenty-seven studies examining how to improve critical thinking in college students, revealed that college attendance in general, without specific critical thinking content, improved critical thinking expression in students (McMillan, 1987) strengthening the argument that discrete exercises contribute relatively little to increases in critical thinking expression. Further strengthening this argument, Beavers, Orange and Kirkwood (2017) examined the impact of teaching critical reflection upon 10 early

education students. At the end of the seven-week experimental period they found no significant difference on scores for critical thinking as measured by a standardized measure of critical thinking expression. However, they believed that the reflections produced by these students may have improved.

There is also debate in the literature as to whether critical thinking gains are steady over the course of college attendance or occur more strongly at smaller intervals during the overall college experience (e.g. during periods of discrete instruction on critical thinking) (Huber & Kuncel, 2016). This argument is related to the concern in the literature that the gains are negligible. For example, Arum and Roksa (2011) point to an overall gain of only .18 standard deviations, or seven percentile points, on the College Learning Assessment between students from their Freshman through Sophomore years. Hattie (1992) estimated a consistent gain of about one half of a standard deviation over several semesters to the full four years of college based on forward projections of gains measured during a semester or two. However, one must be wary of scaling up an increase demonstrated during one or two semesters in an effort to extrapolate those gains over the course of a college career (Huber & Kuncel, 2016). If gains are more pronounced during periods of explicit instruction than the remainder of the college experience, then such extrapolation is over estimating the gain.

Additional concern comes in the nature of the length of gain in critical thinking. Puma et al. (2012) found that the effects of Head Start on children were positive but short termed; by third grade, these advantages seemed to have vanished. This realization prompted Huber and Kuncel (2016) to speculate that discrete critical thinking interventions may have a similar dynamic.

These mixed results about the longevity of, or even the clear existence of, lasting gains in critical thinking after specific instruction strengthen the importance of another factor that may be deeply involved. Most often this gain is manifested as a critical thinking disposition (Ennis, 1985; Facione, 1994; Lai, 2011; Yang & Chou, 2008), the modern incarnation of Dewey's (1933) "good habits of thought." For example, Norris and Hollett (in Ennis, 1996) found differences between multiple choice tests and open-ended versions of those same tests leading them to argue that the multiple choice versions measured ability while the open-ended versions measured dispositions. However, another possibility arises when one considers the expression of critical thinking not as a trait, but as an issue of the motivation (or lack thereof) to display critical thought.

In summary, research on critical thinking education has been mixed, with some authors finding that discrete education was effective while others argued that these effects were negligible or temporary only. The lack of clarity in discrete exercises having a direct and measureable effect upon exhibited critical thinking underscores the importance of a factor other than the particular skills in order to express critical thinking in a regular and reliable fashion. Traditionally, this other factor has been referred to as a disposition to think critically. However, there has been little research treating this other factor as an issue of motivation rather than some kind of inherent trait.

Motivation

Motivation is defined as "the process whereby goal directed activity is instigated and sustained" (Schunk, Pintrich, & Meece, 2008, p.4). Ryan and Deci (2000b) state that motivation is to be "moved to do something" (p.54) and "concerns energy, direction, persistence and equifinality - all aspects of activation and intention" (Ryan & Deci,

2000a, p. 69). Motivation considered as a process rather than an outcome allows it to be inferred from sustained actions occurring over time rather than measured as a product (Schunk, Pintrich & Meece, 2008). Within the framework of Ryan and Deci's (2000a) Self-Determination Theory (SDT) of motivation, autonomy towards a goal is critical. SDT postulates that satisfaction of inherent psychological needs is crucial for self-motivation. SDT identifies three basic psychological needs: competence, relatedness and autonomy (Ryan & Deci, 2000a). Of particular concern for this project is autonomy, although relatedness will be discussed in terms of priming, and competence will be addressed by mindset. This focus is because, according to Ryan and Deci (1991; 2000), individuals with more autonomy tend to exhibit higher performance on a task even when perceived competence and relatedness remain constant.

Intrinsic and Extrinsic Motivation

Intrinsic and extrinsic motivations are a focal element of self-determination theory (SDT; Deci and Ryan, 1980; Deci & Ryan, 1985). As defined by Deci and Ryan (1980) self-determination is "the process of utilizing one's will" (p. 26) with "will" being the ability to choose the method to satisfy a need. Three basic innate needs are identified in SDT: autonomy, competence, and relatedness. The need for competence refers to the inherent need to feel competent in tasks and interactions with others. A similar concept is that of the need for mastery described in attribution theory (Weiner, 1992). Autonomy refers to the degree of self-determination that an individual perceives for a given task; the degree to which it is internally controlled rather than externally controlled (Ryan & Deci, 2000b). The third innate need driving behavior in SDT is a sense of relatedness which deals with how one perceives to be connected to others, especially in the sense of

belonging or of gaining the approval of others for the task (Schunck, Pintrich & Meece, 2008). Self-determination theory posits that a secure and related environment helps bolster motivation throughout the lifespan and is not restricted to the observed higher levels of exploration seen in infants with healthy attachments to their environments (Ryan & Deci, 2000a)

Deci and Ryan (1980) defined intrinsic motivation as "the human need to be competent and self-determining in relation to the environment" (p. 27). Intrinsic motivation therefore includes satisfaction of the inherent needs of competence and autonomy. So important is intrinsic motivation that in 1985, Deci and Ryan developed a specific model within SDT to address it, referred to as Cognitive Evaluation Theory (Ryan & Deci, 2000a). Although children seem to have a rather strong inherent tendency toward intrinsically motivated behavior at birth, this condition requires significant supportiveness in the environment to be sustained developmentally over time (Ryan, Kuhl & Deci, 1997).

Organismic Integration Theory

While Cognitive Evaluation Theory deals with intrinsic motivation within the framework of SDT, Organismic Integration Theory (OIT) deals with extrinsic motivation. Within OIT there are three motivation orientations: autonomy, controlled, and impersonal. The autonomy orientation captures those who are regulated by a high degree of choice in terms of their initiation and maintenance of a given behavior. These individuals are more likely to be intrinsically motivated and to focus their behavior due to personal interests rather than external or internal controls. The controlled orientation reflects those who are primarily regulated by perceived controls. These controls may

come in the form of external ones such as oversight from a third person, deadlines, or rewards. But there may also be internal controls such as the feeling that one 'should' do a particular task in a particular way rather than 'wanting' to do it. The third orientation, impersonal, represents those who are regulated by the perception that their actions are primarily not within their own control. Individuals high on the impersonal orientation tend to feel incompetent and powerless in their behavior and may view their actions as at the mercy of an unknown fate (Deci & Ryan, 1985).

Organismic integration theory proposes that for each motivation style there are non-overlapping regulatory styles. The impersonal orientation is characterized by a regulatory style of non-regulation while the autonomy orientation is characterized by the style of intrinsic regulation. The controlled orientation is more complicated and consists of four regulatory styles progressing from least to most self-determined behavior: external regulation, introjected regulation, identified regulation and integrated regulation. Each regulatory style has a corresponding perceived locus of causality. Non-regulation has an impersonal locus of causality while the intrinsic regulation's style is an internal locus. The four regulatory styles of extrinsic motivation progress from: external, somewhat external, somewhat internal to internal respectively. These styles reflect steps from less externally controlled to more internally regulated and consequently, more self-determined (Ryan & Deci, 2000b).

Associated with each regulatory style and locus of causality are its characteristic regulatory processes. The impersonal locus, which leads to a non-regulatory style and impersonal orientation, is characterized by feelings of incompetence and lack of control over one's behavior. The external locus is the first step away from amotivation and into a

controlled motivation orientation and includes processes of compliance and a focus upon external rewards and punishments. With such a regulatory process, external regulation is consistent with the operant conditioning of behaviorism. Progression to the introjected regulatory style reflects a limited internal integration of some regulation and the locus is consequently moved from external to somewhat external. The relevant regulatory process for introjected regulation involves performance for such reasons as ego value, i.e., being primarily concerned with proving worth to others or avoiding embarrassing failures in the eyes of others. Identified regulation is the next stage of progression of increasing internalization, and subsequently, increasing self-determination. The locus of causality for this style moves from somewhat external to somewhat internal. At this level of internalization a task is acknowledged as being important to the individual and some degree of importance is attached internally for achievement. The fourth, and last, style of regulation in extrinsic motivation is integrated regulation, which is characterized by fully internalized value or worth of the task, with a locus of causality that is perceived to be internal. Although integrated regulation has much in common with intrinsic motivation, it is considered a form of extrinsic motivation because action is related to the achievement of 'separable outcomes' rather than for inherent value.

OIT provides a framework with which the missing factor of expression of critical thinking may be linked. The three orientations describe differences in motivation to a task which capture and separately describe: those whom are internally motivated and self-determined, those whom are externally motivated (although this external motivation may have been internalized at some point and is not a self-determined factor), and those whom perceive no self-determination or autonomy with a task whatsoever. If the missing factor

in expressing critical thinking is a motivational issue, then the three motivational orientations of OIT seem a logical place to look for explanations for differences in the use of critical thinking skills.

Empirical Support for OIT

There is a long history of empirical support for positive educational outcomes in relation to intrinsically oriented motivation including higher levels of interest, creativity and performance (Gottfried, 1985; Lepper et al., 2005; Lloyd & Barenblatt, 1984). Similarly strong empirical support for negative outcomes in association with extrinsic motivation is also present (Friedman et al., 2009). Students who are more autonomous in their orientation have been found to display higher levels of comprehension in reading material (Grolnick & Ryan, 1987). Autonomous self-regulatory styles and perceived competence have been shown to have predictive value on achievement tests scores and grades among elementary students (Miserandino, 1996). Black and Deci (2000) identified a link between autonomy orientations with higher grades and course satisfaction in a group of college students. Ryan and Connell (1989) showed that the extrinsic regulatory styles of self-determination theory showed less correlation the farther apart they were theoretically separated in the model. For example, external regulation would be more correlated with introjected regulation than identified regulation. The same study also found that an identified style was more associated with enjoying school and an introjective style, one step more extrinsic than the identified style, was more associated with school anxiety.

There is some evidence that an individual's motivational orientation can be at least somewhat affected by exposure to other people, or primed. According to the

motivational synchronicity hypothesis, individuals are more likely to demonstrate a motivational orientation after they observe it in others than before such observations can occur. Friedman et al. (2009) found evidence for such imitation with a sample of college students who were exposed to a video game and a geometry problem. In both cases, those primed by an intrinsic confederate spent more time on their respective task during a free choice period. These findings are consistent with results reported by Levesque and Pelletier (2003), who found that those primed with an intrinsic orientation performed better on a subsequent puzzle task and that those who are not chronically intrinsically oriented were more affected by priming than non-chronically oriented individuals. Such priming seems consistent with the relatedness aspect of self-determination theory, which calls for increased internalization of the values and regulations of one's social group (Deci & Ryan, 2000a). Thus, if one considers the importance of motivation in the expression of critical thinking skills, and priming possibly reflects OIT's psychological need for relatedness, such findings may have implications for critical thinking expression.

A recent study of medical students revealed that as performance increased, so too did the progression in regulatory styles. Higher performing students scored highest on identified regulation while lowest scoring students scored highest on external regulation and sought more feedback about their performance (de Jong et al., 2017). Another study within the medical field demonstrated how SDT could be applied successfully to the development of autonomous self-management in diabetes patients through delivery of autonomy support from their physician (Koponen, Simonsen, & Suominen, 2017). Such findings build upon earlier studies that found a relationship between the degree of autonomy in patients with long term medication treated conditions and their propensity to

adhere to the long-term medication regimen (Williams et al., 1998). Similar internalization of treatment goals for health-related issues is seen in weight loss (Williams et al., 1996; Williams and Deci, 1996) and in substance abuse (Zeldman, Ryan, & Fiscella, 2004).

Thus, the literature supports the concept that motivation orientations of autonomy, controlled and impersonal, as described by OIT (Ryan & Deci, 1985; 2000a) are related to observed performance across a variety of tasks. Of additional interest for this study is the idea of priming, described by Levesque and Pelletier (2003) and Friedman et al. (2009), which indicates that motivational orientation may be altered. As motivational orientation has been shown to relate to performance on a given task this idea introduces the question of whether motivational orientation is related to performance on the task of critical thinking expression.

Mindset

As the expression of critical thinking is a cognitive task involving concepts such as evaluating the source of information, analyzing that information, reflecting upon and drawing appropriate conclusions about that information, one's beliefs about their cognitive abilities could have an effect on this expression. Mindsets (Dweck & Leggett, 1988) are self-theories that individuals have about the nature of certain characteristics such as intelligence. In respect to the nature of human intelligence, people differ in their beliefs, ascribing to either an entity mindset or an incremental mindset. Individuals with entity, or fixed, mindsets view intelligence as an invariable constant that is relatively fixed and unchangeable to any meaningful degree. Individuals with incremental, or

growth, mindsets tend to view intelligence as a variable and malleable quality that can be changed over time with effort (Dweck, 2012).

According to Dweck and Leggett (1988) the identification of these mindsets grew from earlier research that distinguished between "helpless" responses and "mastery" responses when subjects were presented with a cognitive obstacle or challenge. The mastery response was characterized by seeking challenges and persistence in the face of difficult challenges, whereas the helpless response was associated with avoiding challenges and a lack of persistence.

Mindsets have been examined in the literature and support has been found that those with an incremental mindset tend to utilize more learning strategies (Braten & Olaussen, 1988). Incremental and entity self-theories have both been shown to relate to students' grades (Faria & Fontaine, 1997). Stipek and Gralinski (1996) found that an entity mindset had a negative effect on achievement.

Critical Thinking and Motivation

As previously noted, the importance of dispositions to think critically was hinted at as early as a century ago by John Dewey (1933) who recognized "good habits of thought." The dispositional component to critical thinking expression was discussed in a more modern sense as early as the 1980s (see Ennis, 1985). Ennis (1996), writing from the philosophical tradition, describes dispositions as "a tendency to do something, given certain conditions" (p. 166). Exemplifying the philosophical tradition, Ennis (1996) used the metaphor of glass having "a tendency to break into a number of pieces when struck" (p. 166). Thus, dispositions may be seen as the "motivation or desire to think critically" that are prerequisites for the expression of critical thinking (Sternberg, 1986, p. 8).

Both of the above definitions clearly frame critical thinking dispositions within a territory familiar to motivation theorists. Thus defined, as a motivation, dispositions seem to be a required, and indeed, self-evident, component of the expression of critical thinking, as it is for any goal-directed activity. Some of the more common dispositions for critical thinking that were discussed earlier, such as inquisitiveness, open-mindedness, fair mindedness, tendencies to seek reason, and desire to stay well informed are things that can all be associated with an intrinsically motivated, incremental mindset as they represent a desire for mastery rather than a focus on performance.

Both Deci and Ryan's (1980) Self Determination Theory and Dweck & Leggett's (1988) self-theories of intelligence speak to elements that affect mastery versus performance goals and their impact upon one's motivation on a given task. Despite this apparent link between motivation and critical thinking expression, no previous research specifically targeting this relationship has been discovered. The same holds true for self-theory mindsets and their potential relationship with the potential to express critical thinking skills.

Statement of the Problem

The ability to exercise good critical thinking skills is important not only to higher education but also to the strength of the very fabric of a democratic society (Dewey, 1933; Facione, 1990). However, while teaching the basic skills of critical thinking is relatively straightforward, it does not automatically cause critical thinking to be invoked at the appropriate time. While critical thinking theorists have introduced the concept labeled "disposition" to account for this discrepancy, motivational theorists have developed more comprehensive models as to why an individual may or may not choose

to exercise effort, despite possessed skills, towards a given goal. What critical thinking theorists have labeled as "dispositions" may be in part, or in whole, a matter of motivation and not a trait called a "disposition".

OIT (Ryan & Deci, 1985; 2000a) provides a framework of motivation that describes persistence and achievement on a task as related to one's motivational orientation. OIT is based upon the inherent needs satisfaction of autonomy, relatedness and competence. Self-theories of intelligence, specifically Dweck & Leggett's (1988) model of entity and incremental mindsets, deal with perceived competence. Those with an entity theory view intelligence (competence) as fixed and relatively unchangeable. Those with an incremental view see intelligence as malleable and improvable with effort. I have been unable to find in the literature that critical thinking has been examined within the motivational frameworks of OIT or mindsets.

Summary

In conclusion, critical thinking has been the subject of diverse discussion in respect to its components and importantly, if and how it may be encouraged. One consensus that has emerged is that the expression of critical thinking requires more than an individual just having the skills to do so. Within the literature of the critical thinking theorists, this expression has been described as a disposition to think critically. Within the field of Educational Psychology this term may imply a trait. When viewed through the lens of motivational theories like OIT, the concept of a critical thinking disposition seems to be seen more accurately as a motivation issue rather than a trait.

Theories of motivation expressly discuss the perseverance of individuals and their desire to engage toward goal directed activities, such as expressing critical thinking. OIT,

in particular, addresses the importance of self-determination that an individual perceives as being crucial to their level of engagement toward a given behavior. Those with higher levels of perceived autonomy have been shown to tend toward higher levels of performance and perseverance. OIT is based upon the inherent need to satisfy three psychological needs: autonomy, relatedness, and competence.

A complimentary theory of motivation is that of self-theories of intelligence. Within this framework, individuals are seen as viewing intelligence as more or less an unchangeable entity or as more a malleable, incremental mindset. Those with the incremental vision of intelligence tend to have higher levels of engagement on tasks. Mindsets may also reflect one of the three underlying psychological needs of OIT, namely competence. No literature has been located in which these theories of motivation have been applied to critical thinking.

CHAPTER III

METHODOLOGY

The objective of this study was to examine the relationships of motivational orientations (Ryan & Deci, 2000a) and self-theories of intelligence (Dweck & Leggett, 1988) with the expression of critical thinking skills (Ennis, 1985) of college students. Previous researchers have described dispositions as a "trait" (Ennis, 1985; Facione, 1994; Yang & Chou, 2008), and the research literature reveals inconsistencies with how researchers operationalize dispositions (Facione, 1990; Lai, 2011); however, an argument can be made to link critical thinking dispositions to motivation, in particular, organismic integration theory (OIT) as described by Deci and Ryan (2000) and self- theories of intelligence (mindsets) as described by Dweck and Leggett (1988). Thus, for this study, I explored to what extent individual differences in the predictor variables of motivational orientation and self- theories of intelligence, might account for variance in the criterion variable of a measure of the expression of critical thinking. Should a link between motivational orientations and use of critical thinking be discovered, it could shed light not only upon theoretical development of a critical thinking model but also to practical strides in advancing the expression of critical thinking.

Research Question One

Does an individual's motivation for a task, as measured on the three factors of autonomy, controlled, and impersonal affect his or her use of critical thinking skills? The three orientations within OIT, reflecting differing levels of autonomy, have been shown to relate to increased degrees of motivation towards tasks progressing from the impersonal orientation (lowest) to the autonomy orientation (highest) (Connell & Wellborn, 1991; Grolnick & Ryan, 1987; Miserando, 1996; Ryan & Connell, 1989; Vallerand & Bisonette, 1992). If motivation is a key factor in the exhibition of critical thinking, then more autonomous orientations should be related to higher expression of critical thinking. In particular, one should expect the strongest positive relationship with critical thinking to be with the autonomy orientation, a weaker or nonexistent relationship with the impersonal orientation and a nonexistent or negative relationship with the controlled orientation. Thus, the anticipated results for this study were as a follows:

H_1: There will be a positive relationship between the autonomy orientation and critical thinking.

H_2: There will be a negative relationship between controlled orientation and critical thinking.

H_3: There will be a negative relationship between impersonal orientation and critical thinking.

Rationale

Critical thinking skills have been shown to require a tendency or desire to assert them in order for them to be expressed (Ennis, 1985: Facione, 1994; Yang & Chou, 2008). One reason for this could be that critical thinking may require more effort and

commitment to engage in than not. The theoretical model for critical thinking dispositions has been shown to closely parallel the concept of motivation in educational research. For example, the definition of dispositions offered by Ennis (1996) is "a tendency to do something, given certain conditions" (p. 166) and the definition of motivation by Ryan and Deci (2000b) is to be "moved to do something" (p.54). Some critical thinking theorists have discussed a motivational component that may be an important factor in the expression of critical thinking (Valenzuela, Nieto & Saiz, 2011). Despite this suggestion of a motivational component, my review of the literature uncovered no examinations of a relationship between critical thinking expression and the motivational factors of autonomy, controlled, and impersonal orientations. However, these motivational orientations have been shown to affect related items such as performance in academic environments (Deci and Ryan, 2000; Grolnick & Ryan, 1987; Miserandino, 1996). As the expression of critical thinking has long been identified as a primary goal of education, especially higher education, and its importance in a wide variety of academic and professional disciplines has been illustrated in the literature (Dewey, 1933; Facione, 1990), it is logical to expect that these motivational orientations will be related to the expression of critical thinking in a similar manner.

Research Question Two

Does an individual' self-theory of intelligence, as measured by statements related to entity and incremental mindsets, relate to how likely he or she is to express critical thinking? Critical thinking requires more cognitive effort than non-critical thinking, or simply accepting information as it is presented. Such cognitive effort is self-intuitive given that critical thinking requires such additional cognitive acts as: evaluating the

credibility of the source of information, exploring for and identifying possible logical fallacies involved, and reflecting over conclusions. Entity and incremental mindsets have been associated with the expenditure of less and more effort respectively. In particular, entity theorists tend to embrace more of an attitude which is associated with lower effort toward a task whereas incremental theorists tend to embrace mastery goals which are associated with greater effort (Dweck, 1999; Robins & Pals, 2002).

H_4 : Critical thinking will increase in relation to increasing incremental mindset.

Rationale

Also related to the question of how motivational orientations may impact one's likelihood to think critically, is how mindset may affect this expression of critical thinking. One's mindset, or the degree to which they hold an entity or incremental self-theory of intelligence, has been shown to affect effort toward goals. Specifically, those with entity self-theories of intelligence have little faith in the value of effort toward a task (Stipek and Gralinski, 1996). Those with entity self-theories tend to view effort as symbolic of low ability while incrementalists do not perceive such a conflict in exertion toward tasks (Dweck, 1999).

If, indeed, critical thinking dispositions are closely tied with motivation, then one would expect that stronger association with an incremental self-theory of intelligence would drive a higher motivation to think critically and engage those critical thinking skills.

Subjects

Subjects for this study were recruited from three Midwestern universities. These institutions ranged from a large, research-focused institution to midsize and small

regional institutions with enrollment numbers ranging from approximately 4,000 to 25,000 students. These institutions provide a diverse sample in terms of ACT/SAT scores with variations in admission requirements ranging from a minimum required score of 24/ACT or 1160/SAT to an open enrollment policy with no minimum ACT or GPA requirement. A gender balance of approximately a 60/40 female/male split was achieved reflecting the makeup of a larger female population overall. As was discussed in the literature review, previous studies with critical thinking have primarily focused on its expression and gains among college students. Maintaining this demographic quality should promote consistency with those studies. Furthermore, I found no literature to support significant changes in critical thinking post college; rather, the literature seems to revolve around whether college experience in general or discrete curriculum during college is responsible for gains in critical thinking skills. A minimum sample size of approximately 125 was calculated using G*Power 3.1.9.2 (Faul, Erdfelder, Buchner, & Lang, 2009). Constants for this calculation were based upon a four factor model with α=.05, with an effect size of .10 and 1-β=.80.

Procedure

Upon approval from the Institutional Review Board, recruitment began in the Spring semester of 2018 with the methods of solicitation varying by institution. Within the College of Education at one university, students were encouraged to participate in research and given course credit to do so. To maintain the voluntary nature of research participation, students were given other options for course credit in lieu of research participation. Students who chose to volunteer for research enlisted in a university administered system, known as SONA, which linked them with potential projects from

which they may choose to volunteer. The SONA system allows researchers to construct and present survey instruments to students in an online format in a way that no identifying information is collected from the participants. Volunteers from the remaining two universities were recruited by email solicitations approved by the respective IRB and academic affairs departments that included snowball methods designed to increase participation of subjects.

Data were collected via an online survey system (e.g., Qualtrics). Before starting the 101-item survey, participants were asked to confirm they are at least 18 years of age and indicate their consent to continue the survey.

Instruments

In order to explore the relationship between factors of motivational orientation and mindset with critical thinking, participants were administered a survey that incorporated instruments to measure the factors in questions as well as gather pertinent demographic information. The Cornell Critical Thinking Test-Z (CCTT-Z; Ennis, 1985) was used to assess critical thinking. The General Causality Scale (GCOS; Deci & Ryan, 1985) measured motivation orientations and the Theories of Intelligence Scale (TOIS; Dweck & Leggett, 1988) assessed entity versus incremental mindsets in respect to self-theories of intelligence. Demographic information captured included academic class, age, gender, major course of study, and self-identified ethnicity. The CCTT-Z requires the subjects to answer 52 multiple-choice questions, the GCOS includes 36 Likert-type scaled items and the TOIS uses 8 statements ranked on a Likert-type scale to identify mindsets. In all, this survey included 101 items and was distributed via Qualtrics, an online survey tool. In order to identify possible non-authentic responses, participant

responses were analyzed for patterns of responses such as selecting the same answer throughout the survey, displaying answers in a predictable pattern, and considering the time elapsed in completing the instrument. Due to the length of these instruments in tandem, it was estimated that up to one and a half hours could be necessary to complete the entire instrument. This estimate was based largely upon the publisher's estimates for completion of the CCTT-Z (the longest instrument included) being fifty minutes.

Critical Thinking Skills

The Cornell Critical Thinking Test-Z (CCTT-Z) consists of 52 multiple-choice questions designed to assess critical thinking in college students and other adults. Based upon the Cornell/Illinois model developed by Ennis (1985) in which critical thinking is defined as "reasonable and reflective thinking focused on deciding what to believe or do" (p.1), this instrument measures six critical thinking aspects of Induction, Deduction, Observation, Credibility, Assumptions, and Meaning to compute one general critical thinking score. It should be noted that the CCTT-Z measures not just the presence of critical thinking skills but the expression of those skills. The decision to express those skills is necessary in order for those skills to be exhibited on the instrument. For example, a participant with strong critical thinking skills but little desire to exercise them would be expected to score relatively lower than a participant with both the strong skills and desire to express them.

Questions on the CCTT-Z are structured in the format of giving information and a conclusion, then asking the respondent to rate the quality of this conclusion. An example being:

Suppose you know that…

All of the cars in the garage are Mr. Smith's

and

All of Mr. Smith's cars are Fords.

Then would this be true?

All of the cars in the garage are Fords

Yes No Maybe

The CCTT-Z score was calculated utilizing the correct answer only method by which each correct answer is scored as one point and wrong answers are scored at zero points, yielding a single score of 0 – 52 using the correct answer only method to quantify critical thinking. The CCTT-Z has a well-documented history of reliability ranging from .74 to .80 using the split-half reliability method. The overall internal consistency estimate for the CCTT-Z is .76 (Ennis, Millman & Tomko, 2005).

The CCTT-Z manual discusses validity for the instrument in the two categories of construct validity, termed criterion-related evidence of validity, and content-related evidence of validity. Criterion-related evidence of validity includes assessing correlations of an instrument with other instruments purported to measure the same or a similar criterion. The CCTT-Z has been correlated with six other instruments that measure reasoning ability. These include the Watson-Glaser Critical Thinking Appraisal; A Test of Critical Thinking, Form G; Logical Reasoning Test, Part II, Form A; Reflective Judgment Interview; and the Statistical Reasoning Test. Correlations vary from a high of $r = .79$ for the Watson-Glaser Critical Thinking Appraisal to a low of $r = .25$ for the Logical Reasoning Test, Part II, Form A. It should be noted that the Logical Reasoning Test is a single vignette (problem II) multiple-choice test by which one of three answers

are chosen and one of twelve reasons for selecting that answer are picked. Discounting this correlation for the brevity of the instrument brings the correlation cluster to approximately $r = .55$ (Ennis, Millman & Tomko, 2005).

Content-related evidence for validity is more nebulous to identify. Referring to whether the questions on the instrument actually are valid measuring vehicles of critical thinking expression, one must make more subjective judgments as to whether the content is appropriate and whether the instrument fairly addresses the intended content. In the case of the CCTT-Z, this instrument was developed by Ennis and the Illinois Critical Thinking Project. Ennis is considered one of the foremost authorities in the critical thinking literature (Ennis, Millman & Tomko, 2005; McPeck, 1981) and it is his definition of critical thinking that is adopted for this present work. The CCTT-Z manual points out two limitations of testing for induction skills: different assumptions made by participants and nuances between the correctness of calling a premise false versus calling it probably false. To address the first issue items were constructed in a manner to require only assumptions upon which most people were deemed to be in agreement upon. An example of this would be an item which calls for an assumption of dust build up in a home that is unoccupied or unused for long periods of time. For the second issue, the instrument is designed to ask for direction of evidentiary support rather than just the final conclusion.

Additionally, the individual items on the instrument have been thoroughly reviewed by the Illinois Critical Thinking Project and have resulted in agreement as to the correctness of the answers. There is also consensus that the items do, in fact, call for the intended aspects of critical thinking given that participants can read at a sufficient level

(Ennis, Millman & Tomko, 2005). The level of reading is unlikely to present a problem in a sample of college students.

Motivation

The General Causality Orientation Scale (GCOS), developed by Deci and Ryan (1985), assesses an individual's alignment along three different motivational orientations: autonomy, controlled and impersonal. The autonomy subscale measures one's alignment with intrinsic motivation tendencies. Individuals high on the autonomy orientation tend to have higher self-initiation, seek out interesting activities and hold themselves more responsible for their behavior. The controlled subscale measures the degree to which one tends to be controlled by rewards, deadlines and the direction of others. Individuals high on the controlled orientation tend to place more emphasis on external rewards such as wealth and fame. The impersonal subscale assesses one's perceived control over outcomes. Individuals high on the impersonal orientation tend to see outcomes largely as a matter of luck, with little ability to affect or adapt to change.

To assess these orientations, the GCOS provides participants with 12 small vignettes with three response statements, one for each orientation. Participants rate each statement on a seven point Likert-type scale (1 = very unlikely; 4 = moderately likely; 7 = very likely) from which their autonomy orientation is determined. The response statements corresponding to each orientation are variably presented, that is, the first, second and third statements vary between autonomous, controlled and impersonal orientations. An example of a vignette on the GCOS is: You have been offered a new position in a company where you have worked for some time. The first question that is likely to come to mind is: a) What if I can't live up to the new responsibility? b) Will I

make more at this position? c) I wonder if the new work will be interesting. The GCOS instrument yields a score on each of the three motivation orientations of between 12 and 84.

The GCOS has been widely implemented and applied to measure motivational orientation in a wide variety of subjects and fields such as schizophrenic patients (Cooper, Lavaysse & Gard, 2015), medical students (Williams & Deci, 1996), in association with weight loss (Williams, Grow, Freedman, Ryan, & Deci, 1996), and medication adherence (Williams, Rodin, Ryan, Grolnick, & Deci, 1998). This instrument has Cronbach's alphas of .74, .69 and .74 respectively for the autonomy, control and impersonal subscales. Test-retest reliability after two months for the three scales was .75, .71 and .78. Correlational analysis of the subscales showed virtually no relationship between autonomy and control (r = .034, p =*n.s.*) and a modestly negative relationship between autonomy and impersonal (r = -.248, p < .001). A moderate, but positive, relationship was found between controlled and impersonal scales (r = .273, p < .001) (Deci and Ryan, 1985).

Mindsets

Dweck's (1999) Theories of Intelligence Scale (TOIS) consists of eight statements that measure the relative degree along the spectrum of entity versus incremental theories of intelligence. The scale has four statements which positively correlate to incremental theories of intelligence (e.g. *You can always substantially change how intelligent you are*) and four statements framing an entity theory of intelligence (e.g. *To be honest, you can't really change how intelligent you are*). The questions are set to a six-point Likert-type scale from Strongly Agree (1) to Strongly Disagree (6). The

incremental statements are reverse scored in order to arrive at a single score, the higher indicating a stronger view of an incremental mindset. The possible range for scores on the TOIS are from 8 (strongest entity) to 48 (strongest incremental). A score of twenty-eight marks the midpoint where those above can be considered mostly incremental and those below mostly entity mindsets. This instrument displays strong reliability with a Cronbach's alpha of .87 (De Castella & Byrne, 2015).

Design and Analysis

This study examined the degree to which individual differences in autonomy, controlled, impersonal orientations and mindset were related to variations in the exhibition of critical thinking. A regression analysis was used to explore the relationships between each of the three motivational orientations (as measured by the GCOS) and the construct of entity and incremental mindsets (as measured by the TOIS) with critical thinking expression as measured on the CCTT-Z. A single score for each subject was calculated on the CCTT-Z. Each subject was also scored for predictor variables on each component of the GCOS (i.e., autonomy, controlled, impersonal) and self-theories of intelligence (i.e., entity/incremental). A multiple regression analysis was conducted to explore predictive effects of motivational orientations and self-theories of intelligence on the criterion variable of critical thinking.

Summary

In order to examine the effects of motivation and mindsets on critical thinking, subjects from three Midwest universities were recruited to complete an online survey, with scales measuring motivational orientations, mindsets, and critical thinking skills. The relationships between the three motivational orientations of autonomous, controlled

and impersonal (as measured on the GCOS), along with mindsets (as measured by TOIS), were regressed onto critical thinking (as measured on the CCTT-Z).

CHAPTER IV

RESULTS

In this study, I examined the relationship of motivational orientations (i.e., autonomous, controlled, and impersonal) and motivational mindsets (i.e., entity and incremental) to critical thinking skills in an effort to address the following two research questions:

1. Does an individual's motivation for a task – as measured by the three factors of autonomy, controlled, and impersonal – affect his or her use of critical thinking skills?
2. Does an individual's self-theory of intelligence – as measured by statements related to entity and incremental mindsets – relate to how likely he or she is to express critical thinking?

To examine the hypotheses proposed, first the three motivation orientations of the GCOS and the TOIS were compared with the CCTT-Z score. Based on theoretical rationale and previous research findings, I expected to find a positive relationship between the autonomous motivational orientation and critical thinking as expressed on the CCTT-Z. Such a relationship would be consistent with the concept that critical thinking dispositions are linked with motivation theory as described by OIT. Similarly, I expected a negative relationship with the controlled orientation and critical thinking, and

a negative relationship with impersonal orientations and critical thinking. These results would strengthen the linkage of motivation theory (i.e. OIT) and critical thinking dispositions. In respect to mindsets, I expected a positive correlation with the TOIS and the CCTT-Z which would be consistent with a connection between those whom believe more effort is related to success (i.e. incremental mindsets) and critical thinking dispositions, further developing the link between motivation and critical thinking dispositions.

Demographics

Upon IRB approval, data were gathered during the Spring 2018 semester through the first part of the Fall 2018 semester. Participants were recruited from three post-secondary institutions of varying sizes. In sum, 210 surveys were initiated and Qualtrics flagged 72 of those as unfinished, meaning the subject never reached the end of the survey. Of the finished 138 surveys, 29 were not considered reliable due to short response times (less than 11minutes). The remaining 109 surveys were examined for integrity by checking for patterns of responses and missing data. One of these 109 finished surveys failed to complete the responses for the entire TOIS scale and was discarded. Another survey had missing data on multiple items resulting in its dismissal from the sample. A third survey from this pool was discarded at the participant self-identified as being 55 years old, which is outside the scope of the intended sample. The remaining 106 responses showed no detectable patterns indicating a rapid response (e.g., all A answers, predictable rotations such as A, B, C repeating). These 106 responses comprised the sample for this study. Within the final sample there were 10 missing data points spread over eight participants, with two participants omitting two data points each. As no

participant omitted more than one data point on any given subscale, these missing data points were substituted with the average value of the participant's responses on that particular subscale.

The average age of those who completed the survey was 21.23 (n = 104, two did not report their age). Of those, the majority self-identified as White (64%) and Female (68%). Freshmen were notably under-represented (10%). Consistent with the underrepresentation of Freshman was the modal reported age of 20 (27%). Data for declared degrees of study were collected by an open-ended question and then grouped into general disciplines as shown in Table 4.1. Medical-related fields included disciplines such as, nursing, communication disorders, occupational therapy, and exercise science, as well as pre-medicine and veterinary medicine. The majors of recreational therapy, psychology, social work and various forms of counseling compiled the behavioral science category. The category of education comprised all forms of education including agricultural education and physical education. Business was comprised of traditional business majors such as accounting, finance, marketing and various fields of management including construction management and sports management. Medical (24%), behavioral science (23%), and education majors (21%) collectively comprised the majority of this sample.

Table 4.1.

Descriptive Statistics of Participant Demographics (N = 106)

Variable	Frequency (*n*)	Percent (%)
Gender		
Male	36	35
Female	68	63
Male/Female	1	1
No Answer	1	1
Age		
18	7	7
19	13	12
20	28	27
21	16	15
22	10	9
23	13	12
24	5	5
25	12	11
No Answer	2	2
Race/Ethnicity		
White	64	60
Native American	18	17
Hispanic	10	9
African American	6	6
Asian	4	4
Other	4	4
Classification		
Freshman	11	10
Sophomore	35	33
Junior	31	29
Senior	26	24
No answer	3	4
Declared Degrees of Study		
Medical	26	24
Behavioral Science	25	23
Education	21	20
Engineering/Construction	12	11
Business	9	9
Undecided/Univ. Studies	9	9
Natural Sciences	2	2
Legal	2	2

Correlational Analysis

Correlational analyses were conducted using SPSS software version 25 to examine the relationships between the proposed predictors (motivation orientations and mindsets) with the criterion of critical thinking. As shown in Table 4.2, there were significant relationships between critical thinking and the autonomy orientation (r =.20, p = .044), and the controlled orientation (r = -.31, p = .001). Autonomy orientations showed a significant correlation with the controlled orientation (r = .26, p = .006) and with mindsets (r = .27, p = .004). The controlled orientation has a moderate and significant correlation with the impersonal orientation (r = .39, p = .000). The impersonal orientation correlates negatively with mindsets (r = -.24, p = .012). Cronbach's alpha for the CCTT-Z was .67, a somewhat lower value than that reported by Ennis, Millman & Tomko (2005). For the subscales of the CGOS, the autonomous orientation achieved a reliability of α = .84, the controlled orientation α = .69, and the impersonal orientation α = .74 which was equal to or greater than the values reported by Deci and Ryan (1985). The achieved reliability of the TOIS was α = .80, slightly lower than the .87 reported by De Castella and Byrne (2015).

Table 4.2.

Descriptive Statistics and Pearson Correlations

Variable	1	2	3	4	5
1. Critical Thinking (CCTT-Z)	-	.20*	-.31**	-.16	.14
2. Autonomous Orientation		-	.26*	.10	.27**
3. Controlled Orientation			-	.39**	-.04
4. Impersonal Orientation				-	-.24*
5. Mindsets (TOIS)					-
Range	0-52	12-84	12-84	12-84	8-48
M	23.07	64.57	52.36	43.96	34.54
SD	5.61	10.12	9.12	10.08	6.42
Scale Reliabilities	.67	.84	.69	.74	.80

Note. *$p < .05$, **$p < .001$

Regression Analysis

A linear regression model was constructed utilizing SPSS software version 25 with the scores of the CCTT-Z as the criterion variable and the scores of each of the three motivation orientations proposed by OIT and the entity/incremental mindset measure of the TOIS as the predictor variables. In order to improve confidence in the model several assumptions required for the regression were evaluated. A P-P graph of expected vs. observed cumulative probabilities presented a tight linear relationship and suggests a normal distribution of residuals. A scatterplot of regression standardized residuals vs. predictive value of the regression residuals indicated the assumption of homoscedasticity was met. Testing for collinearity yielded a variance inflation factor (VIF) of less than 2 on all predictors, indicating an acceptable degree of multi-collinearity.

Results of the regression analysis are displayed in Table 4.3 below and reveal a significant relationship for two of the predictor variables of motivational orientations on critical thinking scores, accounting for approximately 18% of the variance ($R^2 = .18$, $F(4, 101) = 5.58$, $p = .000$) with an adjusted R^2 value of .15.

Table 4.3.

Multiple Regression Analysis Predicting Critical Thinking Scores

Source	*B*	*SE B*	β	*t*	*p*
(Constant)	24.34	4.8	.00	5.07	.000
Autonomy	.16	.05	.29	2.91	.005
Controlled	-.23	.06	-.37	-3.65	.000
Impersonal	-.02	.06	-.03	-.34	.734
Mindset	.04	.09	.04	.43	.851

Relationship between Motivational Orientations and Critical Thinking

Research question one addressed whether the motivational orientations of autonomy, controlled and impersonal have a relationship with critical thinking. Within this research question there were three hypotheses.

H_1: There will be a positive relationship between the autonomy orientation and critical thinking.

H_2: There will be a negative relationship between controlled orientation and critical thinking.

H_3: There will be a negative relationship between impersonal orientation and critical thinking.

The autonomy orientation indicated a low to moderate predictive value for critical thinking as expressed on the CCTT-Z that was highly significant (β = .29, t = 2.91, p = .005). The autonomy orientation accounted for 10% of the variance in the model. Those with controlled orientations on the GCOS indicated a stronger but negative predictive relationship with critical thinking that was again highly significant (β = -.37, t = -3.65, p = .000). The controlled orientation accounted for 8% of the variance in the model. Only the impersonal orientation failed to achieve a significant relationship with critical

thinking scores, and had only a miniscule influence (β = .04, t = -.34, p = .734). These data supported H_1 and suggest a positive relationship between the autonomy orientation and critical thinking. H_2 was also supported by the results of a negative relationship between controlled orientations and critical thinking. The data did not support H_3 as there was no indication of a relationship between the impersonal orientation and critical thinking, nor did the data suggest there was a realistic trend toward a relationship between this predictor and criterion.

Relationship between Mindsets and Critical Thinking

Research question two addressed whether an individual's self-theory of intelligence, as measured by statements related to entity and incremental mindsets, relate to how likely he or she is to express critical thinking. Addressing this question was a single postulated hypothesis.

H_4 : Critical thinking will increase in relation to an increasingly incremental mindset (i.e. higher TOIS score).

Mindsets, as measured continuously from entity to incremental by the TOIS, exhibited no meaningful or statistically significant relationship with critical thinking as measured on the CCTT-Z (β = .04, t = .43, p = .851). These data, which were of little influence and far from statistical significance, seem to indicate that there is no hidden relationship that may be trending towards meaningfulness or significance. Thus, H_4 was not supported by the data in this study.

CHAPTER V

SUMMARY, CONCLUSION, AND FUTURE RESEARCH

The purpose of this study was to examine the relationship of motivational orientations (Ryan & Deci, 2000a) and self-theories of intelligence (Dweck & Leggett, 1988) with critical thinking as expressed on the CCTT-Z. Within the conventional framework of the critical thinking literature it seems clear that in order to demonstrate critical thinking one must not only possess the abilities, or skills, of effective critical thinking but also the tendency to use them in the appropriate circumstances. Perhaps through the lens of motivation theory there are clues to the expression of critical thinking.

In this final chapter I will discuss this study in five sections. The first section provides a summary of the results, followed by conclusions based upon these results. In the third section, I discuss the limitations of the current study. The next section presents the implications of these results within the context of critical thinking research and educational practice. In the final section I discuss suggestions for future research in the area of critical thinking.

Summary of Findings

In this study I examined two research questions developed from the literature on critical thinking and motivation theory. To test these two research questions, four

hypotheses were developed. A regression analysis was performed with predictor variables of three motivation orientations (autonomy, controlled and impersonal) and a predictor variable of mindset onto the criterion of critical thinking.

Motivation Orientations

The first research question addressed the effect which motivational orientation (autonomy, controlled, impersonal) may have on critical thinking. Theoretically linking the construct of disposition – or the tendency to use one's skills – to motivation – or the degree to which one is moved to do something – I expected that each orientation would have a different relationship with critical thinking. As autonomous orientations serve a function most similar to the critical thinking disposition discussed in the literature, I expected it would be positively related to critical thinking expression as measured on the CCTT-Z. As the controlled orientation lacks the autonomy to perform a given task and relies on externally derived incentives, I interpreted this orientation to reflect a lack of a critical thinking disposition, and thus expected it to have a negative relationship with the CCTT-Z. Finally, as the impersonal orientation reflects those who feel that luck, or fate, has more to do with success on a task than does effort, indicating a lack of a critical thinking disposition, I expected this orientation to have a negative relationship with the CCTT-Z.

The regression analysis for this question yielded a model in which autonomous and controlled orientations provided a statistically significant but modest predictive relationship with critical thinking as expressed on the CCTT-Z. This relationship was consistent with expectations that an autonomous orientation would be associated with higher expressed critical thinking and the controlled orientation associated with lower

expressed critical thinking. These results indicate that individuals who experience more intrinsic motivations (autonomy orientations) with their desire to express critical thinking do indeed perform higher on critical thinking measures. Those who are motivated more extrinsically (controlled orientations) perform less well on critical thinking measures. Those with autonomy orientations seem to have displayed what the critical thinking literature describes as a 'critical thinking disposition'.

The only hypothesis for research question one in which the null could not be rejected was that of the negative relationship between impersonal orientations and critical thinking. The impersonal orientation represents those who feel that their efforts have little to no effect on outcomes of a given task. This difference on performance between the controlled and impersonal orientations was interesting given the established mild, but positive, correlation between those subscales, which was also seen in this study. I had presumed that this reliance upon luck, or fate, would signal a lack of effort similar to that of the controlled orientation. However, it should be noted that there is a distinct difference between the controlled and impersonal orientations. Namely, those with controlled orientations are motivated to work on a task when externally motivated, or by internalizing a factor that originated externally, such as by a grade, praise, or credit granted for participating in college research projects. However, those in the impersonal orientation are amotivated rather than motivated by either an internal or external loci.

Perhaps a clue to this dynamic is the prevalence of the impersonal orientation in this sample being quite low. Only one of the 106 participants ranked higher on the impersonal orientation than on the other two orientations. Three others ranked equally highest on the impersonal orientation along with the controlled orientation. With a

substantial majority of the impersonal orientations also scoring high on the controlled orientation, it may mean that there were very few amotivated participants in this sample. So few individuals in this sample leaning heavily towards the impersonal orientation altogether may mean that those most amotivated were more likely to have been part of the 72 surveys omitted for failure to complete the survey and therefore were underrepresented in the final sample. In effect, there could be a strong self-selection bias seen for those whom are highest on the impersonal orientation to opt-out. This dynamic would be theoretically consistent as the impersonal orientations would be less likely to be motivated to participate even with the credit granted for doing so by one of the institutions, an external reward, than the controlled orientations.

Mindsets

The second research question addressed whether one's mindsets, entity or incremental, would be related to the expression of critical thinking. A single hypothesis was developed to address this question. I expected that critical thinking would increase in relation to increasing incremental mindset. The correlational analysis and regression model developed to address mindsets and critical thinking revealed a nearly non-existent and statistically insignificant relationship between mindsets as a predictor of critical thinking. Thus, this study provides little evidence that a trend may be uncovered by a larger sample size utilizing this design. The null hypothesis cannot be rejected in respect to mindsets relationship with critical thinking.

Conclusions

With respect to motivation orientations, only the autonomy and controlled orientations indicated a significant relationship with critical thinking. Autonomy

orientation yielded a positive predictive relationship and controlled orientation indicated an inverse relationship to critical thinking. Together these two predictors account for approximately 18% of the variance in the critical thinking scores. With respect to mindsets, no significant relationship with critical thinking was observed.

The practical significance of the effect of autonomy vs. controlled motivation orientations is of concern. This finding is consistent with the interpretation that the autonomy orientation may function similarly to the proposed 'critical thinking disposition' so prevalent in the literature. Rather than an inherent psychological trait being responsible for the exhibition of critical thinking (i.e. disposition), the expression of critical thinking may reflect motivational factors instead. In particular, these differences in motivation appear to center around whether they are intrinsic or extrinsic in nature. Not only did the autonomy orientation yield a positive predictive relationship with critical thinking but the controlled orientation showed a negative relationship. This inverse relationship may signal that not only does intrinsic motivation provide something of a positive factor for critical thinking but that extrinsic motivation may also represent a negative factor in critical thinking.

Limitations

There were several limitations to the current study. One set of limitations concerns the sample for this study. The second set of limitations revolves around the instruments used to collect the data for this study.

Sample

The sample for this study was collected from students at three Midwestern universities. Although, the sizes of the universities were varied, all are located within the

same state and thus, constitute a rather unrepresentative sample of the college student population nationwide, prohibiting a generalization to the overall college population. Furthermore, this sample included nearly twice as many females as males and was dominated by education and behavioral science majors. Students in fields related to business or law were significantly under-represented in this sample, as were freshmen students. The lack of demographic diversity diminishes this sample's representativeness to the population of college students and to the general population nationwide.

Additionally, students from one of the universities sampled received course credit for volunteering to participate in the study, and it was from this university that I noted a pattern of survey responses that were incomplete or completed in unrealistically short time periods. Given the incentives for these students to take the survey inherent in the recruitment process, this pool of participants may not be as reliable as for the other participants, which may have introduced error into the data.

The sample size for this study was computed to need at least 125 participants in order to achieve the desired power. The final number of usable responses was 106, which provided a moderately lower achieved power. This lack of power, although significant, possibly played little role in the two hypotheses that were not supported. Both the impersonal orientation and mindsets failed to show a significant relationship with critical thinking. The impersonal values illustrate the failure of this predictor from even approximating a significant relationship with critical thinking. In respect to the unsupported hypothesis of mindsets relating to critical thinking a similar effect was observed. The mindset predictor achieved only weak values; however it may be that the lack of representativeness in this sample has a role to play in the failure to detect a

relationship between mindsets and critical thinking. As this sample consists entirely of college students, and predominately upper-classmen, it is likely to over-represent incremental mindsets. Furthermore, data for self-efficacy on the critical thinking domain was not gathered in this study. Because of this, it is not possible for this study to differentiate between high and low self-efficacy participants within the same mindset. Dweck & Leggett's (1988) model of mindsets deals with perceived competence. For example, those with high perceived competence may still perform at high levels even with an entity mindset. This could be an important factor for identifying a relationship between mindsets and critical thinking but would require the collection of a perceived competence, or self-efficacy, measure which was not performed in this study.

Instruments

Of concern are the limitations of instruments used to collect this data. The CCTT-Z is a long scale and is cognitively demanding. Combined with the GCOS and the TOIS, the complete instrument utilized was nearly 100 questions in length. This brings into play the possibility of fatigue among participants. This possibility was perhaps reflected in the lower achieved reliability than found in previous research on the CCTT-Z. With lower achieved reliability on the criterion variable, it is important to consider that the scores on the CCTT-Z may not have accurately reflected the participants' critical thinking skills.

In addition to being a long instrument, the CCTT-Z was designed to be administered by paper and pencil in a controlled environment. Although the publisher consents to administering this instrument in online formats, I found no literature establishing the reliability and validity of the CCTT-Z in such a format. While the questions on my online scale were identical to the paper-pencil format, the presentation

of each item was not consistently controlled. For example, the instrument could display different degrees of text for a question in different formats requiring different amounts of scrolling depending on whether one took the CCTT-Z on a PC or a smart phone. Quite possibly there was variability on presentation depending on the participant's technology. The online formatting issues could also apply to the GCOS and TOIS, while shorter, were also developed prior to the age of connectivity of smart phones.

In addition to the formatting issues of taking these instruments in an online context there is a concern over the environment in which participants took the survey. For instance, there was no way to determine if a number of participants were interrupted while taking the survey or if they were in a distracting environment. It is possible that participants did not fully focus on taking the survey given the online delivery of the material rather than in the more controlled environment for which these instruments were devised.

It is noteworthy that the completion times of the instrument were far shorter than estimated, with most participants who completed the survey doing so in 20 minutes or less. The estimated time for the CCTT-Z was 50 minutes and was based upon the publisher's estimated completion time. There is no estimate for the length of time that the CCTT-Z is expected to take for an online format versus the traditional paper and pencil format. This means that in addition to the uncontrolled environment in which the instrument was completed, the time of completion may also signal a source of error in the data.

Implications

Despite the above-mentioned limitations, the results of this study have potentially valuable implications. My primary purpose for this study was to assess possible predictive relationships for motivation orientations and mindsets on expression of critical thinking. Of the three motivation orientations, two behaved as predicted. Autonomy oriented individuals did indeed perform better on critical thinking. Also, the controlled orientation individuals performed worse on critical thinking. These findings support a connection between motivation theory and the expression of critical thinking independently of a disposition that has been a stalwart concept in the critical thinking literature thus far.

This connection to motivation is important. If moving an individual from a less controlled to a more autonomous orientation on critical thinking does indeed function as the previously hypothesized disposition, then critical thinking theorists and educators have access to a new approach for ways to support and increase critical thinking expression. Dispositions imply fixed traits, while motivation orientations have been shown to be variable through the process of priming described by Levesque and Pelletier (2003) and Friedman et al. (2009) and by exposure to autonomy supportive teachers (Deci & Ryan, 2000b). What has been traditionally viewed as a relatively fixed trait crucial in the expression of critical thinking may be at least partially mitigated by a malleable variable that has been shown to be responsive to certain educational environments. This environment would include framing issues in autonomously oriented language (e.g., describing a task as interesting) and exposure to autonomy supportive teachers who practice actions in the classroom such as encouraging choice, encouraging

criticism and promoting and understanding of the relevance of the material at hand (Kaplan, 2018).

After further research, it may become clearer that moving individuals from a more external locus to a more internal locus on critical thinking is an essential factor of increasing performance of critical thinking. Helping students to understand the inherent value of critical thinking and the importance of being able to generalize good critical thinking across domains would be an example of encouraging an autonomy orientation towards critical thinking. It should be of concern that those in the least strong expression of critical thinking are those who may have the skills but simply do not have an autonomous value for the use of critical thinking. Focusing on shifting the importance of critical thinking from getting a good grade to being a good thinker may be a crucial challenge in fostering critical thinking skills in these controlled (external) students. To this end, it seems vital that these skills are framed as valuable to the individual and not merely skills that need to be exhibited for an external reward that may then be safely relegated to the dusty vaults of memory.

Future Directions

Additional research is needed to explore more fully the relationship between factors of motivation orientation and critical thinking. Studies with more representative samples and more robustly structured instruments would help shed additional light on these relationships. Replication with a more diverse sample is needed to evaluate if the relationships that were supported in this study are further supported or found to be an anomaly. Research utilizing priming of participants to autonomy, controlled and

impersonal orientations would be useful to explore the utility of how affecting one's orientation would affect their critical thinking.

Given the ever-growing popularity of data gathering by online methodologies and the preference of online participation in younger students, more information is needed on the efficacy of collecting data on critical thinking with instruments designed for controlled paper and pencil environments when delivered in a modern online format. The development of a more streamlined instrument for measurement of expressed critical thinking specifically for online delivery could be a very valuable contribution to future studies of critical thinking.

Additionally, OIT is only one theory of motivation, and future research should expand to investigate different theoretical frameworks of motivation (e.g., achievement goal orientation, expectancy x value theory) and their relationship with critical thinking. Future research in this area may be helpful in refining what, if any, relationship is found between different models of motivation and critical thinking.

Future research which captures self-efficacy measures along with mindset would be helpful in that it would allow for a distinction between those of similar mindsets but with high versus low self-efficacy on critical thinking. This would allow for the detection of entity type theorists whom are high on critical thinking self-efficacy to be differentiated from those whom are low in self-efficacy. This distinction could theoretically play an important role in critical thinking performance.

The low prevalence of impersonal orientations in this sample highlights a unique challenge in terms of revealing potential relationships with this orientation and critical thinking expression. The possibility of these orientations to choose to self-select out of

completing the instruments should be addressed in future research. A research design in which the motivation orientations are captured prior to the more demanding CCTT-Z may assist in identifying some motivational characteristics of those whom self-select out on the longer instrument. Also, since it seems reasonable to expect dramatically fewer impersonal oriented individuals in college students than in the general population, studies designed to investigate populations other than college students could be instrumental in capturing data on impersonal orientations.

Should the relationships between motivational orientations and critical thinking found to be significant in this study stand up to future scrutiny, then more research into practical applications of guiding students into the most positive conditions for best expression of critical thinking should be explored. Studies directed at how to improve the critical thinking of ever wider populations within our society would ostensibly lead to a more well-informed electorate which in turn would support a more efficient democracy and general improvement in science and technology.

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APPENDIX

Oklahoma State University Institutional Review Board

Date:	Friday, February 9, 2018
IRB Application No	ED17169
Proposal Title:	Does Motivation Orientation and Mindsets of Self-Theories of Intelligence Affect Critical Thinking?
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 2/8/2021

Principal Investigator(s):

Chris Garland
P.O. Box 1472
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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☐ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of the research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Dawnett Watkins 219 Scott Hall (phone: 405-744-5700, dawnett.watkins@okstate.edu).

Sincerely,

Hugh Crethar, Chair
Institutional Review Board

VITA

Christopher C. Garland

Candidate for the Degree of

Doctor of Philosophy

Dissertation: THE RELATIONSHIP BETWEEN MOTIVATIONAL ORIENTATION, MINDSETS AND CRITICAL THINKING IN COLLEGE STUDENTS

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