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Culture and Critical Thinking: Exploring Culturally Informed Reasoning Processes in a Lebanese University Using Think-Aloud Protocols

William Merrifield

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CULTURE AND CRITICAL THINKING:
EXPLORING CULTURALLY INFORMED REASONING PROCESSES IN
A LEBANESE UNIVERSITY USING THINK-ALOUD PROTOCOLS

by

William Merrifield

FACULTY RESEARCH COMMITTEE

Chair: Dane C. Joseph, PhD

Member: Patrick Allen, PhD

Member: Terry Huffman, PhD

Presented to the Faculty of the
Doctor of Educational Leadership Department
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COLLEGE OF EDUCATION

“CULTURE AND CRITICAL THINKING: EXPLORING CULTURALLY INFORMED REASONING PROCESSES IN A LEBANESE UNIVERSITY USING THINK-ALOUD PROTOCOLS,” a Doctoral research project prepared by WILLIAM MERRIFIELD in partial fulfillment of the requirements for the Doctor of Education degree in Educational Leadership.

This dissertation has been approved and accepted by:

04/24/2018  Committee Chair
Date Dane Joseph, PhD Assistant Professor of Education

4/24/2018  Professor of Education
Date Patrick Allen, PhD

4/24/18  Professor of Education
Date Terry Huffman, PhD

Abstract

This study examined the role of cultural and contextual factors in the critical thinking processes of bilingual Lebanese undergraduate students. In addition, it investigated whether bilingual students used comparable processes to answer equivalent critical thinking questions in Arabic and English. A purposive sample of 24 upper division undergraduate students enrolled in a Lebanese university completed the Cornell Critical Thinking Test Level Z (CCTT) as well as 10 questions from the Sample Reasoning Mindset Test (SRMT). Participants were divided into two similar procedural groups. Group A completed the CCTT and SRMT in Arabic. Group B completed the assessments in English. A think-aloud protocol was used to collect verbal data of the thinking processes of the participants on select items from each test. Participant responses on the CCTT were coded using the consensus descriptions of the core critical thinking skills and sub-skills of *interpretation*, *analysis*, *evaluation*, *inference*, *explanation*, and *self-regulation* outlined in the APA Delphi Report (Facione, 1990a). Responses on the SRMT were coded based on whether statements were framed in *moral terms*, *pragmatic terms*, *logical terms*, *religious terms*, *social/relational terms*, or *ideological terms*. Additional patterns that emerged in the verbal data were labelled and utilized as appropriate. An exploratory quantitative analysis indicated no significant difference in overall scores based on demographic and linguistic variables. The mean and median scores on the CCTT were generally lower than scores from equally leveled participant scores in other studies. The results of the qualitative analysis of the verbal data demonstrated participant weaknesses in comparing options; considering multiple points of view; reasoning neutrally; engaging in global reasoning; identifying the credibility of sources; and the use of best-explanation criteria. The results also indicated that the majority of participants did not understand the concepts of equivocation; propositional logic; and the proper

use of the scientific method in evaluating and planning experiments. In addition, the verbal data revealed an instrumental view of education; a general disposition of self-confidence; and a lack of self-regulation and self-reflection. A cross-linguistic comparison of verbal processes did not reveal significant differences in reasoning processes based on language. The results of the study support the claim that Lebanon's sectarian and authoritarian educational contexts impact the critical thinking processes of Lebanese undergraduate students. The results also highlight the need to include an awareness of cultural location in understanding, developing, and assessing critical thinking.

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CHAPTER ONE

Introduction

The question of what constitutes the goals and purposes of an educational model is varied and controversial, but in spite of the variety of different underlying theories or methodological approaches to education, there is at least one consistent variable; education is concerned at some level with the development of the human capacity to think. Philosophers of education and organizations such as the National Research Council stress the importance of critical thinking as a primary output of a successful education (Barnett, 1997; Pellegrino, Hilton, & National Research Council, 2012; Pithers & Soden, 2000; Siegel, 1989). Some educators bemoan the general lack of critical thinking among students (Browne & Keeley, 1988). Others claim that as educational systems become more oriented towards passing standardized tests that this approach comes at the expense of developing students who engage information critically (Alexander & Laboratory, 2012). Still others argue that the educational method of rote memorization that is practiced in certain cultures is unable to produce students capable of meeting the demands of critical thinking in the Western university (Davies, 2007).

In parallel a variety of programs, curriculum proposals, and instruments have emerged that claim to develop or assess critical thinking (De Bono, 2006; Ennis, 1993; Follman, 2003). Some of these approaches emphasize the importance of critical thinking for economic success (Kamens, 2013; Soh, 2014) while others discuss the role of critical thinking in creating good citizens (ten Dam & Volman, 2004). Certain critics argue that critical thinking neither creates good citizens nor economically successful individuals (Weissberg, 2013) and that critical thinking may actually deconstruct the importance of conviction (Ritola, 2012). Although most of

the debate is centered on how to strengthen and improve critical thinking, there is not always conceptual clarity concerning the definition of the term itself. Is critical thinking primarily a set of skills, a disposition, or both (Facione, 1990a; Siegel, 1989)? Is it nonconformist, individualistic, and creative (Elder & Paul, 2007)? Is critical thinking reducible to logical deconstruction or to an act of self-reflection (Johanson, 1987; McNiff, 2011)? Does critical thinking include a moral component (Kwak, 2009)? Is critical thinking possible across disciplines, or does it require discipline-specific knowledge (Bailin, 1992; McPeck, 1981)?

In addition, there is also confusion concerning the impact of culture on critical thinking. Does critical thinking mean the same thing in different cultural contexts (Chan & Yan, 2009)? Do humans engage in reasoning in similar ways across cultures (Evers, 2007)? How do different cultural and epistemological starting points influence the conceptualization of critical thinking (Siegel, 2007)? Is critical thinking a Western convention (Tian & Low, 2011)?

A growing body of research indicates that there is a significant relationship between culture and thinking. Studies in the neuroscience of culture contend that evidence supports a physiological relationship between thinking and culture (Ambady & Bharucha, 2009). Behavioral researchers such as Nisbett, Peng, Choi, and Norenzayan (2001) review quantitative, empirical studies to argue that the cognitive processes triggered by a specific cultural situation cannot be separated from their context. These researchers claim that even if humans in different cultures use similar cognitive process, “the circumstances that prompt the use of one process versus another will differ substantially across cultures, the frequencies with which the very most basic cognitive processes are used will differ greatly, consequently, the degree and nature of expertise in the use of particular cognitive processes will differ; and tacit or even explicit normative standards for thought will differ across cultures” (Nisbett et al., 2001, p. 306). Studies

such as these suggest that if social, ecological, linguistic, physiological, and cultural differences affect the way that humans interpret the world, a re-evaluation of certain cognitive theories and methodological approaches to the development of critical thinking is needed.

As long as the development of the human capacity to think critically continues to be one of the primary goals of education, it is important to examine how particular social/cultural/political contexts influence the conceptualization, teaching, and assessment of critical thinking. It is also instructive to explore the particular cultural and/or educational assumptions that are used to define the conceptual boundaries of what qualifies as critical thinking. This type of discussion can increase awareness of the dangers of epistemic imperialism as well as the limitations inherent in mono-cultural perspectives and definitions of critical thinking.

Critical Thinking Assessment

A number of tests have been developed to measure critical thinking. Assessments, such as the Ennis-Weir Critical Thinking Essay Test (1989), evaluate production responses to questions. In a production response, a test-taker is asked to generate and evaluate arguments in response to specific questions and then the test-taker's responses are scored by trained evaluators using established criteria. Tests like the Cornell Critical Thinking Tests (Millman, Tomko, & Ennis, 2005), Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 2002), and California Critical Thinking Skills Test (P. Facione & N. Facione, 2002) employ a selection response format. In a selection response, a test-taker is asked to read a short passages and then choose the correct answer from among a selection of choices (Frisby & Traffanstedt, 2003). Selection response questions are designed to measure specific skills associated with critical thinking such as *deduction, induction, analysis, interpretation, making inferences, assessing credibility, assumption identification*, etc. A third approach, as seen in the Halpern Critical

Thinking Assessment using Everyday Situations (Halpern, 2007), uses both production responses and selections responses. In addition, tests like the California Critical Thinking Dispositions Inventory (CCTDI) have been developed to specifically measure critical thinking dispositions (P. Facione, N. Facione, & Giancarlo, 2001). The CCTDI employs a Likert scale questionnaire designed to measure self-reported perceptions towards *truth-seeking*, *open-mindedness*, *analyticity*, *systematicity*, *critical thinking self-confidence*, *inquisitiveness*, and *maturity* (Facione et al., 2001).

Although there is an ongoing debate about how best to conceptualize critical thinking, the operational definitions used to measure critical thinking in most critical thinking assessments are largely similar (Ennis, 2016; Possin, 2008). In 1990, the American Philosophical Association (APA) published the Delphi Consensus Definition of Critical Thinking (Facione, 1990a). The APA Delphi Report presents a broad definition of critical thinking that includes critical thinking skills, the purpose of critical thinking, the nature of critical thinking, and the characteristics of the ideal critical thinker. In specific, the report outlines the need for critical thinking skills in *interpretation*, *analysis*, *evaluation*, *inference*, *explanation*, and *self-regulation*. It also articulates critical thinking dispositions of being “habitually inquisitive, well informed, trustful of reason, open-minded, flexible, fair minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit” (Facione, 1990, p. 3). The report provides a detailed discussion of the meaning of each of these terms and states that the critical thinker must be able to explain the “evidential,

conceptual, methodological, criteriological, or contextual considerations” upon which a judgment is based (p. 3).

Although there are 33 references to context in the Delphi document, there is no specific reference to culture. The report discusses context in the terms of domain-specific, not culture-specific, knowledge. In addition, the 46 scholars who participated in the production of the Delphi Report all work as part of institutions located in the United States and none work within fields explicitly associated with the study of culture, such as sociology or anthropology. One of the questions that will be explored in this study is whether Lebanese students use distinct cultural processes to frame and solve critical thinking questions and, if so, the implications of these findings for understanding the teaching and assessment of critical thinking in divergent cultural contexts.

Local Context

Lebanon presents an interesting test case for examining the nexus of culture and critical thinking. In an area of 4,036 square miles (slightly smaller than the US state of Connecticut) Lebanon contains eighteen different religious sects each vying to preserve its own distinctive identity and presence while participating in the shared aspects of a Lebanese national and cultural identity. Lebanon's politics reflect this diversity. In 1942, the government was established as a confessional democracy where each religious community is entitled to particular political offices in relation to its population demographic. There has not been an official census in Lebanon since 1932 based on the rationale that it is best to avoid the possibility that officially recorded demographic shifts will disrupt the balance of power. Religious identity is a matter of public record with each child inheriting the religious affiliation of his or her father. This religious

affiliation is recorded on the child's birth certificate and is included on a number of public documents.

Lebanon also has a long history of political instability. Its geographical location between Israel and Syria has led to its role as a type of playground for regional power struggles. From 1975 until 1990 Lebanon was embroiled in a sectarian civil war tied to regional events (Fisk, 1990). In 2005, the former prime minister Rafic Hariri was assassinated. Since 2005 there have been more than twelve political assassinations, a regular turnover in government, and a number of extended periods where the government has only existed in a caretaker role ("Timeline: Lebanon assassinations," 2008). From 2014 to 2016, the country functioned without a president for a period of 29 months (Nakoul & Perry, 2016). The political instability in Lebanon has elevated the importance of ethnoreligious affiliations for survival and vocational opportunities. The culture is commonly described as collectivist (McCabe, Feghali, & Abdallah, 2008) wherein the needs of the individual are generally met through the community of origin instead of the political entity.

Lebanon's long litany of conflicts has also destroyed its economic infrastructure. Lebanon's instability has resulted in a remittance-based economy where a large number of Lebanese citizens survive by depending on remittances sent by family members living and working in different countries. In 2010, Lebanon received 8.2 billion dollars in remittances with an estimated population of 4.3 million people, which constituted 22.4% of the country's GDP, the highest in the Middle East/North Africa region (World Bank, 2011). A steady emigration of Lebanese citizens, who rely on education as a means to gain employment opportunities in more prosperous societies, has been one consequence of Lebanon's failed economy.

Lebanon places a high value on privatized, formal education. In 2011, a World Bank report stated that approximately 61.3% of the secondary school population is enrolled in private schools (World Bank, 2011). These schools are generally under the oversight of a particular ethnoreligious community (Frayha, 2010). The curriculum is distributed between Arabic and English, or Arabic and French. Math, sciences, and language and literature courses are taught in either English or French while history, geography, and civics are taught in Arabic. As a result of the French and English language instruction, Lebanese students are functionally bilingual and often trilingual by the time they enter high school (Zakharia, 2010). The Lebanese educational system is built on a high-stakes test model that requires students to pass a nationally administered test after primary school (the Brevet) in order to move on to secondary school and a nationally administered test after secondary school (either the Lebanese Baccalaureate or the French Baccalaureate) in order to move on to tertiary education.

In addition, Lebanon has a tradition of Western influences on educational theory and practice (Sbaiti, 2008). French Jesuit Priests and British and American Protestant missionaries established a number of schools in Lebanon in the late 1800s. Because of the French and English language instruction, Lebanese private schools often import Western curriculums. The top university in Lebanon promotes itself as being built upon the American liberal arts education model (“Best Arab Region Universities Rankings,” 2017; About Us, n.d. para 1).

Interestingly, the mission statement of the general education program at this university presents an instrumentalist view of knowledge and a definition of critical thinking that equates critical thinking with developing problem-solving skills. More specifically, the mission statement conveys the idea that what makes knowledge valuable is the ability to use it to solve problems

(About General Education, n.d., para 1). This description of knowledge is consistent with the Lebanese emphasis on education as a means towards an improved economic outcome.

As referenced above, instability, collectivism, Western curriculum borrowing, bi-lingual instruction, high-stakes testing, and an instrumental/economic view of education characterize the social/cultural/political/educational context of Lebanon. These context-specific issues should strengthen reasoning patterns that emphasize the value of interdependent thought (Varnum, Grossmann, Kitayama, & Nisbett, 2010), conformity (Salloukh, Barakat, Al-Habbal, Khattab, & Mikaelian, 2015), and an understanding of critical thinking that emphasizes problem solving for the purpose of economic benefit. In addition, these issues should work against critical thinking dispositions such as open-mindedness, flexibility in considering stereotypes and socio-centric tendencies, seeking to understand the opinions of others, honesty in facing one's own biases, and a willingness to reconsider and revise convictions (Abrami et al., 2015).

The Purpose of the Study

The purpose of this study was to examine the role of cultural and contextual factors in the critical thinking processes of bilingual Lebanese undergraduate students. Using selected items from the Cornell Critical Thinking Test Level Z, the study explored how Lebanese students employ culturally informed processes to frame and interpret critical thinking questions designed to measure *deduction, induction, observation and credibility of sources, assumptions identification, and meaning*. It also explored how Lebanese students framed and self-reported on questions taken from Insight Assessment's Sample Reasoning Mindset Test designed to assess dispositions of *truth-seeking, open-mindedness, inquisitiveness, critical thinking self-confidence, and maturity*.

A secondary purpose was to examine whether bilingual students used comparable processes to answer critical thinking questions in Arabic and English. Participants completed the Cornell Critical Thinking Test Level Z and Sample Reasoning Mindset Test in Arabic and English. Using a think-aloud protocol on select items from each test, the Arabic and English critical thinking processes of students were compared.

Significance of the Study

This study addresses the dearth of empirical studies that discuss the relationship between culture and critical thinking. If critical thinking is adopted as an educational ideal rooted in a teacher's respect for students (Siegel, 1980), it becomes imperative to better understand the relationship between culture and the goals of critical thinking instruction. The study highlights potential cultural variables that may contribute to a misunderstanding of how students perform in critical thinking assessments and provides evidence that contributes to the contemporary discussion about the uses and limitations of critical thinking assessments across cultures. It also touches on the question of the extent to which critical thinking should be accepted as a trans-cultural concept.

The study provides data on whether or not contemporary conceptualizations of critical thinking are disadvantageous to non-Western cultures. The results of the study address the question of whether one of the goals of developing critical thinking is to move students away from culturally constructed values such as interdependent thinking and whether normative critical thinking skills and dispositions should be developed regardless of context. The results also serve as a basis for exploring culturally-sensitive approaches to critical thinking and contextual approaches to the development of critical thinking.

Finally, this research project encourages a re-evaluation of the APA Delphi Definition of critical thinking in light of the impact of culture and context-specific epistemological assumptions. It also contributes to a more nuanced understanding of how to assess and develop critical thinking cross-culturally.

Research Questions

1. What reasoning processes do Lebanese undergraduate students utilize to frame, interpret, and answer critical thinking questions from the Cornell Critical Thinking Test Level Z designed to measure skills of *deduction, induction, observation and credibility of sources, assumption identification, and meaning*?
2. How do undergraduate Lebanese students frame and self-report on critical thinking questions from Insight Assessment's Sample Reasoning Mindset Test designed to assess dispositions of *inquisitiveness, open-mindedness, truth-seeking, critical thinking self-confidence, and maturity*?
3. Do undergraduate Lebanese students employ culturally-specific reasoning processes in responding to questions on the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test?
4. Do bilingual students use comparable reasoning processes in answering equivalent questions in Arabic and English from the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test?

Theoretical Framework

This study is built on a framework based on two central assumptions. First, that the formal process of education is associated with advancing human understanding, promoting human flourishing, and embracing the breadth of cultural, historical, and philosophical diversity

within the human experience. From this assumption, it can be argued that the relationship between thinking and making choices based on the supposed coherency of our thoughts is a central and distinguishing aspect of our shared humanity. In the spirit of promoting human flourishing it follows that the development of the human capacity to think should occupy a central place in the role of education (Siegel, 1989)

Second, the framework accepts the idea that ways of thinking, in some sense, are shared across cultures (Evers, 2007; Siegel, 1999, 2007; Wong & Evers, 2001). As a result, as humans navigate their lives in different cultures and contexts, they use similar cognitive capacities to make sense of similar types of choices that are intrinsic to a shared human experience. The contention is that in spite of a multitude of rational discourses that exist, it is possible to make evaluative statements that attempt to transcend a specific local context (Siegel, 2007). In relation to the question of critical thinking, within this framework it is possible to understand the epistemological and cultural assumptions of a different explanatory paradigm and still make a judgment concerning the validity of that paradigm or correctness of its claims.

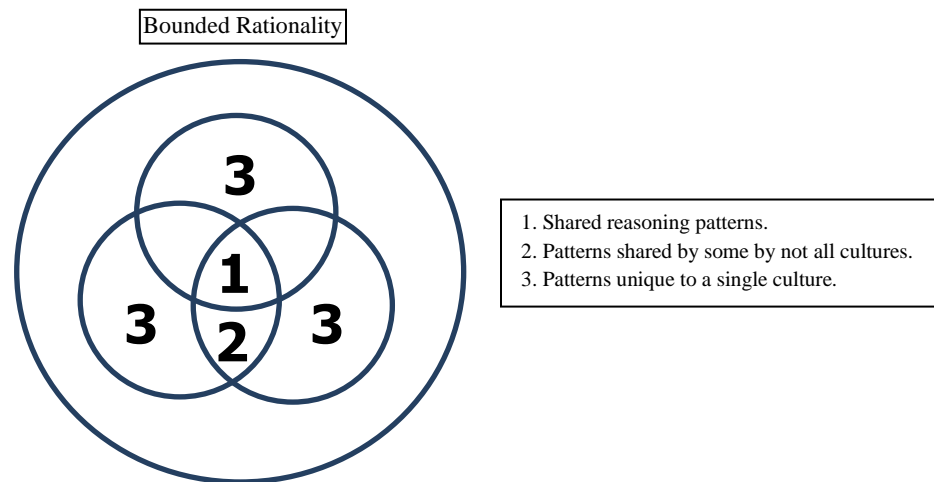
Correctness in this case is different than reasonableness. It may be argued that a reasonable explanation is consistent with its own assumptions but does not accurately represent the way the world operates; thus, this framework cautiously adopts a critical realist ontology with the belief that accurate knowledge reflects how the world operates independent of human constructs and beliefs (Archer et al., 2016). The framework also roots the justification for education in the value of promoting human flourishing. It may be argued that an epistemologically consistent worldview does not promote values that are consistent with the educational goal of promoting human flourishing. This argument assumes that independent criteria which transcend historical and cultural context exist upon which actions can be judged as

promoting or working against human flourishing (Archer et al., 2016). There is an acceptance of the claim that intellectual fields contain an inner logic by which they are governed (Manzon, 2011). The adoption of this framework makes it possible to conceptualize and frame an intellectual field such as the study of critical thinking in a way that can be productively communicated and assessed across cultural and societal boundaries. As a result, this study of critical thinking works toward a more accurate understanding of how humans in different cultural contexts can develop the capacity to think in a particular way.

That being said, the adoption of a critical realist approach includes the recognition of the fallibility of human knowledge and the potential dangers of explanatory metanarratives. As such, this framework adopts many aspects of an interpretivist view of the social world. It accepts that actors in different social contexts create sets of meanings, rules, and norms that make social interaction possible and help them to make sense of their own social worlds (Manzon, 2011; Wittgenstein & Kenny, 1994). It also acknowledges that the question of critical thinking is generally concerned with which beliefs are considered justified (a justified belief is built on a good reason) and how a culture defines what constitutes a good reason varies across contexts (Ichikawa, Jenkins, & Steup, 2017; Shweder, 1986; Stich & Nisbett, 2012; Weinberg, Nichols, & Stich, 2001). The framework recognizes that there are a variety of interpretative frameworks that make good sense of the world but are based on different sets of assumptions. These facets of the interpretivist perspective create a number of challenges in evaluating and exploring what it means to develop and assess critical thinking across cultural contexts.

In general, the approach adopted in this study to the question of critical thinking and culture is best summarized using the model in Figure 1 adapted from a model presented by Chan and Yan (2009).

Figure 1



In this model, region 1 represents general reasoning patterns that are shared across cultures. For example, the general pattern of moving from observation to inference to interpretation to action based on implicit assumptions constitutes a shared reasoning pattern. Evidence that lends credence to the claim that there are some shared patterns of reasoning that cross cultural divides can be seen in the advent of similar types of inventions created to address similar types of problems independently in a variety of times, places, and cultures (Evers, 2007).

Region 2 represents general patterns of assumptions or interpretation that are shared by some cultures but not all cultures. Consider the decision concerning whether a husband should leave his family and move to another county in order to find a better income with which to support his family. In such a scenario, particular cultural assumptions and values can lead to different sets of priorities that are used to make a decision that is considered reasonably justified (Wong, 2001). Cultural values can be conceptualized in the form of systematic differences or similarities that represent particular cultural patterns of reasoning (Evers, 2007). Region 2, therefore, represents the interpretivist aspect of this theoretical framework. The concepts of independent versus interdependent thinking outlined in the Social Orientation Hypothesis fall within this category (Varnum, Grossman, Kitayama, & Nisbett, 2010).

Region 3 represents the idea that on some level different cultural frameworks have unique patterns of thinking that are specific to their own cultural contexts. As such, certain culturally embedded logical inferences can only make sense in the context of a specific culturally coherent mental scheme (Gellatly, Rogers, & Sloboda, 1989; Hutchins, 2005). This region is consistent with the philosophical critique that shared patterns of thinking break down at some point and become individualistic patterns of interpretation (Stich, 1993).

The model's commitment to the tenets of a critical realism enables an evaluation of how culturally informed thinking patterns are aligned with the educational goals of advancing human understanding and promoting human flourishing. It also allows for an examination of whether cultural patterns of reasoning are consistent with specific definitions and values of critical thinking. At the same time, the framework's recognition of the fallibility of human knowledge and the limitations of bounded rationality (Simon, 1957) creates the necessary space to acknowledge and embrace the breadth of cultural, historical, and philosophical diversity within the human experience. This space is meant to help mitigate the danger of educational imperialism and mandates a closer evaluation of the limitations of normative critical thinking frameworks.

Limitations and Delimitations

This study has a number of limitations. The study used a think-aloud protocol (TAP) to collect verbal data for the purpose of analyzing and comparing thinking processes (Somerén, Barnard, & Sandberg, 1994). TAPs are designed to capture the immediate, naturally occurring cognitive processes that occur in reasoning during problem analysis. As such, this study did not primarily address aspects of critical thinking that involve the use of long-term memory for retrospective reflection or the justification and interpretation of particular reasoning patterns. It

was focused on exploring the immediate processes that students use in working memory while solving critical thinking problems. However, in the final section of the protocol participants were asked to verbalize rationales for choosing whether they agreed or disagreed with questions designed to measure critical thinking dispositions. This final section of the TAP introduced long-term memory and reflection into the data. As such, the verbal data collected in the final section of the TAP was analyzed separately from the verbal data collected in the previous sections.

Another limitation of the TAP method is that it may result in incomplete or incoherent cognitive data resulting in gaps in the verbal record of reasoning. Post-protocol interviews provide supplemental information to help account for these gaps. Whereas TAPs attempt to capture information that appears in working memory, the post-protocol interview may introduce information retrieved from long-term memory into the data. In addition, Ericsson and Simon (1998) state that there are significant differences in the ease with which people verbalize their thoughts. Although training and post-protocol interviews can help reduce these differences, the impact of this variable cannot be altogether eliminated. These limitations require that a TAP is designed to assess particular cognitive processes among a specific population. It also necessitates the use of proper training for participants and a clear data collecting and transcription strategy.

Think-aloud protocols are often used to evaluate test items for understanding and comprehension. This project used a TAP to evaluate thinking processes, not test items. As such, the researcher accepts the evidence presented in the CCTT manual that supports the standard-condition situational validity and overall construct validity of the Level Z test for measuring critical thinking skills among undergraduate students. Since the CCTT Level Z was designed for a set of standard conditions that differ from those in the study, the reader will have to determine the extent to which the test presents a valid measure of critical thinking skills in the Lebanese

context based on the information provided. In addition, the researcher was unable to acquire permission to use the California Critical Thinking Dispositions Inventory (CCTDI) since Insight Assessment will not release any proprietary information for research purposes. As a result, the questions from Insight Assessment's Sample Reasoning Mindset Test have not undergone psychometric testing.

The Arabic translations of the test instruments were provided by Insight Assessment for the Sample Reasoning Mindset Test and the Debono Center for Teaching Thinking in Amman, Jordan for the CCTT Level Z. A back-translation and examination of the test items used in the CCTT TAP was performed using standard translation practices (Davies, 2007; Gokhan Iskifoglu & Agazade, 2013). Minor changes to the Debono Center for Teaching Thinking translation were made based on the results of back-translation. Since Insight Assessment claims that all of their products go through an extensive translation process, a back-translation was not performed on the Sample Reasoning Mindset Test. During the TAP a few mistakes in the SRMT translation became evident and changes were made and reported as appropriate. A full evaluation of the translations used in this study is beyond the scope of this project. It is therefore possible that differences in student understanding of questions could be traced to problems of translation. In addition, the Arabic translations of these tests have not been psychometrically tested.

Researchers working on culture and thinking have often attempted to make broad comparisons of thinking patterns on the basis of culture. Even so, Knight and Nisbett (2007) have shown that it is possible that individuals from geographically similar regions may think in different ways. Similarly, Varnum, Grossman, Kitayama, and Nisbett (2010) argue that empirical studies generally support the broader correlation between social orientation and thought but these correlations may break down on the individual level such that modes of thought are expressed in

different ways for different individuals within each group. The small sample size in this study makes it possible that the participants may interpret and perform critical thinking tasks in ways that differ from other Lebanese undergraduate students.

This project also has a number of delimitations. There are many ways to categorize and evaluate cognitive thinking processes. For example, Benjamin Bloom's taxonomy of cognitive educational objectives is widely cited in education. His higher-order thinking skills are often seen as equivalent to critical thinking. As Ennis (1985) points out, Bloom's taxonomy is too vague to be useful for conceptualizing or evaluating critical thinking. Similarly, critical thinking has often been used as a catch-all term to describe various types of thinking such as creative thinking or problem-solving, or used too narrowly as skepticism or logical thinking. Although critical thinking has many connections with other types of thinking, this study has chosen to explore critical thinking processes using the categories of critical thinking outlined in the APA Delphi Definition of critical thinking (Facione, 1990). As such, the interpretation of the results should not be employed to evaluate other types of thinking.

There is a breadth of approaches used to examine critical thinking. This project specifically focused on the role of cultural and contextual factors in the critical thinking processes of bilingual Lebanese undergraduate students. The study does not address ways to teach critical thinking and does not assess the critical thinking ability or dispositions of participants. As mentioned above, the project also does not primarily address meta-cognitive reflection or the reasons or evidence that participants provide to justify particular reasoning patterns. These delimitations align with the central aim of the study to examine the role of culture and language in the critical thinking processes of students while performing on a critical thinking test.

The think-aloud protocol is a labor-intensive methodology that yields a large response data set (Johnstone et al., 2006). As a result, the sample size used in TAP research is generally small and purposeful. Nielsen (1994) suggests that a sample size of 5 participants is sufficient for most TAP research. Leighton (2017) contends that the labor-intensive nature of TAP research is not a valid justification for small sample sizes. Instead, she argues that sample sizes must be appropriately aligned with project goals. Leighton presents research to suggest that sample sizes should range from between 15-50 participants. In qualitative TAP research, participants are generally chosen to represent demographics relevant to a particular set of research questions (Johnstone et al., 2006). This project has chosen to use a purposive sample of 24 undergraduate students. The sample size is too small to generate randomly and the researcher chose to limit the research to one university. The researcher worked with junior and senior students according to the CCTT Level Z test target level. These delimitations limit the ability to generalize the research results to a broader population.

Another delimitation is related to the choice of the CCTT Level Z test and the Sample Reasoning Mindset Test as instruments in the project. There are a variety of critical thinking skills assessment instruments available on the market. The criteria that were used to select the CCTT were (1) it has a long history of being used to assess critical thinking, (2) it has received a positive, academic third-party review (Possin, 2008), (3) the items in the assessment were considered sufficient for the project goals, (4) the company that owns the instrument granted permission to reproduce its items for academic research, and (5) an Arabic translation of the instrument was available. Although individual test scores from the CCTT are compared with verbal data gathered from the TAP for quality control, the researcher did not use test score comparisons by language or ability with any intention of equivalence testing.

In contrast to the plurality of critical thinking skills tests, there is a dearth of critical thinking dispositions inventories. The researcher attempted to get permission to use the California Critical Thinking Dispositions Inventory (CCTDI) for the study. After a lengthy dialogue, Insight Assessment made it clear that it will not allow items from its instruments to be published in academic research. In addition, Insight will not share the item-scale information that is used to score the test. As a second option, Insight suggested that the researcher use their free Sample Reasoning Mindset Test which is available in English and Arabic. After evaluating the instrument and comparing its questions with academic research on critical thinking dispositions (P. Facione, N. Facione, Sanchez, & Gainen, 1995), the researcher determined that the Sample Reasoning Mindset Test would function as an acceptable alternative to the CCTDI.

Finally, the length of the two tests, the amount of verbal data that would need to be collected, and the potential for cognitive and psychological fatigue for participants if asked to verbally process 76 questions, led the researcher to choose specific questions from each section of the CCTT Level Z and the Sample Reasoning Mindset Test to be used in the TAP. In sum, participants were asked to verbally articulate their cognitive processes for 34 out of 76 questions. The questions that were chosen were not selected randomly; they were chosen by the researcher based on his experience and understanding of the Lebanese context and the goals of the project. The content of questions were not altered for the purpose of the study.

Background of the Researcher

The researcher's interest in these questions stems back to his experience of living cross-culturally for the past sixteen years and to his experience of teaching in the Civilization Studies program at the American University of Beirut. When he moved to Lebanon, the researcher discovered a world with a different conception of history, different cultural norms and

expectations, a different language, and different patterns of thinking. In the process of learning the Arabic language and studying Arab history and culture, he developed an interest in understanding different ways of perceiving the world. He also became interested in how different perceptions of the world impact the choices that people make. He began to better understand how his cultural upbringing has influenced his own patterns of thinking. From 2010-2014 the researcher taught in an academic program whose mission statement includes the mandate to develop critical skills and creative, flexible thinking. By using primary texts of thinkers from ancient civilizations the program attempted to develop a student's critical ability to comprehend, analyze, and assess different worldviews. The majority of Lebanese students he encountered in his classes were either uninterested or ill-equipped to think about their own worldviews or the worldviews of others in accordance with his definition of critical thinking at that time. The researcher also observed that even though students from different ethnoreligious groups share the same geographic space they were generally unaware of how their neighbors reason. This experience challenged him to re-evaluate what it means to develop critical thinking as well as how both macro and micro cultures influence what it means to think critically.

Key Terms

Objectivist school of critical thinking: Views of critical thinking that emphasize the importance of objective, logical principles that serve as criteria for evaluating and justifying belief across intellectual disciplines.

Subjectivist school of critical thinking: Views of critical thinking that move away from objectivist, trans-cultural and trans-domain criteria for evaluating and justifying belief and ground critical thinking in domain-specific, socially-located epistemic communities of discourse.

Culture: Taken in its broad sense, culture is the complex and dynamic pattern of socially transmitted assumptions, knowledge, values, feelings, beliefs, morals, and customs through which humans interpret their experience; develop strategies for living; attempt to answer questions of meaning and purpose; locate their belonging; and grow in their understanding of their intellectual and social worlds (Geertz, 1973; Rynkiewicz, 2011; Tylor, 1970).

Critical Realism: A post positivist philosophy situated between naïve realism and constructivism. Critical realism includes a series of philosophical positions united by a shared commitment to ontological realism, epistemic relativism, judgment rationality, and a cautious ethical naturalism (Archer et al., 2016).

Ethnoreligious group: A category used to distinguish social groups on the basis of a shared, communal identity as well as a sense of belonging to a historical and/or cultural religious community.

Sectarianism: A sociopolitical system where power is divided among religious communities according to established quotas and where ethnoreligious groups are empowered by the state to create and manage their own religious courts and personal status and family laws (Nassar, 1995; Salloukh, Barakat, Al-Habbal, Khattab, & Mikaelian, 2015).

Social Orientation Hypothesis: The hypothesis that it is social practice and not geographic or ethnic differences that primarily impacts thinking patterns (Varnum, Grossman, Kitayama, & Nisbett, 2010).

Linguistic Relativity: The hypothesis that the languages humans speak are intricately related to the way that people think about and interpret reality (Dirven & Niemeier, 2000; Dragos, 2012; Goddard, 2003).

Dialectical Reasoning: A pattern of reasoning that emphasizes social cohesion and seeks to avoid confrontation and debate. Dialectical reasoning recognizes and accepts contradiction and highlights the importance of multiple perspectives in a search for the “Middle Way” between opposing propositions (Nisbett, Peng, Choi, & Norenzayan, 2001).

Weak sense critical thinking: The ability to use the intellectual skills of critical thinking selectively to identify and refute flaws in the reasoning of others and defend personal beliefs (Paul, 1992).

Strong sense critical thinking: The ability to question deeply a personal framework of thought; an ability to reconstruct sympathetically and imaginatively the strongest versions of oppositional frameworks of thought; and an ability to reason through dialogue in order to determine when one's own point of view is at its weakest and when an opposing point of view is at its strongest (Paul, 1992).

CHAPTER TWO

Literature Review

Conceptualizations of critical thinking

The study of critical thinking's role in formal education is a growing and nascent field of inquiry. There is no shortage of theories, conceptualizations, arguments, and counter-arguments about what it means to promote and develop critical thinking. In a qualitative study, Moore (2011) explores ideas about and approaches to critical thinking as held by 17 academics working in the three disciplines of history, philosophy and cultural studies at an Australian University. He asked professors whether they found the term critical thinking relevant to their practice as a teacher, and, if they do, how they understand the term in relation to the qualities and attributes they seek to encourage in their students. Among these 17 academics, Moore identifies seven different definitional strands of critical thinking, namely critical thinking: as judgment; as skepticism; as a simple originality; as sensitive readings; as rationality; as an activist engagement with knowledge; and as self-reflexivity. His study demonstrates the multiplicity of meanings given to the term critical thinking and shows that although educators generally agree on the importance of critical thinking, the term means different things to different university educators.

Some of the main areas of disagreement among the better known positions in the field of critical thinking concern whether critical thinking is primarily a cross-disciplinary skill, such as the ability to assess reasons properly, to weigh relevant evidence, or to identify fallacious arguments; a critical attitude or disposition, such as the tendency to ask probing questions, a critical orientation, or dispositional knowledge in the sense of a moral perspective or set of values that motivate a particular way of thinking; or a deep and wide knowledge of a particular

discipline and its epistemological structure, in which case a person can only be a critical thinker within a particular discipline (Mason, 2008).

This chapter will address some of the central differences and main tenets of the objectivist and subjectivist approaches to critical thinking within the critical thinking literature. More specifically, it will look at the epistemological frameworks and values upon which these conceptualizations are built. It will then explore the way that critical thinking scholars address the accusations of bias that have been leveled against the critical thinking movement. Examining the conceptual contours of the critical thinking debate and the question of bias will help establish a framework for understanding approaches to critical thinking assessment. After laying this foundation, the chapter will address the strengths and weaknesses of methods used to assess critical thinking. It will then explore studies that highlight the physiological, sociological, and linguistic relationship between culture and thinking. The chapter will conclude with a discussion of the historical, cultural, and social factors that impact critical thinking in the Lebanese context. These different elements in the critical thinking literature, woven together, will lay the foundation for addressing the research questions articulated above.

Objectivist conceptualizations of critical thinking

In a series of reflections on the critical thinking movement in the United States, Ennis (2011) outlines a history of the political-social factors that have influenced the critical thinking discussion in the US over the last seventy years. Ennis argues that World War II and the subsequent race with Russia to launch a satellite resulted in a swing from progressive education to an emphasis on subject matter. He contends that these events decreased concerns about critical thinking, but that the protest movements of the 1970s sparked a renewed interest in critical thinking because it “provided the rigor, reflection, and reasonableness that both the anti- and pro-

war forces had ignored” (p. 7). He then traces the increase in interest about critical thinking in the 1980s. During that time, a number of educational policy decisions were adopted to promote the development of critical thinking and a multitude of critical thinking institutions and foundations were established.

In this brief survey of history, Ennis links the importance of contextual factors to an increase or decrease in the development of critical thinking. He also sets up a distinction between an emphasis in education on subject matter or critical thinking. As such, he contends that the contemporary US context has allowed an interest in critical thinking to grow over the past twenty years which has resulted in a litany of controversies about the nature, assessment, and teaching of critical thinking as a part of formal education. In reflecting on his over fifty years in the field, Ennis advocates for more research to be done to address this vital area of study and claims that, “critical thinking in the schools and colleges is still in a state of infancy” (p. 17).

Some of the contours of the contemporary debate over the role of critical thinking in education can be traced to Ennis (1962). In his 1962 article, Ennis discussed the conception of critical thinking presented in John Dewey’s *How We Think* (1933) and stated that Dewey, “suggests that the problem is solved when the solver thinks it is solved, thus providing a psychological instead of logical criterion for the solution of a problem” (Ennis, 1962, p. 82). Ennis then presents a definition of critical thinking as “a correct assessing of statements” (p. 83). This definition is meant to move the question of critical thinking from the realm of psychology to the realm of logic and to establish criteria from which it is possible to develop and assess critical thinking. Nearly fifty years later Ennis presents his current definition of critical thinking as, “reasonable reflective thinking focused on deciding what to believe or do” (Ennis, 2011b, p. 5).

In this definition, he exchanges the concept of *correctness* for *reasonableness* and adds the practical dimension of action and belief.

One of the key components of Ennis' conceptualization of critical thinking is the importance of identifying assumptions in the process of thinking critically. Similarly, a number of authors place assumption identification at the center of the critical thinking process (Bailin, Case, Coombs, & Daniels, 1999; Brookfield, 2011; Paul, 1985). Ennis defends the concept of an argument-to-best explanation which involves "the principle that a hypothesis should not be endorsed if there is a plausible alternative explanation, and the principle that, before a hypothesis is endorsed, a competent sincere effort should have been made to find supporting and opposing data and to seek alternative hypotheses" (Ennis, 2011b, p. 11). In doing so Ennis maintains a conceptualization of critical thinking that focuses on critical thinking as a cross-disciplinary skill that requires withholding judgment until enough data have been gathered to develop a reasonable belief that one's assessments are correct.

In his current definition Ennis also adds the recognition of critical thinking dispositions such as caring that beliefs are true, caring to present a position honestly, caring about other people, and being concerned about their welfare. He also includes value judgments in the scope of critical thinking (Ennis, 2011b). In doing so he moves critical thinking from being constrained to the realm of logic and brings it, at least partially, back into the realm of values and psychology. Ennis accounts for this move by making a distinction between constitutive and correlative critical thinking. Constitutive critical thinking involves the skills of collecting and evaluating evidence, the logical dimension. "Constitutive features of critical thinking are tools that can be used for good or bad purposes" (Ennis, 1998, p. 25). Correlative critical thinking

includes the dispositions and values that accompany the use of critical thinking skills; the ethical or moral dimension of the critical thinking process.

A commitment to some degree of fallibilism is shared across critical thinking scholarship. In general terms, fallibilism is the belief that every claim is open to revision (Brookfield, 2011; Lam, 2009; Siegel, 2008; Thayer-Bacon, 1998). It also acknowledges imprecision in the process of making judgments. As a result, Ennis argues for the need to attend to the credibility of sources. He contends that the credibility of a source “tends to be weakened if the source has a conflict of interest, and if it does not have experience in the field” (Ennis, 2011b, p. 11). In teasing out what he means by a conflict of interest, Ennis introduces a scenario where a doctoral chair’s strong opinions potentially impact a doctoral student’s empirical research claims. In such a case, there may be evidence that draws the credibility of the claims into question. Although this is a relatively straight-forward example, Ennis does not delve into the more complicated contention that all knowledge claims are influenced by power dynamics and are inherently impacted by conflicts of interest (Stich, 1993). Ennis does not provide a clear set of criteria upon which to gauge the extent to which a conflict of interest impacts credibility. In addition, he does not address the extent to which claims that purportedly have no or little conflict of interest are valuable. His discussion of critical thinking dispositions and caring that beliefs are true admits of an environment where all choices are charged with potential conflicts of interest but he does not specifically address the challenges of applying critical thinking in high-stakes situations that are rife with conflicts of interest and social implications. Ennis focuses on rational processes without a nuanced discussion of the impact of social location. In spite of these limitations, Ennis’ clear delineation of critical thinking skills and dispositions is one of his main contributions to the field.

In contrast, Paul (1985) contends that “the logical systems of the schools have little to do with the logic we live. We are largely controlled and confused, and consequently have never consciously assented to, the inner logic we ourselves create in our concrete forms of life” (p. 17). In his writings, Paul argues that humans are deeply irrational and that this creates the greatest challenge for teaching critical thinking. He outlines what he calls the four dimensions of background logic that influence decision making. He creates the category of *preductive* logic, which he contrasts with inductive and deductive logic. Paul argues that preductive logic is the reasoning humans use consciously or unconsciously to shape a goal or issue before actually thinking about the issue. The infra-logical dimension of background logic is how humans interpret an issue; how they categorize its subject matter; and the tacit assumptions and relevant background facts that they use in the process. The extra-logical dimension is the unexpressed implications and collateral consequences of choices. Finally, the dialectical dimension is the capacity of the reasoning to be developed in such a way as to meet specific objections put to it from another point of view. Building on these categorizations, he argues that “every interpretation of language usage is a complex act of decoding in which we are responding to cues that reflect three variously-related background logics, that of the egocentric individual, that of the social group, and that of the natural language of the user” (Paul, 1985, p. 14).

Paul also discusses different degrees of critical thinking. In particular, he develops a distinction between what he calls strong sense critical thinking and weak sense critical thinking (Paul, 1992). Weak or sophistic critical thinking is the use of critical thinking skills to serve the interest of a particular group of individuals without taking others into account. In weak sense critical thinking, the thinker uses the critical thinking process ego-centrally. Weak sense critical thinkers are “those who use the intellectual skills of critical thinking selectively and self-

deceptively to foster and serve their vested interests (at the expense of truth)” and are “able to identify flaws in the reasoning of others and refute them; (and) able to shore up their own beliefs with reasons” (Paul, 1992, p. 41). Weak sense critical thinking lacks a critical self-awareness. In contrast, strong sense critical thinking entails, “an ability to question deeply one's own framework of thought; an ability to reconstruct sympathetically and imaginatively the strongest versions of points of view and frameworks of thought opposed to one's own; and an ability to reason dialectically (multilogically) in such a way as to determine when one's own point of view is at its weakest and when an opposing point of view is at its strongest. Strong sense critical thinkers are not routinely blinded by their own points of view” (Paul, 1992, p. 41).

According to Paul, the goal of developing critical thinking, to be a strong sense critical thinker, is to provide the skills necessary to identify and correct the irrational logics that humans use to make choices. This process involves moving away from egocentric and socio-centric modes of thinking to the pursuit of rational convictions and the ability to appraise the convictions of others regardless of personal consequences or the social context (Paul, 1985). Paul also argues that all human inferences are based on assumptions; therefore, critical thinking, as he conceptualizes it, involves tracing inferences to assumptions and then rationally evaluating those assumptions as either good or bad (Elder & Paul, 2002). As such, Paul, himself, begins with the assumption that independent thinking uninfluenced by possible social consequences is valuable or good. His work focuses largely on the development of informal logic and rationality and the distinction between critical thinking as a skill, weak sense, and as a skill and disposition, strong sense. In addition, he also emphasizes the importance of developing a deep knowledge of the psychological dimensions and influences that affect the decision-making process.

Siegel (1980) most clearly addresses the philosophical justification for the adoption of the objectivist, rationalistic conceptualization of critical thinking found in Paul and Ennis. He grounds critical thinking in the dual concepts of rationality and a critical spirit or attitude. Critical thinking is rational thinking. To be rational is to understand and accept the importance and convicting force of evidence and reasons on which to base assessment, evaluation, or judgment. It also entails a commitment to guiding principles such as impartiality, consistency, and non-arbitrary judgment that govern the rational process (1989). Finally, it requires the necessary skills to collect and evaluate evidence. A critical spirit is a combination of attitudes, dispositions, habits, and character traits such as a willingness to conform judgment to principle, a commitment to fairness, a habit of inquiry, a readiness to forego self-interest, a caring about reason and its use, a respect for others, etc. (1980). A critical spirit also involves valuing good reasoning and a disposition to believe and act on the basis of good reasoning. For Siegel, good reasoning is reasoning that is subject to the criteria outlined above. A critical thinker is a person who both thinks critically and possesses a critical spirit or critical attitude. Therefore, he makes a distinction between critical thinking and being a critical thinker. It is possible to think critically without being a critical thinker, but not possible to be a critical thinker without the ability to think critically. In this description, Siegel agrees with Ennis' and Paul's distinction between the skills of critical thinking and the disposition of being a critical thinker. Where he differs is that Siegel argues that a critical spirit is a constitutive, not correlative feature of critical thinking. His interest is not in the skills of critical thinking per se, but in the development of the critical thinker.

In highlighting the importance of a critical attitude, Siegel wants to avoid the impression that critical thinking is a logical and passionless enterprise. He contends that critical thinking is

full of passion and it is for this reason that a critical thinker requires a psychological as well as intellectual capacity. “A person who is to be a critical thinker must be, to the greatest extent possible, emotionally secure, self-confident, and capable of distinguishing between having faulty beliefs and having faulty character. A positive self-image, and traditionally-conceived psychological health, are important features of the psychology of the critical thinker, for their absence may well present practical obstacles to the execution of critical thinking” (Siegel, 1989, p. 27) He sets up both rationality and a critical attitude as ideals in order to demonstrate that these are fluid and evolving skills and characteristics, not fixed traits.

What is particularly significant to this study is the argument Siegel uses to justify why his conceptualization of critical thinking should be adopted as an educational ideal. He grounds his first argument in a moral imperative. He claims “it would be immoral to teach in any other way” (Siegel, 1980, p. 13). The argument he makes is that morality entails that human beings respect one another. Teachers demonstrate a respect for students by “recognizing the student’s right to question, to challenge, and to demand reasons and justifications for what is being taught” (p. 14). According to Siegel, to respect a student’s personhood is to respect his or her right to exercise independent judgment. It is by grounding critical thinking in this moral imperative that Siegel makes a critical spirit constitutive, not correlative, of critical thinking as an ideal. As such, the teaching of critical thinking skills without a critical spirit is at best, uninteresting, and at worst, educationally irresponsible. The second justification he provides for critical thinking is that one goal of education is to produce self-sufficient adults who have the power and ability to control their own lives. Siegel argues that it is the self-sufficient person who is the liberated person, “free from the unwarranted control of unjustified beliefs, unsupportable attitudes, and paucity of abilities which can prevent that person from competently taking charge of his or her own life” (p.

16). Finally, he contends that critical thinking initiates students into the central human traditions of science, literature, history, the arts, mathematics, and so on.

It is clear from a review of Siegel's works that he builds his conception of the critical thinker on specific values such as autonomy, independence, self-sufficiency, emotional security, a democratic spirit, egalitarian power relationships, and liberation. He attaches moral force to these values by arguing that they are a necessary demonstration of respect for persons. At the same time, he tempers his emphasis on independence by maintaining that critical thinking initiates students into intellectual traditions guided by principles and criteria. As such, individual passions and commitments are mitigated by accountability to the epistemic community in which an individual is located as well as the intellectual history of a particular field of inquiry. He does not address the fact that the intellectual traditions he mentions are largely dominated by the Western world. Most significantly, he does not simply state that critical thinking should inculcate these values but that the goal of critical thinking, and education in general, is to produce a certain type of person, the critical thinker (Siegel, 1989, p. 28). In making these claims, Siegel puts a stake in the ground and commits the process of education to the pursuit of the particular end of developing critical thinkers infused with values such as autonomy, independence, democracy, etc., which some scholars would describe as Western values (Bell, 2000; Cuypers, 2004; Franck, 1997; Heine & Norenzayan, 2006; Henrich, Heine, & Norenzayan, 2010; Hofstede, 1997; Nisbett, 2003).

Ennis, Paul, and Siegel all represent a similar school of thought in the critical thinking debate. They argue that at the heart of critical thinking is a commitment to evidence as a basis for justified belief. They each highlight the importance of objective, logical principles such as impartiality, consistency, and non-arbitrary judgment that can serve as criteria for evaluating

beliefs across intellectual disciplines. They are also committed to concepts such as those found in withholding judgment, gathering data, questioning potential biases, and identifying assumptions until enough data have been gathered to justify beliefs. They each highlight the importance of a dispositional willingness to act based on evidence. In addition, they make a distinction between critical thinking skills and critical thinking dispositions while acknowledging the importance of both. To varying degrees, they emphasize the value of independence and autonomy as inherent values of critical thinking and believe that the exercise of critical thinking should occur independent of the entanglements and pressures of a particular social context.

Whereas Ennis primarily focuses on the articulation of critical thinking skills and dispositions, Paul engages with the psychological dimensions of social context, and Siegel attempts to ground and philosophically defend his conceptualization of critical thinking against its critics. Although the three authors do not agree on all aspects of critical thinking, they represent an approach to critical thinking that locates critical thinking in objectivist, rationalist, processes. In doing so, they highlight what they believe are transcultural and transdisciplinary skills that can be developed to facilitate a linear critical thinking process and attempt to establish normative criteria upon which claims can be assessed as being reasonable or unreasonable as well as good or bad. Because of their commitment to separating critical thinking from its social context, they fail to adequately address the social and affective complexities of justified belief.

Subjectivist conceptualizations of critical thinking

A second general approach or school of thought in the critical thinking debate moves away from a focus on generalizable and transcultural critical thinking skills and instead emphasizes domain-specific and context sensitive critical thinking. Many of the thinkers that adopt this approach base their arguments for domain-specific critical thinking on the

Wittgensteinian idea that logic is located within language and speech acts themselves (Wittgenstein & Kenny, 1994). As such, the criteria of logic and reasoning are located within a language and set of rules of reasoning that are agreed upon by a specific epistemic community. On this basis, McPeck challenges the view of critical thinking as a cross-disciplinary skill and argues that critical thinking requires knowledge of the field in question as well as knowledge of the epistemic foundations of that field. He defines epistemology as “the study of the foundations of various types of belief” (McPeck, 1981, p. 153) and claims that each field of research has its own internal logic and is governed by the authority of its specific epistemic community. He challenges the idea that critical thinking is equivalent to informal and/or formal logic and argues that critical thinking is compatible with rationality but that they are not equivalent terms. Instead, he claims that critical thinking is the facet of rationality that involves both the disposition and skill to identify difficulties in reasoning and construct possible solutions, again, within a specific field and set of epistemological presuppositions.

To illustrate his point, McPeck gives the example of alcoholism and explains that what one desires to know about alcoholism is dependent on the type of question that is asked and the field that is used to answer it. “If one is interested in how widespread it is, or in which age-group, then it is a sociological question. If one wants to know if it is right or wrong, then it is a moral question. If one wants to know why people become alcoholics, then it is a psychological question. If one wants to know whether it is sinful, then I suppose this is a religious question” (Mcpeck, 1985, p. 51). “To become rational, one must come to understand the different logical, conceptual, and epistemic differences that obtain between the different kinds of questions and problems there are” (Mcpeck, 1985, p. 46). He points out two distinguishable dimensions of justified belief. The first is to “assess the veracity and internal validity of the evidence as

presented,” and the second is to “judge whether the belief, together with its supporting evidence, is compatible with an existing belief system” (McPeck, 1981, p. 35). In his approach to critical thinking, McPeck argues that the pragmatic dimensions of critical thinking assure that it includes value judgments on almost every level and that scholars such as Ennis over-emphasize a sort of value-free rationality as an untenable goal of critical thinking. He thus proposes that if there is genuine interest in promoting critical thinking, any conceptualization of critical thinking must include relevant background knowledge and the epistemology of a subject along with its corresponding value judgments an integral part of the subject-matter.

Similarly, Blatz (1989) addresses the question of context in critical thinking. He does not completely agree with McPeck’s limitation of critical thinking to domain-specific fields, but instead attempts to clarify a taxonomy of critical thinking levels. Blatz discusses the different aims and uses of reason as well as the importance of identifying the shared assumptions in what he calls communities of discussion, similar to McPeck’s epistemic communities. For example, like McPeck, he compares the ways that scientists, Christian theologians, ethicists, and legislators all employ reason for different purposes and, therefore, use different standards for evaluating and weighing evidence. The standards adopted are based on a shared set of basic assumptions or epistemologies that correlate with the purposes of the reasoning activity and the nature of questions being asked. The background assumptions and purposes of different questions within communities of discussion set limits on the way that critical reasoning is able to be used within that community.

To illustrate his point, he presents the example of an ornithologist suffering from liver failure who asks to be treated by both medical doctors from New York and South American shamans. After the man dies, the question is raised as to what killed him. Blatz writes, “The

proper or true account of what killed him depends, of course, upon which community of discussion you take up to understand and approach his illness. It is not as though we have two explanations competing on equal terms and open to judgment by the same standard. The two explanations belong to different communities defined by different assumptions and procedures for finding the truth” (Blatz, 1989, p. 111). In this description, Blatz disagrees with Siegel’s defense of normative, transcultural criteria. He contends that “the internal question of what is good reasoning is to be answered differently according to different sets of problem-framing assumptions and question-addressing procedures that are present in the two communities” (p. 111).

The key move made by Blatz, which differentiates his argument from McPeck’s, is to distinguish between the internal and external question of good reasoning. The internal question is limited by the accepted assumptions of a particular community. He argues that whether or not a particular community’s set of assumptions represents reality cannot be answered without begging the question. Consequentially, what can be done is to ask the external question of which set of assumptions and procedures will best fulfill the aim of the question; in this case, which will most likely result in healing the ornithologist. The guidelines that are used to answer the external question of good reasoning are, at least, partly pragmatic and evaluated based on which set of assumptions is best able to achieve the stated or unstated purpose of the problem or question addressed. In this approach there is a return to the psychological aspect of Dewey’s pragmatism questioned by Ennis. Critical thinking involves the evaluation of a solution based on how satisfactorily it addresses the articulated question or problem.

According to Blatz, there are four levels of critical thinking. On the broadest level, critical thinking involves clarifying and defending beliefs through the avoidance of fallacies and

the adoption of a framework for valid and inductively cogent patterns of reasoning. At this level, critical thinking is concerned with consistency in tracing assumptions to beliefs to actions and the interpretation of events. The second level entails testing the alignment of reasons for belief with their rational, moral, aesthetic, legal, or prudential goals. Thus, levels one and two enable the critical thinker to trace sets of assumptions and beliefs and then to evaluate the extent to which they successfully accomplish their specific aims. Level three involves reasoning within a particular domain or subject-specific reasoning. In level three, subject matter specifics restrict the proper use of logic according to the accepted norms of the field in question. Level four relates to reasoning within the restrictions of a specific case that exists within a particular domain. “Thus by seeing critical thinking in terms of reasoning within and in accordance with, or else outside and about, the guidelines of communities of discussion, we can understand the contexts of critical thinking, where it occurs, how it is guided and, very broadly, to what standards of conduct critical thinkers are accountable” (p. 112).

For example, consider the plight of our ornithologist. For the medical doctors from New York, level four might involve accepting the standards of Western medical models, its epistemological criteria, and then thinking critically about how to use the tools of the model to effectively treat his specific case. Discerning treatment would be based on a medical history of the ornithologist and his unique symptoms; specific background knowledge. Level three would entail accepting the standards of Western medical models and then thinking critically about how general cases have been treated within the field of liver related diseases. Level two would consist of evaluating the efficacy of Western medical models for treating liver related diseases against other models. Level one would be centered on logically defending the consistency of naturalistic views of disease with the practices employed by Western medical models. According to Blatz,

the expertise of a critical thinker is not related to the level at which she engages in critical thinking, but the autonomy with which she is able to address issues external and internal to the relevant communities of discussion (p. 115). Thus, the central characteristic of the expert critical thinker is that of autonomy.

Papastephanou and Angeli (2007) take a different approach and argue that skilling or purpose-oriented conceptualizations of critical thinking are embedded in a “goal-oriented, purposive rationality...that inevitably remains silent about pupils’ ability to critique the task itself, and take a reflective distance from their own involvement in it” (p. 608). As such, they critique the conceptualizations of critical thinking in the works of Ennis, Paul, and Blatz. Skills involve the ability to perform a task well. A skills approach to critical thinking accepts as normative a particular set of tasks and a particular set of values by which these tasks can be evaluated as having been done well. It adopts a means-ends rationality where the end of justified belief is evaluated based on the means of achieving it. This contention is supported by Norris’ claim that much of the assessment done in critical thinking is centered on testing which type of skills people should be able to do well (Norris, 1985).

Papastephanou and Angeli believe that the skills paradigm falls short in its inability to be self-critical of its own set of means-ends values. For example, Paspastephanou and Angeli argue that the individualism reflected in the skilling perspective is ethnocentric. The skills perspective uncritically accepts the value of independence and its noticeable lack of reference to the Other within the society. As a result, the skills perspective involves the initiation into a particular, positivist, empiricist, epistemic community that has adopted certain values, such as autonomy and independence, and has agreed upon a certain set of criteria for evaluating the skills needed to achieve these values. In quoting Hinchliffe, Papastephanou and Angeli argue that “skills are

learnt in a context and are deployed in a context. The context, or background, gives the skill its purpose or point. Thus, whether a skill is performed more or less well depends not only on whether particular techniques have been mastered, but also on whether the particular context has been appropriately understood. It follows, therefore, that there are not necessarily straightforward, simple objective criteria for what counts as successful performance, since interpretations of context may vary, and what counts as a successful performance in one context may not do so in another” (Papastephanou & Angeli, 2007, p. 617).

Papastephanou and Angeli also adopt Smith’s (2001) discourse on effective thinking and contend that much of the discussion in the field of critical thinking should actually be characterized as effective thinking. They define effective thinking as the process of thinking that is oriented toward achieving a purpose. Papastephanou and Angeli argue that in adopting a means-ends rationality, many critical thinking scholars have confused the effective use of evidence to justify belief within the values framework of empiricism as critical thinking whereas it is simply the effective use of a particular type of thinking within the value framework of a positivist epistemic community. “Despite its claiming objectivity, the paradigm of effectiveness is biased right from the start, i.e. from its basic assumption that critical thinking is reducible to a small (or large) set of skills. It takes a particular mode of rationality, purposive and/or strategic, and elevates it to a universal normative standard and, in turn, to an educational ideal” (p. 613). Papastephanous and Angeli contend that an over-emphasis on effective thinking is, in fact, a Western value. “The exaggeration and hegemony of effectiveness constitutes an absolutization and universalization of the specific western context and an effacement of complementary or alternative spaces” (p. 613).

Instead of critical thinking as purposive rationality, Paspastephanous and Angeli claim that it is principally related to “the scrutiny of purpose” (p. 611). “It is the very ‘system of values’ in which the decisions as to the desirability of outcomes are embedded that should be placed under scrutiny by the critical self in all spheres of action, the private, the professional, and the public” (p. 608). In quoting Benn, they write “to be a chooser is not enough for autonomy, for a competent chooser may still be a slave to convention, choosing by standards he has accepted quite uncritically from his milieu” (Benn, as cited in Paspastephanous & Angeli, 2007, p. 612). In making this argument, Paspastephanous and Angeli principally locate critical thinking in the realm of reflection on morality, dialogue, and meta-cognitive meaningfulness. “Critical thinking and its teaching cannot be solely concerned with the achievement of goals, but with the ability to think over and argue for or against their meaningfulness or moral pertinence” (p. 609). As a result, critical thinking should orient reason toward mutual understanding, not successful action. Again, this is predicated on the Wittensteinian claim that rationality is contextual. “The rationality of a mode of thinking is not something necessarily intrinsic to it, but the result of a characterization we make according to criteria of what counts as rational, criteria that vary in virtue of context and cultural values” (p. 610).

According to Paspastephanous and Angeli, the essence of critical thinking is aporetic or question raising. It involves the ability to evaluate systems of means and ends with regards to its own set of assumptions and then to consider alternatives. It locates criteriology in separate communities of fallible thinkers. As a result, it delegates the practice of critical thinking to the sphere of questioning that which is taken for granted and exploring alternate possibilities.

Bailin (1998) attempts to navigate the difference between thinkers who emphasize skills and those who focus on context. She contends that any reference to good thinking makes critical

thinking a normative concept, including criteria upon which to differentiate critical from uncritical thought. Bailin critiques the skilling approach's implication that critical thinking is a possessed, mental ability. She argues that adherence to the use of principles, reasons, and arguments in line with criteria is not a skill, but rather it involves the mastery of public norms and conventions, which she calls intellectual resources. Intellectual resources include "background knowledge, knowledge of critical thinking standards, possession of critical concepts, knowledge of strategies or heuristics useful in thinking critically, and certain habits of mind" (Bailin, Case, Combs, & Daniels, 1999, p. 286). "The problem becomes one of determining the range of use and application of the principles and criteria which inhabit our public tradition of inquiry rather than looking for general skills in the inner world of individuals" (Bailin, 1998, p. 4). As a result, the central question in critical thinking is whether it is possible to generalize principles, reasons, and arguments across different contexts as well as the range in which intellectual resources, such as the rules of logic, apply. In this way, the intellectual resources approach focuses on understanding "the principles, concepts, and criteria which constitute our critical practices and are inherent in our traditions of inquiry" (p. 5). Bailin's traditions of inquiry are Siegel's intellectual traditions, McPeck's epistemic communities, and Blatz's communities of discussion. Bailin admits that the conceptualization of critical thinking includes a certain level of vagueness. As such, she does not specifically address which normative criteria in critical thinking are generalizable across different domains though she does indicate that the rules of logic are used across a number of disciplines.

Finally, Thayer-Bacon (1998; 1999) challenges the objectification of knowledge and the distinction between knowledge and the knower that characterizes much of the discussion in the field of critical thinking. She traces this distinction from Plato and Aristotle throughout the

history of Euro-Western philosophical thinking and argues that it is this tradition which has elevated reason, and its corresponding tool of logic, to a place of pre-eminence at the expense of other tools for knowing such as imagination, intuition, and emotional feelings. She contends that the critical thinking movement has grounded its arguments and corresponding criteria on the unsubstantiated belief that knowers can be separated from what is known. It is our experience that shapes our conceptual knowing and our conceptual knowing that, in turn, shapes our experience. This is an ongoing reciprocal relationship that cannot be objectified in the terms of knower and known. “To look at the practice of critically thinking without examining at the same time what critical thinking means creates a situation where any description of that practice will be shaped by how the unexamined concept ‘critical thinking’ is being used” (Thayer-Bacon, 1998, p. 132).

In the place of critical thinking, a term that she argues is beyond repair, Thayer-Bacon offers the substitute of constructive thinking. In constructive thinking, reason takes its place alongside of other ways of knowing as a fallible tool that helps in the construction of meaning and inquiry. Instead of critical thinking’s aiming for agreement and consensus, one final answer based on normative criteria, constructive thinking values coexistence. Instead of universal essences and individual epistemic agency, Thayer-Bacon emphasizes relativity and social connectivity. Instead of conceptualizing social location as a hindrance to good critical thinking, Thayer-Bacon contends that social location is an inherent description of the human condition. Constructive thinking emphasizes that humans are not able to be objective, neutral beings, but, instead, bring contextuality into all thinking. Contextuality cannot be set aside and examined from outside itself, as suggested by thinkers such as Ennis, Paul, McPeck, Blatz, Paspastephanous and Angeli, etc., it is a constitutive aspect of the human condition. That being

said, contextuality does not require a jettison of reason or criteria. It is reasoning, which many define as the essence of critical thinking, that helps us straighten, order, clarify, and examine our ideas. It helps us make judgment calls, but it is in not objective. Although Thayer-Bacon is a relativist, she does not believe that relativism or the cultural location of critical thinking requires that we “embrace all theories as being true or that we have no way of measuring one theory against another to determine which one is better (depending on one’s criteria). What it does mean is that we must acknowledge that we do not know the absolute truth, what is right. We continue to inquire, and we try to support our understandings with as much “evidence” as we can socially construct, qualified by the best criteria upon which we can agree” (Thayer-Bacon, 1998,p. 145).

The second general approach or school of thought in the critical thinking debate, as seen in the writings of McPeck, Blatz, Paspastephanous and Angeli, Bailin, Thayer-Bacon, and others, moves away from the objectivist, trans-cultural and trans-domain skills model of critical thinking and, instead, grounds critical thinking in domain-specific and socially located contexts. McPeck focuses on domain-specific critical thinking as, at the very least, the primary locus of critical thinking practice. As a result, domain-specific epistemologies, skills, questions, and background knowledge are essential in the development, discussion, and assessment of critical thinking (Battersby & Bailin, 2011). Blatz adds the criteria of effectiveness of purpose in answering a particular question as a means for evaluating critical thinking. Paspastephanous and Angeli exchange the concept of critical thinking skills with that of effective thinking skills within a particular epistemic community. In doing so, they move away from a means-end purposive rationality and delegate critical thinking to an aporetic orientation concerned with meaningfulness and morality. Bailin argues for viewing critical thinking through the lens of the appropriate use of intellectual resources that are located in specific traditions of inquiry. Thayer-

Bacon removes critical thinking from its Euro-Western pedestal and places it alongside of other tools of knowing such as intuition and emotion. She removes critical thinking as an educational ideal and assigns it a modest role as an organizing, evaluating, and clarifying tool in the process of constructing meaning.

In a move away from more normative conceptualizations of critical thinking, the question of what constitutes the values of critical thinking becomes more fluid. McPeck and Blatz agree with the objectivist school in stating that autonomy is a central value in critical thinking. They also grant a certain level of authority to different epistemic communities of discourse. Blatz and Paspastephanous and Angeli emphasize the reflective value of comprehending a broad perspective of various systems of thought. As such, they include the mutual understanding as constitutive value of critical thinking. Blatz adds the criteria of effectiveness of purpose to that of understanding, a move specifically rejected by Paspastephanous and Angeli. In spite of these differences, there seems to be a tacit agreement by authors in both schools of thought that autonomy is a central value in critical thinking. To develop the critical thinker is to develop the autonomous thinker. The exception appears to be Thayer-Bacon who locates values in agreed upon criteria of particular social communities, and, at the same time, argues for the importance of connectivity, not autonomy, as a primary value of the thinking process.

This review of conceptualizations of critical thinking raises a number of important questions. Is it appropriate to talk of critical thinking as an educational ideal? Does it move humanity towards truth and understanding? Does it primarily lead to respect and tolerance? Is its function to help solve the world's problems? The central issue in the critical thinking debate revolves around the question of purpose. If the goal of critical thinking is to develop autonomous thinkers able to justify their beliefs with trans-cultural evidence using normative, positivist

criteria and, as a result, make independent choices irrespective of their social context (Ennis, Paul, Siegel), then it will challenge and seek to transform the values of collectivist cultures; establish the criteria of positivism as normative across cultures; privilege rationalism as the preeminent strategy for making decisions; and move humans toward a monolithic conception of truth. If the goal of critical thinking is to develop responsible and consistent thinkers that adhere to the standards of their various epistemic communities (McPeck, Bailin, Blatz), then it is constrained by the epistemologies of different intellectual and culture traditions and must acknowledge the possibility of different standards and criteria for evaluating evidence and making judgements. Conceptualized this way, critical thinking entails an initiation into the way that particular domains use intellectual resources within divergent communities. It also loses its transcultural, normative weight. If the goal of critical thinking is to promote multicultural understanding and tolerance (Papastephanou and Angeli), it is primarily concerned with meta-cognitive reflection, questioning, and dialogue between differing meta-narratives and interpretations of the world. Finally, if critical thinking is simply a context-dependent tool that is used, along with other tools, to construct meaning (Thayer-Bacon), then it should not be allocated a disproportional emphasis in education.

Other questions in the critical thinking discussion relate to criteria, morality, and the use of critical thinking. Is the criterion of critical thinking primarily logical, practical, or psychological? If it is logical, then critical thinking is primarily concerned with the right way to deal with a problem. If it is practical, then critical thinking is concerned with the most effective way of dealing with an issue. If it is psychological, then critical thinking evaluates the most satisfying answer to a problem. Is critical thinking a moral or an amoral activity? If amoral, then its skills and resources can be used towards positive, neutral, or nefarious ends. If moral, then a

normative set of moral critical thinking criteria must be established, such as is present in the discussion of critical thinking dispositions. Finally, is critical thinking primarily procedural or aporetic? If procedural, then critical thinking must be assessed using the epistemological criteria of particular communities or accepted normative, trans-cultural criterion of reasoning. If critical thinking is meta-cognitive, then it is unable to be assessed.

The foundations upon which a particular conceptualization of critical thinking is built have significant ramifications for how it is understood, implemented, and assessed in different cultural contexts. These foundations also impact whether or not critical thinking is culpable of cultural bias.

Critical thinking and bias

Regardless of which school of thought one sides with in the critical thinking debate, the articulation of a particular set of values as constitutive of critical thinking raises the question of whether critical thinking is inherently biased. Bailin (1995) outlines a number of the accusations of bias that have been leveled against critical thinking such as the following: critical thinking neglects or downplays emotions; critical thinking privileges rational, linear, deductive thought over intuition; critical thinking is aggressive and confrontational rather than collegial and collaborative; critical thinking is individualistic and privileges personal autonomy over the sense of community and relationship; and critical thinking presupposes the possibility of objectivity and thus does not recognize one's situatedness. Similarly, Norris (1995) raises the criticism that the implementation of critical thinking in certain cultures seeks to challenge or change a particular culture's way of life.

Ennis (1998) addresses Norris' critique by describing how critical thinking may function differently in cultural groups characterized by group think, authoritarian structures, and a

disinterest in answering the artificial, suppositional, questions such as those often used in the assessment of critical thinking. He contends that the critical thinking practices of seeking reasons and alternatives and the dispositions of caring to get it right and to represent a position clearly and honestly are relevant across cultures; they exist as transcultural principles of critical thinking. At the same time, he acknowledges the potential bias in the methods used to teach how these principles should be implemented and assessed. For example, in response to the claim that critical thinking is aggressive, Ennis argues that a confrontational methodology is a cultural by-product; that it is not intrinsic to critical thinking. He contends that a critical thinking methodology may be biased and should be accommodated to the context. He also states that it is not necessary in a collective culture with an authoritarian structure to encourage everyone to critically think. Instead, it is possible to only require the decision makers to engage in critical thinking in particular instances.

In a culture where individuals refuse to answer artificial questions divorced from practical contexts, Ennis argues that such questions should not be used to measure critical thinking. The issue in this case is the bias in the tool, the use of artificial logic problems to deduct logical ability, not the concept of critical thinking itself. In cultures where it is perceived as offensive to ask for reasons, such as a shame-honor culture, a direct approach can be avoided. Students should not be expected to question their teachers. An “alternative would be to promote the reason-seeking disposition and the disposition to seek and be open to alternatives in such a way that reasons are sought with great discretion – with no apparent challenge to authorities” (Ennis, 1998, p. 20). He completes his argument by responding to the claim that critical thinking can be used as a tool of exploitation. He argues that if respect for others is constitutive of critical thinking, such as in Siegel’s approach, then the use of critical thinking skills as a tool of

exploitation is not, in fact, critical thinking. If respect for others is a correlative of critical thinking, such as in his own approach, then the use of critical thinking skills as a tool of exploitation is simply a bad use of critical thinking and can be evaluated as such.

In his attempt to accommodate for cultural differences, Ennis does not sufficiently address the complexities of cultural bias. He assumes that preserving cultural norms is good and, thus, critical thinking methodology should be accommodated to preserve particular culture patterns. He fails, perhaps intentionally, to present a rationale, argument, or evidence for why the preservation of cultural norms, such as collectivism and face-saving, are worthwhile. More importantly, he does not clearly distinguish critical thinking methodology from critical thinking values. For example, he does not offer a justification as to why it is reasonable to only require critical thinking from decision makers in a collectivist culture. He fails to address how it is possible to explore other alternatives in a way that does not challenge authority. If questioning the status quo or empowering individuals are values of critical thinking, then changing the critical thinking methodology does not circumvent the problem of cultural bias. Ennis attempts to defend critical thinking against the charge that it threatens culture. In doing so, he raises some important issues about contextualizing methodology but fails to provide a justification for his primary contention that critical thinking methods or instruction may be biased, but that the underlying values of critical thinking, itself, are not biased.

Siegel, on the other hand, does not shy away from critics (Shweder, 1986; Stich, 1993; Thayer-Bacon, 1999) who question whether his conceptualization of critical thinking can withstand challenges posed by postmodernism and multiculturalism. He argues that his view of multiculturalism is built on “the ‘supracultural universal’ of coherence” (Siegel, 2007, p. 210) in that “all cultures should be valued and regarded as worthy only if they extend that value and

regard to other cultures, i.e. that ‘all cultures must accept the legitimacy of all other cultures living in accordance with their own culturally-specific ideals, insofar as those culturally-specific ideals and attendant practices are consistent with the moral imperatives of multiculturalism itself’ (p. 208). He contends that what makes his view of multiculturalism coherent is its commitment to the value of respect for others as intrinsic to the concept of multiculturalism itself. It is therefore this value of coherence, not tolerance, that is universal and subject to evaluation, reasons, and evidence. Although the specifics of Siegel’s debate with postmodernism are beyond the scope of this work, there are aspects of his discussion that are relevant to this project.

Siegel addresses the Wittensteinian claim that rationality varies from culture to culture, what Shweder labels divergent rationalities (Shweder, 1986). According to Shweder, divergent rationalities have a bounded quality including rational processes that are not universal, similar to Blatz’s internal questions. Shweder gives the example of “presuppositions and premises from which a person reasons; the metaphors, analogies, and models used for generating explanations; the categories or classifications used for partitioning objects and events into kinds; and the types of evidence that are viewed as authoritative – intuition, introspection, external observation, meditation, scriptural evidence, evidence from seers, monks, prophets, or elders” (p. 181). Shweder argues that “the version of reality we construct is a product of both the universal and the non-universal rational processes, but it is because not all rational processes are universal that we need a concept of divergent rationality” (p. 181). The concept of divergent rationalities fits within the second school of thought described above.

Siegel rejects Shweder’s argument for divergent rationalities on the basis that rational dialogue between parties is able to transcend divergent ideologies. For example, the existence of

meaningful, academic dialogue is evidence of a normative view of rationality. He also argues that rationality is not about the process but about the use of evidence to justify belief. As such, evidential criteria can be established to evaluate divergent beliefs irrespective of the processes employed. In addition, he contends that processes themselves admit of rational evaluation and therefore premises and presuppositions may be shown to be irrational. He concludes by arguing that “cultures are diverse and divergent, but rationality is not” (Siegel, 2007, p. 218).

Siegel’s argument against divergent rationalities, although clear, is incomplete. He attempts to establish the universality of rationality by distancing it from cultural processes and describing it as using evidence to justify belief. Taken in this broad sense, it is difficult to disagree with his description of rationality as a universal or, at least a shared, concept but such a concession is not particularly helpful. He sidesteps the heart of the issue. He does not address the claim that cultural groups judge evidential criteria differently, and that judgments of rationality are culturally specific (Nisbett, 2003; Weinberg, Nichols, & Stich, 2001). He also does not discuss the basis upon which evidential criteria can be judged across cultural divides, although his other writings indicate positivism and logic as his criteriological standard. As a result, he simply moves the question from divergent rationalities to divergent standards of evaluating evidence used to justify belief.

Siegel attempts to counter this objection by arguing that the quality of an argument is normative and independent of its cultural location and the perspectives of its evaluators (Siegel, 1999). He disagrees with the contention that the evaluation of “the goodness of an argument depends on the cultural identities and commitments of its evaluators, and the cultural circumstances in which the evaluation takes place” (p. 186). Although Siegel admits that it is impossible to transcend one’s cultural perspective, “we can nevertheless ‘transcend’ such

perspectives in judging argument quality” (p. 189). Examples from science, such as heliocentrism, demonstrate that an argument can be both locally situated (in fact all arguments are) and universal. “All that is required for argumentative principles and criteria to be, in the relevant sense, transcultural, is that it is possible that reasons offered for particular conclusions be such that a fair-minded contemplation of those reasons will result in such conclusions being deemed worthy of acceptance on the basis of that contemplation, independently of the cultural heritage and commitments of those doing the contemplating” (p. 195).

Siegel’s argument is clear. It is difficult to counter his contention that certain arguments carry a normative force that transcend their cultural location. That being the case, a number of questions remain. It is unclear which arguments carry the normative force he describes. Perhaps normative arguments are those that are justified by evidence, but this begs the question of the divergent ways that different cultural paradigms approach the interpretation of evidence. It is also unclear to what extent the fallibility of the human condition and unequal power relationships present a hindrance to grasping, and, therefore, evaluating, the normative nature of particular arguments. Siegel (2008) acknowledges the context-dependent nature of historically and culturally situated arguments, but does not parse out the possible differences between an ethical argument, a culturally situated course of action, and a scientific theorem. To claim that normative arguments exist is one thing, but to convincingly argue that values, such as autonomy, are transcultural is another. As discussed above, Siegel attempts to ground his view of the normative nature of critical thinking in the moral imperative of respecting others. As such, he correlates values such as autonomy, self-determination, and independence with the concept of respect. This line of reasoning makes his view of critical thinking coherent but possibly unconvincing within cultural frameworks that do not accept his normative description of respect.

As outlined above, if Siegel's argument is accepted, critical thinking is culturally biased but will also carry the normative force to change existing cultural norms that contradict the values that imbue his conceptualization of critical thinking.

Brookfield (2011) discusses the critique that critical thinking represents an approach to knowledge that emphasizes doubt and springs from a Eurocentric intellectual heritage. He references Lee's (2011) study on how East Asian learners focus on knowledge applied under the strict supervision of a teacher. Lee claims that the expectation for a good East Asian student is to accept and apply knowledge exactly how a teacher wishes. As a result, learning does not entail doubting; it is centered on the acquisition and practice of received knowledge. If an East Asian student is asked to question an instructor's reasoning, he is being asked to do something deeply disrespectful to his own culture. Brookfield responds to Lee's study by acknowledging that the tenets of critical thinking must continually be reinvented and reshaped to fit alternative times and places. Unfortunately, he does not specifically discuss the nature of these tenets and what it means to reshape critical thinking to fit within a different culture. If doubting or challenging authority is removed from many conceptualizations of critical thinking, it conceptually dissolves. Similar to Ennis' argument, Brookfield's discussion is noticeably vague.

Brookfield also addresses the claim that critical thinking is individualistic and privileges personal autonomy over relationship. He argues that students learn how to think critically most effectively in the social context of community. In his research, derived from over 1,500 Critical Incident Questionnaires completed by students over 30 years, Brookfield describes that "students report that critical thinking is best learned in groups in which peers serve as critical mirrors allowing students to see parts of their thinking that would otherwise remain obscured" (Brookfield, 2011, p. 216). As such, he argues that social learning is an important aspect of

critical thinking. Again, Brookfield does not move beyond a cursory discussion of the role of community in critical thinking and fails to address the more complicated questions of individualism and collectivism. He presents social learning as a value-added activity and does not specifically address whether this means that knowledge is constructed by consensus through social learning or that community primarily helps the autonomous learner unearth assumptions. It appears to be the latter. If this is the case, Brookfield's response may encourage the value of social learning and help temper an overemphasis on individualism, but does not answer the charge the critical thinking privileges autonomy over the sense of community and relationship.

Finally, Brookfield raises the question of whether critical thinking may lead to cultural suicide. Cultural suicide occurs when a student feels his identity shattered and finds himself psychologically adrift as a result of his engagement in critical thinking (Casey, 2005). If a student begins to critically question conventional assumptions and beliefs shared by her peers, the student risks being excluded from the group. For thinkers such as Paul, this type of cultural risk should not impact critical thinking. In fact, critical thinking is meant to enable an individual to develop convictions regardless of the risks involved (Paul, 1985). Brookfield implies that some aspect of critical thinking includes a responsibility to mitigate the risk of cultural suicide or must, in some way, factor in the importance of social belonging as part of the critical reasoning process. Although Brookfield raises a number of important questions, he does not offer substantial answers.

Bailin and Battersby (2009) acknowledge that the confidence resulting from the success of western science has "led, implicitly and explicitly, to the boundaries of investigation being set at the boundaries of western civilization, and frequently at the boundaries of current research within local disciplinary traditions" (p. 190). They argue that although the boundaries set by

Western scholarly research have many practical advantages, they do not have epistemic justification. As a result, Bailin and Battersby admit to the charge that critical thinking is largely situated within boundaries set by Western civilization. According to their argument, in so far as critical thinking adheres to boundaries established by western civilizations, critical thinking is biased. Where does this leave critical thinking? For Bailin and Battersby, it is necessary for critical thinkers to think critically about critical thinking. This process involves an honest consideration of alternative solutions to human problems as well as alternative sources of knowledge. That being said, Bailin and Battersby argue that their approach does not necessitate a relativism where all views of other cultures are equally acceptable or should be given equal weight. What it does require is a broadening of traditional, established boundaries and criteria for what is accepted as knowledge. In spite of their admission of bias in critical thinking, Bailin and Battersby reject the idea that different cultures employ radically different standards. They believe that the overlap in human experiences across cultures provides a ground for engaging in cross-cultural understanding and comparison. As a result, they contend that differences across culture “reflect differences of emphasis rather than radically different standards” (p. 191).

To illustrate the possible epistemic advantages of considering alternative cultural perspectives, Bailin and Battersby provide examples from art, justice, and medicine. Art, a shared human experience, is conceptualized in western societies as an objectified activity that is set apart from life and observed with disinterested contemplation. In contrast, traditional societies incorporate art into daily life such that everyone engages in art-making. Which is truly art? Bailin and Battersby contend that “looking at art phenomena cross-culturally can cause one to look critically at one’s prevailing conceptions, revealing unexamined normative claims, and possibly supplying grounds for revision of those conceptions, or at least putting appropriate

limitations on them” (p. 193). Similarly, they compare the justice system in the North American system of courts with that of native systems of justice. Whereas in North America justice is based on a view of fairness through impartiality and due process, native systems of justice resolve cases of criminal behavior through working together with perpetrators and victims with the goal of reintegration and restitution within the community. Is justice built on fairness, impartiality, retribution, deterrence, and an adversarial structure or is it restorative and built on the values of healing, reconciliation, and prevention? According to Bailin and Battersby, critical thinking requires the consideration of both. In looking at medicine, they compare prevailing Western medical models that approach illness naturalistically to Chinese medicine that see illness as bodily processes being out of balance. Contemporary western medicine’s theory of illness is incompatible with that of traditional Chinese medicine because “TCW (traditional Chinese medicine) is not reductionist, is non-microbial and provides explanations that refer to entities and bodily ‘parts’ that have no physical manifestations” (p. 195). Yet, certain applications of traditional Chinese medicine have met western empirical standards used to evaluate efficacy. As a result, Bailin and Battersby conclude “it does not seem epistemically justified to presume a priori that the explanatory paradigm of CWM (contemporary western medicine) is the only model worthy of consideration” (p. 196).

Bailin and Battersby’s discussion of critical thinking and different cultural perspectives admits of bias in Western conceptualizations of critical thinking but also sees the development of critical thinking dispositions as the solution. “Given a history of Eurocentric arrogance, it is especially important to be wary of the possibility of prejudice in treating views and practices from other cultures. An attitude of open-mindedness and fair-mindedness seems the most appropriate way to proceed – an approach of looking to see what wisdom might be gleaned, what

we might be missing, and what we might learn. We may come away with our original views intact, or the interaction may result in the re-evaluation of our own paradigms by holding them up against those of others, or the incorporation of new knowledge and insights, or both.

Whatever the outcome, the epistemological benefits are clear” (p. 200).

Finally, Elder (1997) responds to the charge that critical thinking neglects emotion and privileges reason over intuition by arguing that it is actually critical thinking which leads to a high emotional intelligence. She claims that “if we want to change a feeling, we must identify the thinking which ultimately leads to that feeling. If we want to change a desire, again it is the thinking underlying the drive which must be identified and altered if our behavior is to alter” (p. 42). As a result, it is critical thinking that helps align human emotions and intuitions with intelligence and justified action. Similarly, Arslan and Demirtas (2016) present research to support Elder’s claim that there is a positive correlation between social emotional learning and critical thinking. Elder bases her argument on Plato’s hierarchy of thoughts, feelings, and desires. In this taxonomy, it is thought or reason which exists to help correct feelings and direct desires. Thus, critical thinking is not meant to be an emotional activity and the claim of critical thinking’s bias against emotion is a misunderstanding of the relationship between reason, emotion, and will.

At the heart of the issue of bias is once again the question of normativity, values, and the role of critical thinking in the life of an individual and society. If it is conceptualized as rational thought, and if reason is elevated above emotion, then critical thinking is not biased against emotions or non-linear thought, it exists separate from these ways of knowing. If critical thinking is grounded in a moral imperative (Siegel) and has as its goal the creation of normative, criteriological standards by which to evaluate autonomous, independent, egalitarian, linear-thinking, logical, democratic, and authority-questioning individuals, then critical thinking

instruction is only biased against those who do not share these values. If critical thinking is a set of amoral skills that can be used for good or bad ends to evaluate a particular type of evidence (Ennis), then bias is only present once these skills are used in a particular way that is measured and qualified as good. If critical thinking is primarily a disposition of questioning and exploring alternative explanations (Papastephanou), then bias is related to how alternative explanations are subsequently evaluated. If critical thinking is an organizing tool used among many to help make sense of and construct belief within a particular social context, then it is inherently biased because it is a tool always employed by humans in a particular intellectual and cultural location (Thayer-Bacon). Although contextually inappropriate critical thinking methodology, tools, or approaches may be altered, they can only change in ways consistent with the values upon which critical thinking is built.

It should also be noted here that the charge of bias is not inherently negative. As both Thayer-Bacon and Siegel point out, all knowledge is situated and therefore includes bias. The issue is whether or not the biases of critical thinking are good. If critical thinking is biased but good, then it should be implemented based on its value. Therefore, the central question is not that of bias, but whether critical thinking is a good, moral, or educationally valuable endeavor either generally or within a particular context and, if so, how it can be assessed.

Critical thinking assessment

The central point of disagreement between the school of thought represented by Ennis, Paul, and Siegel, and that of McPeck and Blatz is, in some sense, a practical and procedural question. It is a question of how critical thinking should be taught and if critical thinking can be broadly assessed. To date, there is no consensus over how critical thinking should be measured. In large part, this lack of consensus is the result of the ongoing debate over how critical thinking

should be conceptualized. The first school of thought emphasizes a particular set of rational skills and dispositions that can be taught, extended, and assessed across disciplines. The second school locates rationality within specific fields and epistemologies and contends that critical thinking skills only exist within the boundaries of a specific epistemic community. For the second school, critical thinking can be assessed, but only within a particular field among individuals that have a shared background knowledge of the field in question and a facility in using the domain-specific skills in question. Construct validity for critical thinking assessment requires an agreed upon, explicit operationalization of the domain critical thinking. As Ku (2009) points out “the conceptualization and assessment of critical thinking are interdependent issues that must be discussed together: how critical thinking is defined determines how it is best measured” (p. 71).

Norris (1989) points out that most critical thinking tests claim to be valid measures of process-oriented activities, such as evaluation, analysis, and interpretation, but that these tests only measure the product, not process, of thinking. As a result, these assessments actually test whether a test taker is aligned with the extra-critical-thinking assumptions of the test maker. “To decide on the correct answers for a credibility judgement test, the test maker must take into account factors other than criteria for judging credibility, including background beliefs and political and religious ideologies that reasonably could be expected to be held by examinees, and assumptions that examinees would likely make. This means that test makers’ judgements are based on extra-critical-thinking factors that can differ from those on which test takers base their judgments. But examinees should not be penalized on critical thinking tests for taking into account different, but reasonable, extra-critical-thinking factors, nor rewarded merely for taking into account the same factors as the test maker” (p. 24). In a multiple-choice test it is difficult to

ascertain whether a chosen answer is incorrect because of uncritical reasoning or the use of reasonable inferences that differ from those assumed by the test makers. Similarly, Halpern contends that multiple-choice critical thinking tests “are basically tests of verbal and quantitative knowledge, since test-takers are not free to determine their own evaluative criteria nor generate their own solutions to problems” (Ku, 2009, p. 73).

McPeck attempts to expose the shortcomings of multiple choice critical thinking assessments by arguing that any assessment of critical thinking must at least meet the following conditions:

1. That the test be subject-specific in an area (or areas) of the test taker’s experience or preparation. This is required because knowledge and information are necessary ingredients of critical thinking,
2. That the answer format permits more than one justifiable answer.
3. That good answers are not predicated on being right, in the sense of true, but on the quality of the justification given for a response.
4. That the test results should not be used as a measure of one’s capacity or innate ability, but as a learned accomplishment – which is usually the result of specific training or experience (McPeck, 1981, p. 149).

McPeck challenges critical thinking assessments that equate critical thinking with correct thinking and instead introduces the idea of critical thinking as consistent thinking. He argues that critical thinking can only be assessed when a test taker has a wide knowledge of a discipline including its content, epistemology, truth premises, as well as what constitutes a valid argument within the discipline.

Another point of contention in the discussion of critical thinking assessment is the extent to which test scores are an accurate measure of the ability to critically think in unprompted contexts (Ennis & Norris, 1990; Halpern, 2003; Norris, 2003). Krupat et al. (2011) explored whether the theoretical definitions of critical thinking adopted by doctors was consistent with their descriptions of critical thinking in clinical practice. In a qualitative content analysis of surveys collected from 95 medical educators at 5 medical schools, these researchers discovered that although critical thinking was consistently defined as a process employing abilities or skills, the examples provided of critical thinking in clinical practice emphasized the priority of critical thinking dispositions. Medical educators were asked to define critical thinking and then “describe a challenging clinical scenario, real or imagined, in which critical thinking would make a crucial difference to the way the situation is handled” (p. 627). Particularly informative were the descriptions of doctors in these scenarios that were seen as not demonstrating critical thinking. A failure to think critically was not primarily attributed to a lack of critical thinking skills, but to factors such as a desire to take mental shortcuts, disinterest in going through the steps needed to make a good decision, and an insensitivity or lack of awareness to the value of gaining additional information. This study highlights the potential disconnect and lack of transfer between the way that critical thinking is approached in prompted scenarios, such as critical thinking assessments, as opposed to real-life situations.

In a similar fashion, Chan and Yan (2009) build on a number of empirical studies and present the concepts of adaptive and critical rationalities. They argue that adaptive rationalities require humans to simplify tasks in order to make them manageable, and that this is not irrationality, but it is the result of bounded rationality (Simon, 1957). They then construct a geography of thinking styles with the claim that judging critical thinking by abstract reasoning,

as implemented in many critical thinking assessment tools, fails to adequately address that critical thinking involves putting logical thinking into practice. Chan and Yan also highlight the need for students to be taught to be more aware of the cultural contexts in which their thinking patterns are embedded so that they can become more sensitive to their own ways of thinking and less likely to misapply them. Their research combines Paul's emphasis on being aware of background logics, Krupat's discovery of the disconnect between theory and practice, and McPeck's claim that critical thinking is bounded by knowledge of a particular discipline.

In spite of these challenges, most commercially marketed critical thinking tests purport to provide a reliable assessment of cross-disciplinary critical thinking skills (Ennis & Weir, 1985; Facione, 2002; Halpern, 2007; Ennis & Millman, 2005; Watson & Glaser, 2002). Cross-discipline assessments of critical thinking generally utilize what Black (2012) calls a top-down approach to construct validity. In a top-down model, a definition and taxonomy of critical thinking is adopted and then assessment questions and evaluative criteria are developed to test for proficiencies that line up with the outlined taxonomy. These types of tests generally adopt one of three approaches. Assessments, such as the Ennis-Weir Critical Thinking Essay Test (1989), evaluate production responses to questions. In a production response, a test-taker is asked to generate and evaluate arguments in response to specific questions and then the test-taker's responses are scored by trained evaluators using established criteria. The Watson-Glaser Critical Thinking Appraisal (2002) and California Critical Thinking Skills Test (2002) employ a selection response format. In a selection response, a test-taker is asked to read a short passages and then choose the correct answer from among a selection of choices (Frisby & Traffanstedt, 2003). A third approach, as seen in the Halpern Critical Thinking Assessment using Everyday Situations (2007), uses both production responses and selections responses. Cross-discipline tests

claim they are designed so that specific content knowledge is not a factor in the measurement of critical thinking proficiency (Frisby & Traffanstedt, 2003).

In general, cross-discipline assessments attempt to measure the skills of informal logic and the ability to apply rules of scientific inquiry to postulated scenarios. Taube (1997) suggests that production response formats are also able to capture some of the dispositional aspects of critical thinking. Insight Assessment has attempted to account for the limitations of its selection response test, the California Critical Thinking Skills Test (CCTST), by developing a complementary test to measure critical thinking dispositions, the California Critical Thinking Dispositions Inventory (CCTDI). The tests, taken together, are meant to provide a holistic measure of the skills and dispositions of a critical thinker. Possin (2008) points out that self-assessments do not measure actual dispositions, “but rather the students’ self-reported beliefs about their dispositions – beliefs that can be wildly wrong” (p. 208). His argument is supported by the weak correlation reported by P. Facione, N. Facione, and Giancarlo (2001) between scores on the CCTDI and demonstrated CT skills (Possin, 2008). Whether or not Insight’s dichotomous approach is an effective measure of assessing the critical thinker is contested (Ku, 2009).

Critical thinking test manuals include a section discussing the validity and reliability of the instrument in question. For example, the supplement to the manual of the Ennis-Weir Critical Thinking Essay Test presents data from twenty-four studies to demonstrate “a record of good inter-rate reliabilities for high school and college, and for gifted younger students” (Ennis & Weir, 1989, p. 11). This manual also states that it is necessary to “situationalize test validity, that is, focus on the extent to which *in the situation* the test assesses what it is supposed to assess” (p. 12). By situating test validity with a set of standard conditions the instrument can account for challenges to validity that may result from cultural and language differences. As such, the Ennis-

Weir Critical Thinking Essay Test claims to have standard-condition situational validity; in standard situations the test assesses what it is supposed to assess. No evidence is presented to support concurrent or predictive validity but the manual asserts a strong content validity in that “the situation that the test presents to examinees is a common type of situation in which skills at appraising and formulating arguments is manifested, and the problems presented provide opportunities for assessing the important areas of critical thinking competence” (Ennis & Weir, 1989, p. 3). Additionally, the manual presents the argument that use of an internal consistency index like a Kuder-Richardson or Cronback alpha is inappropriate for the measuring the reliability of the Ennis-Weir Critical Thinking Essay Test because the test attempts to measure a multidimensionality concept of critical thinking, not isolated skills.

The Cornell Critical Thinking Test Level Z (CCTT) is a selection response test that evaluates critical thinking skills related to *deduction, meaning and fallacy, observation and credibility of sources, induction, definition, and assumption identification*. Ennis contributed to the development of the CCTT and it is based upon his definition of critical thinking (Ennis, 2015). The Level Z test is specifically designed for advanced and gifted high school students, college students, graduate students, and other adults. The CCTT manual makes the same argument presented in the Ennis-Weir Critical Thinking Essay Test manual; namely that using the Kuder-Richardson to evaluate internal consistency is not justified because of the heterogeneous nature of critical thinking. Even so, the manual presents reliability estimates based on studies using the Kuder-Richardson and Spearman-Brown methods ranging from .49-.87.

The manual is critical of the idea that “a test is valid to the extent that it measures what it is supposed to measure” (Millman et al., 2005). It argues that tests themselves are not valid but validity relates to the inferences drawn from tests or the validity of interpretations of test scores.

Although it makes this point, the manual accepts “the context-dependence of validity together with the basic idea of measuring what the test is supposed to measure. Accordingly, in a particular set of circumstances, a test is valid to the extent that it assesses what it is supposed to assess in that set of circumstances” (p. 19). As such it states that “to the extent that Level X and Level Z are valid in a certain situation, one can use them as a basis for inferences about the degree of presence of critical thinking ability and for interpretation of scores received on the test” (p. 20). In explaining test validity this way, the CCTT locates the question of validity in the interpretation of the test scores, not in the test itself.

The manual rejects the idea that there are three kinds of validity, content, criterion, and construct validity. Instead, it argues that there is only construct validity and that criterion and content are types of evidence to support construct validity. The manual states that “a great deal of information about a test must be available before a construct validity judgment can be made with justified confidence. After forty years of use in various ways, there is still not enough evidence to declare unequivocally that these are valid tests” (p. 20). With this admission, it proceeds to present eleven sorts of criterion and content evidence to support the construct validity of the CCTT Level Z.

Content evidence for construct validity is presented in a variety of ways. The CCTT attempts to account for the impact of different auxiliary assumptions on induction decisions by adopting a score of 85% agreement to indicate mastery of the skill; individual items were chosen through a collaborate process by members of the Illinois Critical Thinking Project; the test does not claim to represent a real or imaginary sampling of a universe of test items; and a detailed discussion of each answer is included. Criterion-related evidence is presented through a series of studies. The manual presents seven correlations between the Level Z test and other critical

thinking instruments ranging around .50; six studies that conclude that gender is not significantly related to test results; nine studies demonstrating low to moderate correlations with grade point average; six studies that indicate an expected progression of critical thinking scores with grade level; and three studies that indicate correlations with personality such as a positive correlation between independence and CCTT scores and a moderate consistent negative relationship between dogmatism and critical thinking (pp. 32-38). The manual also presents low/moderate correlations between CCTT scores as an indicator of graduate school success and a moderate/low relationship between CCTT scores and subject matter prowess. Four experimental studies found that the more time was spent on critical thinking the better the CCTT scores. Based on this evidence, the manual claims that “there is strong support for the substantial validity of Level Z, given standard conditions” (p. 41). In keeping with Ennis’ conceptualization of critical thinking, the manual also states that these items are evidence but the user must decide whether the information provided justifies a claim of construct validity.

Frisby (1992) questioned the CCTT’s claim that the heterogeneity of critical thinking naturally reduces the internal reliability of test items. He contended that although this argument may explain low internal consistency across all items, that it is still possible, and desirable, to test the psychometric properties of each test section. In a study conducted at a major research university and a two-year community college, he found that “support for the heterogeneity hypothesis was mixed and inconclusive” (p. 301). He concludes that “this finding casts doubts on the view that Form Z sections measure coherent and conceptually distinct thinking skills” (p. 301). In his field-guide to critical thinking assessments, Possin (2008) gives the CCTT a positive review and states that it is “well-constructed and has a well-documented history” (p. 218) but points out some minor concerns such as that the test gives a disproportion emphasis on inductive

reasoning (33% of the questions) and that its use of a three-answer format may lead to a higher percentage of correct guesses. He also argues that a handful of questions have more than one reasonable answer.

In evaluation of the reliability and validity of the CCTT performed 34 years ago, Modjeski and Michael (1983) collected data from 11 panelists who were asked rate the CCTT using “10 statements representing the ten ESSENTIAL validity standards and for each of five statements portraying the five ESSENTIAL reliability and measurement error standards to the degree to which the standard was met” (p. 1189). The findings showed interrater reliability estimates between .84 and .88, relatively high ratings on two aspects of criterion validity, and unfavorable evaluations of test bias. In terms of reliability and measurement error, the test was judged favorably “with respect to (a) a description of procedures and samples used to determine reliability coefficients or standard errors of measurement and (b) use of acceptable ways of reporting reliability data” (pp. 1195-1195). At the same time, the test received negative judgements regarding the reporting of stability of scores. Verburch, François, Elen, and Janssen (2013) engaged in a comparative evaluation of validity and reliability of a Dutch translation of the Halpern Critical Thinking Assessment and the CCTT. The participants in the study were 154 mostly freshman women majoring in educational sciences at the KU Leuven in Flanders, Belgium. On both tests they discovered good interrater reliability, low internal consistencies, and sufficient content validity. Based on the data collected, they argue that neither instrument has sufficient overall reliability and validity for the student population that was tested.

Insight Assessment claims to use a validation procedure for their instruments that includes items/scales that are piloted in target samples and validated through replication studies (Facione, 1990a, 1990b, 1990c, 1990d). The CCTST manual (P. Facione & N. Facione, 2002)

reports “high correlations with standardized tests of college-level preparedness in higher-order reasoning” (p. 46), predictive value to “measure higher-order thinking ability and predict success in educational programs and workplace positions” (p. 47), internal consistency estimates ranging from .68-.80 (p. 48), and KR-20 estimates ranging from .70-.82. Unfortunately, Insight Assessment does not allow access to its items/scales or scoring procedures making it difficult to evaluate the veracity of these claims.

Bondy, Koenigseder, Ishee, & Williams (2001) challenge the reliability estimates of the CCTST presented by Facione. In two studies of undergraduate students, they found “relative and absolute reliability estimates for the subscales ranged from .24 to .61. The total score test-retest estimates were .58 for relative and .54 for absolute reliability” (p. 317). They suggest that the combining of multiple skills taken from Delphi study into the subscales used in the CCTST may contribute to difficulties of measurement. In addition, they contend that student complaints about the difficulty of the vocabulary and structure used in test questions may contribute to test score inconsistencies. Similarly, Leppa’s (1997) study of 70 nursing students reported a low internal consistency in the CCTST. In this study, students were given the CCTST on the first day of the nursing program and then retested 10 months later. After the second administration, Leppa analyzed the reliability of the five subscales. The results revealed KR-20 alpha statistics for the test instrument scales varying from .21 to .51. In addition to low KR-20 alpha statistics, the change in the inference sub-score on a paired score t test showed, on average, a decrease from 6.56 to 5.74. This score, if accurate, indicates the counterintuitive idea that nurses’ inference skills were negatively impacted as a result of a 10-month course of nursing studies.

In two large-scale studies Jacobs (1995; 1999) challenged the construct validity of the CCTST by demonstrating a lack of equivalence between CCTST Forms A and B. In a 1994

study of 1,383 freshmen at a large Eastern private university, Jacob divided students into matched groups and compared scores on the CCTST Form A and Form B. In a replication study in 1999, he examined the scores of 1,461 freshmen students using the same procedures. The results of both studies revealed that the modifications made on 28 question items from Form A in order to transform them into equivalent questions on Form B resulted in the items becoming more difficult. “Almost 40% (13 of 34) of the means for “equivalent” Form A-Form B items differed by 20% or more” (Jacobs, 1999, p. 211) In addition, the differences in relative item difficulty within forms were shown to vary from item to item. A principal components analysis produced two dissimilar groups of items, neither of which corresponded to the suggested categorizations of items. The study also indicated that certain subtests, such as deduction, were more homogenous than others, such as analysis, and that the relationship between CCTST scores and SAT verbal scores raises questions about how unique a contribution the CCTST makes to understanding student thinking. Based on these results, Jacobs argued that context effects and format effects, such as minor changes in item wording, had a significant impact on student responses and that “the resulting measures reveal how little is known about how much a difference in a stimulus (i.e. the item) is required to produce a significant effect on the response” (Jacobs, 1995, p. 106). In conclusion, Jacob argues that in the CCTST “neither total test score nor subtest scores should be regarded as measuring unitary constructs” (p. 105) and that “the technical quality of many CCTST items and scales makes it inadvisable to attempt to interpret between-scale and between-form score differences, particularly at the individual level” (Jacobs, 1999, p. 211) In addition, Fischer, Spiker, & Riedel (2009) point out that “because the test is short, its factors are not orthogonal as each item contributes to multiple facts (i.e., inference, interpretation, etc.)” and that “it is impossible to evaluate the CCTST because the answer keys

are not made available by the publisher” (p. 18). Insight’s CCTDI has also received a series of mixed reviews (Bondy, Koenigseder, Ishee, & Williams, 2001; P. Facione, Sanchez, N. Facione, & Gainen, 1995; Giancarlo & Facione, 2001; Iskifoglu, 2014; Leppa, 1997; Spelic et al., 2001; Sulaiman, Rahman, & Dzulkifli, 2010; Yeh, 2002).

As the above discussion demonstrates, the debate around critical thinking assessment is rooted in different conceptualizations of critical thinking. Although different assessment tools have been developed, they primarily assess logical skills such as *assumption identification*, *interpretation*, *analysis*, and *argument construction*, or focus on the assessment of a normative set of critical thinking dispositions. The psychometric properties of these instruments are limited. In addition, the proprietary and commercial nature of many of these tests makes it difficult to find third-party reliability and validation studies. As of yet, little empirical research has attempted to identify the role of cultural values that undergird the development, assessment, and process of critical thinking. One variable that is noticeably scarce in the literature on critical thinking is a discussion of the relationship between culture and critical reasoning.

The Social Orientation Hypothesis and Cultural Context

There is a growing body of research which includes physiological studies, culture specific case studies, and comparative studies addressing the question of culture and thinking. For example, Ambady and Bharucha (2009) explore how culture is related to physiology. They present a framework for neuro culture-mapping, which is the mapping of neural patterns that characterize culture, and source analysis, which is the attempt to determine physiological sources of observed cultural commonalities and differences. They also present empirical studies such as a study that monitored the brain activity of native English and native Chinese speakers while performing similar intellectual tasks (culture-mapping). The results showed that the two cultural

groups use different brain regions during similar intellectual tasks, which indicates a physiological difference between the ways people of different cultural groups think about similar problems. The researchers acknowledge that this does not address the question of whether neural differences are learned or innate but argue that this demonstrates that there is a physiological relationship between thinking and culture. The neuroscience of culture is still in its infancy. Future work needs to be done to explore how or if the use of different areas of the brain for similar tasks can be related to cultural values and expressions, how different cultural environments and learning strategies affect brain activity, and whether there are universal cognitive processes that are shared across cultures.

Behavioral researchers such as Nisbett, Peng, Choi, and Norenzayan (2001) suggest that the social, ecological, and cultural differences that affect the way that humans interpret the world require a reevaluation of certain cognitive theories and methodological approaches to developing thinking. Specifically, they argue that East Asians think holistically, attend to the entire field and assign causality to it, make relatively little use of categories and formal logic, and rely on dialectical reasoning. Dialectical reasoning is presented as reasoning that has “an emphasis on change, a recognition of contradiction and of the need for multiple perspectives, and a search for the ‘Middle Way’ between opposing propositions” (Nisbett et al., 2001, p. 293). The goal of dialectical reasoning is a social cohesion based on harmony and an avoidance of confrontation and debate. In contrast, these researchers state that Westerners are more analytic; pay attention primarily to the object and the categories to which it belongs; and use rules, including formal logic, to understand its behavior. They argue that “people who are free to contend with their fellows might be expected to develop rules for the conduct of debate, including the principle of noncontradiction and formal logic” (Nisbett et al., 2001, p. 295).

Building on this hypothesis Gutchess, Welsh, Boduroglu, and Park (2006) make use of an event related fMRI to test if there is a neural basis for the object/context distinction between Western and Asian thinkers. They theorized that these proposed cultural behavioral norms should correlate with differences in neural activity and that Americans should engage more object-based neural structures, whereas East Asians should engage those specialized for contextual processing. They discovered that Americans did activate more object-specific regions than did East Asians but that cultural differences with background-processing were less pronounced. Based on their results, they challenge behavioral studies that argue that the additional processing of context on the part of East Asians drives cultural difference. Instead, they suggest that cultural differences in the encoding of complex scenes result predominantly from additional processing of objects by Westerners and that cultural differences could occur at an earlier stage of object-based processing rather than a later stage of integrating objects with elaborated contexts. This means that differences in object processing may contribute to cultural differences in picture encoding but that encoding processes may then converge across cultures.

Addressing a similar question from a different perspective, Davies (2007) looks at the cultural influences on inference-making and discusses their implications for the teaching and understanding of critical thinking. Citing empirical research Davies suggests that Asians and Westerners to some degree use different patterns of reasoning and make different inferential connections but that these culturally modulated thinking patterns are marginal and that, for all practical purposes, humans share the same system of what constitutes reasonable inferences. He argues that evidence indicates that it is the basic principles of western critical reasoning that are not understood, or at least, are not well-deployed, by Asians, and not necessarily a lack of critical thinking skills. Davies' research also suggests that teachers must learn to identify and respect

alternative ways of making inferential connections and that the use of different patterns of reasoning does not indicate a lack of shared understanding concerning what constitutes a reasonable inference. Similarly, Lun, Fischer, and Ward (2010) empirically test whether there is a difference in critical thinking between Asian and Western students in a large New Zealand university. Their findings indicate that differences, as measured by critical thinking assessments, are less about critical thinking and more about language acquisition and background knowledge.

In regards to the relationship between language and culture, the linguistic relativity hypothesis proposes that the languages humans speak are intricately related to the way that people think about reality (Dirven & Niemeier, 2000; Dragos, 2012; Goddard, 2003; Hussein, 2012; Tohidian, 2009). Whereas linguistic diversity acknowledges that language patterns are different, proponents of linguistic relativity contend that these linguistic differences shape the way that humans interpret the world. In general, empirical studies of linguistic relativity are approached in three ways. “Structure-centered approaches begin with language differences and ask about their implications for thought. Domain-centered approaches begin with experienced reality and ask how different languages encode it. And behavior-centered approaches begin with some practical concern and seek an explanation in language's effect on thought” (Lucy, 1997, p. 291).

Györi (2000) explores the cognitive processes of linguistic relativity by tracing the history of lexical-semantic change. He argues that “when cognitive processes take on a linguistic form, thought becomes propositional thought” (p. 72). Thus, languages impose particular categorizations of the world onto non-propositional experiences. In addition, social, cultural, historical environments impact the way that language is developed and used. It therefore follows that socio-cultural contexts shape propositional thinking. At the same time, he acknowledges that

the flexibility of language is evidence that perceptions of the world do not always fit into linguistic categories. As a result, the relationship between perception and language is reciprocal and dynamic. “The study of linguistic change is effectively the study of cognitive change” (Dirven & Niemeier, 2000, p. xv).

Slobin (2000) presents a series of studies in which he examined descriptions of manner of motion in a wide range of languages using the categories of verb-framed languages, (V-languages), and satellite-framed languages, (S-languages). In one study, he presented participants a 24-page children’s storybook with pictures and no words. He then recorded the types of words that were used to describe the manner of motion in the book. In a second study, he and his colleagues did a literary analysis of motion words by looking at novels in languages of the two types. A third study evaluated the verbal use of manner of motion words in preschool children aged 2-4. A final study looked at the extent to which one language can accommodate manner of motion words into a second language through translation. Reflecting on the results of these studies he argued “that that users of V-languages build mental images of physical scenes with minimal focus on manner of movement, and with rather different conceptualizations of manner when it is in focus. Thus, when they hear or read stories, or newspaper reports, or gossip, they might end up with quite different mental representations than users of S-languages. These differences are exceptionally difficult to pin down, but the considerable range of evidence examined here is at least suggestive of rather divergent mental worlds of speakers of the two language types” (p. 133).

Scholars remain divided over the extent to which language influences world-view patterns or cultural practices (Gumperz & Levinson, 1991; Keesing, 1994). As Goddard (2003) points out, the key question for linguistic relativity is not how much language influences

thinking, but rather “in what ways does the process of linguistic thinking differ from language to language” (p. 397).

Another way to examine the relationship between culture and thinking is to explore the correlation between independent cultures and analytic thinking and interdependent cultures and holistic thought. This approach, known as the Social Orientation Hypothesis, contends that it is social practice that primarily affects thinking not geographical or ethnic differences. Varnum, Grossman, Kitayama, and Nisbett (2010) argue that empirical studies generally support the broader correlation between social orientation and thought but that there remain a number of questions. For example, they present a study which indicates that these correlations break down on the individual level such that the independence/interdependence or analytic/holistic modes of thought are expressed in different ways for different individuals within each group. They also highlight a study that indicates that primes of social orientation can produce corresponding shifts in cognition. If social orientation can be shown to be easily influenced by priming, this raises the question of how accurately this reflects a consistent pattern of thought. Similarly, if social orientation is a conditioned way of answering problems and does not represent individual thought this may call into questions the effectiveness of current methods used for measuring differences in ways of thinking.

Using the Social Orientation Hypothesis, Knight and Nisbett (2007) test the way students think in relatively independent regions in northern Italy and in relatively interdependent regions in southern Italy. The results of their study showed that southern Italians reason in a more holistic fashion than northern Italians and also indicated that lower socio-economic status resulted in more holistic reasoning among southern Italians. The implications of the study, if

supported by further research, indicate that the influence of culture on thinking is more related to local values and possibly socio-economic status instead of geographical or national identities.

There are a number of themes that emerge in this review of studies on culture and thinking. There is an indication that there are physiological differences in how different cultural groups use their brains to address questions but that there is no definitive indication as to whether neural differences are learned or innate. There is a broad consensus regarding the influence of culture on patterns of reasoning but little consensus regarding if there is actually a cultural difference in critical thinking ability or if these apparent differences are more related to language proficiency and background knowledge. There is the recognition that language and thought are intricately related, but an ongoing debate over the extent to which linguistic thinking varies from culture to culture. There is some indication that the categories of independent and interdependent cultures can provide a useful framework for understanding different reasoning patterns, but there are also questions about whether the Social Orientation Hypothesis adequately accounts for other potentially influential variables. The above discussion makes it clear that there is an ongoing need for research to explore the relationship between cultural context and the process of critical thinking.

The Lebanese context

As outlined in chapter 1, Lebanon presents an interesting test case for examining the relationship between cultural, political, and religious influences on critical thinking. On one hand, Lebanon is defined by a sectarian system that reinforces collective identity, uniformity, submission to authority, fear of the other, and interdependent thinking within the in-group. At the same time, the majority of sects in Lebanon are rooted in the intellectual histories of Islam and Christianity; traditions heavily influenced by Aristotelian analytic reasoning. (D'Ancona, 2005;

Hall, 2004; Inglis, 2003; Merrifield, 2012). It is Aristotelian analytic reasoning that Nisbett (2003) argues undergirds Western patterns of independent, object-oriented thinking.

Over the past 200 years, education has served as an arena where Lebanese students have had to navigate the complexities of culture, language, foreign influence, loyalty, and self-identity. Factors such as imperialism, decentralized education, political instability, and the influence of sectarianism in both the public and private sectors have created challenging environments that work against a number of the values promoted by the critical thinking movement. For example, it becomes more difficult to withhold judgment or consider other points of view when these are construed as high-stakes activities with significant social consequences. In order to interpret the critical thinking process of Lebanese students, it is important to develop an informed understanding of the Lebanese social, intellectual, and educational context.

Under the rule of the Ottoman Empire, religious communities in the region of Lebanon were permitted to open their own schools in the arts, sciences, and industry (Bahous and Nahbani, 2011). In the late 1800s, foreign missionaries began establishing schools in the region. By the advent of World War I, American Protestant missionaries had opened one hundred thirty-two schools; British Protestant missionaries had established forty schools; and French Jesuits had founded a number of schools as well (Frayha, 2004). As an Islamic alternative to the mission schools, Beirut's Sunni Muslim community founded the Maqasid (Sbaiti, 2008). By 1919, nearly every religious sect in the region of Lebanon had established its own set of schools with different educational systems, many of which were tied to foreign powers (Bahous and Nahbani, 2011). At that time, 88.6% of Lebanese schools were private. Of these schools, 39.2% were foreign schools and 49.4% were local private schools (Kobeissy, 1999). In the years leading up to World War I, the dynamic between schooling, the backing of foreign powers, and the

oversight of religious sects created an environment where education became enmeshed in the complexities of competing loyalties and political-cultural agendas.

After the fall of the Ottoman Empire, the State of Greater Lebanon was created in 1920 under the colonial rule of the French Mandate (Entelis, 1985). During the Mandate, from 1920-1943, sectarianism was indelibly woven into the fabric of Lebanese politics and public life while language and education were established as key arenas where national, religious identities, allegiances, and cultural outlooks could be carefully constructed.

The Mandate Charter of June 24, 1922 made French-language education compulsory and established French and Arabic as the official languages of Lebanon (Sbati, 2010). As Sbati (2010) points out, “the French inherited a rather mottled educational landscape in Lebanon, comprised of former Ottoman public schools, those schools that self-defined as ‘secular nationalist,’ as well as a great many schools belonging to various foreign missions: American, British, Scottish, Russian, German, Italian, and Swiss. This was in addition to French mission schools operating in Syria and Lebanon since the late eighteenth century” (p. 63). Article 10 of the 1926 constitution of the Republic of Lebanon officially granted each religious sect the permission to establish and run its own schools (Farha, 2012). To help manage the varied educational landscape, the French relied on a network of 1,341 private schools scattered throughout the region (Farha, 2012).

One consequence of the creation of the Republic of Lebanon was the binding together of various religious sects with no natural connection or affinity under the imported concept of the nation-state. In 1932, the French took a census to determine the population and religious distribution in the newly established republic. On March 13, 1936 the French officially recognized 18 different sects in Lebanon and empowered each sect with the right to “create and

manage their own religious courts and to follow their own personal status and family laws” (Salloukh, Barakat, Al-Habbal, Khattab, & Mikaelian, 2015, p. 32). Based on the 1932 census, all political and administrative seats in the state were distributed according to a six-to-five ratio of Christians and Muslims. This arrangement was renegotiated as a five-to-five ratio after the Lebanese civil war (Nagle, 2015). The establishment of ethnoreligious quotas in government and a dependence on religious courts institutionalized the influence of sectarianism in both the private and public sphere (Barakat et al., 2015).

During the Mandate period, the language used in education emerged as a distinguishing characteristic of social class as well as religious and confessional identity (Zakaria, 2010). Personal language choices began to carry political meanings and either opened or shut access to resources from competing foreign powers. In addition, languages themselves began to carry certain connotations. Arabic instruction was assigned to the teaching of the arts and religious studies while foreign languages were seen as languages of progress (Zakaria, 2010). By many, Arabic was seen as inherently incapable of being used to teach math, science, and technology (Sbati, 2010). As a result, foreign languages were tasked with teaching of the “rational” sciences, a division still present in the current Lebanese educational system.

After the Republic of Lebanon achieved independence in 1943, the realm of education was once again subject to significant shifts in policy and implementation. As a response to the colonization efforts of the French, the Lebanese government established Arabic as the only official language of instruction (Jarrar & Massialas, 1991) and the only compulsory language for official exams (Wheeler, 1966). The decentralization and privatized structure of a majority of schools made it difficult to implement government-issued educational decrees. By the 1950s, private schools were exempt from the requirement to teach in Arabic and the official

examinations were offered in Arabic, English, and French (Zakaria, 2010). Political tensions over national identities and foreign allegiances erupted in a 1958 civil war (Entelis, 1985). Although the conflict only lasted three months, it once again highlighted the instability created by political sectarianism and the strength of the confessional fault lines running throughout the country.

The 1960s and the first part of the 1970s were dominated by tensions over the influx of Palestinians fleeing from the 1967 Arab-Israeli war. Varying ideologies concerning the Western backing of Israel further fractured an already weak Lebanese nationalism. Attempts at nation-building were mired in regional conflicts, and in 1975, Lebanon erupted. From 1975-1990, Lebanon was engulfed in a civil war divided among sectarian lines (Fisk, 1990). The collapse of the government led to the collapse of any national public school agenda. The supervision of the Ministry of Education was reduced to oversight of nationally administered exams (Zakaria, 2010). Identity, ideological loyalties, and security were heightened as primary factors dictating school choice. The deterioration of the role of an already weak Ministry of Education corresponded to a strengthening of a private, largely sectarian, school system (Farha, 2012).

The civil war began drawing to an end in 1989 with the signing of the Taif agreement (Fisk, 1990). Up until this time, Lebanon's educational history had been characterized by instability, decentralization, wide-ranging shifts in educational policy, and the reinforcement of sectarian identities and divisions. After the war, there was a recognition that both sectarianism and a failed national educational policy had contributed to the bloody conflict. The Taif agreement included a number of statements about national education. Two of the key ideas agreed upon were that the curricula should be revised to inculcate national belonging and integration and that the history and civic education textbooks should be unified (Frayha, 2010).

The post-Taif government tasked the Ministry of Education with the development of broad-scale educational reform. “The Educational Reform Plan (CERD 1994) was prepared by the Educational Center for Research and Development (ECRD) and approved by the Lebanese cabinet on 17 August 1994” (Abou Assali, 2012, p. 86).

Abou Assali (2012), the first director of the Education Center for Research and Development (1993-1999), and Frayha (2010), the head of the ECRD from 1999-2002, both provide accounts of the development, attempted implementation, and failure of the Post-Taif Educational Reform Plan. The first national reform project spanned 52 months, included participants from the majority of Lebanese factions, and was centered on eight themes designed to promote social cohesion. The project focused on developing the subject areas of civics, history, and religious education. The final stage of the project included curriculum objectives centered on “promoting critical thinking, debate, dialogue, human rights, and respect for others’ opinions” (Abou Assali, 2012, p. 93). Although there was broad agreement on the plan, as of 2012 none of the educational reforms developed to promote social cohesion are functioning. Abou Assali lays the blame for this failure on the influence of the “confessional, religious, clientelist system” (p. 99). She contends that sectarianism is a formidable obstacle to achieving national and civic goals and states that the failure of the project mandates a careful examination of the complicated social and cultural Lebanese context.

Similarly, Frayha (2010) provides an account of his experience of religious pressure and lack of accountability in areas of education in Lebanon. He details events that occurred during his tenure as the head of the ECRD to support the claim that it is religious groups that are the most influential in education policy and practice. Frayha catalogues how, although supported by political leaders, religious leaders rejected the removal of religion from the national curriculum

and rejected the development of a pluralist curriculum designed to encourage respect and understanding of different religious traditions (Abouchedid & Nasser, 2002). Instead, Lebanon's religious communities pushed for separate, didactic religious instruction based on ethnoreligious identity and indoctrination (Frayha 2004; 2010). Frayha was eventually dismissed from his position and, in reflecting on his experience, discussed how the politicized nature of education in Lebanon is affected by even the hint of controversy. Because religious groups elevate sectarian interests above the public good, Frayha argues that this jeopardizes sound curriculum and educational practice.

About Assali and Frayha's accounts of failed educational reform demonstrate the protectionist mentality that is bred by Lebanese sectarianism and an unwillingness to promote thinking beyond the boundaries of sectarian self-interest. Hage (1996) echoes this theme in his exploration of the psychological aspects of Lebanese religious identities that create oppositional communities as a strategy for survival. Through a content analysis of historical statements from different Lebanese religious communities about specific events in the Lebanese civil war, Hage argues that "nationalists and communalists in general cannot perceive their community without an otherness of some sort standing between them and 'it'" (Hage, 1996, p. 122). Hage adopts a psychoanalytical approach and contends that the oppositional nature of sectarianism is used by religious communities in the affective realm to create communal identity and a specifically located ethnoreligious social existence.

Similarly, Wedeen (1999) traces the role of rhetoric and symbols as tools of allegiance building in Syria through archival research, anthropological fieldwork, and open-ended interviews. One of her arguments is that rhetoric is used as a vehicle in the Middle East to create a sense of belonging; even in the absence of individual belief or conviction in a sectarian

ideology. It is rhetoric that provides guidelines for public speech and conduct where “people are not required to believe the cult’s fictions, and they do not, but they are required to act as if they did” (p. 30). Wedeen’s account of the use of rhetoric aligns with a long history of polemics in the Arab world. In the polemical discourse between Islam and Christianity, the “other” has often been grossly misrepresented as a means of strengthening commitment to a particular religious ideology (H. Goddard, 2000; Sahas, 1972). The defensive orientation of religious identity politics and the use of emotionally charged rhetoric to garner support stand in sharp contrast to principles in the critical thinking movement such as examining multiple points of view (Facione, 1990a), suspending judgment (Neiman & Siegel, 1993), and the pursuit of rational convictions regardless of personal consequences, emotional connections, or the social context (Paul, 1985).

Akl (2007) offers a survey of literature in an attempt to trace the influence of Lebanon's politico-religious history on national and cultural identity. She argues that the absence of a national Lebanese identity to promote within schools results in an educational system where each faction tends to reproduce its own culture through sectarian educational institutions. Similarly, though examining educational policy decisions and Lebanon’s civic education curriculum, Al-Habbal (2015) contends that the private school network in Lebanon provides students a sectarian education and a civic education that “lacks the methodological instruments and empirical design to foster a critical consciousness, a culture of citizenship, tolerance of the sectarian ‘other,’ respect for the rule of law, and the accountability essential to produce citizens who are free from sectarian shackles and affiliations” (Salloukh et al., 2015, p. 49).

The research of Abouchedid and Nassar (2002) provides support for Al-Habbal’s contention. In a study of seven, privately-run confessional schools in Lebanon, Abouchedid and Nassar attempted to identify whether the policies and practices of the schools promoted multi-

cultural understanding. Data were collected through semi-structured interviews with 14 educational decision-makers of Lebanese confessional schools, 5 decision makers from CERD, and 7 history teachers. The schools chosen consisted of a Maronite Catholic, Protestant, Orthodox, Armenian, Sunni, Shiite, and Druze school. Abouchedid and Nassar relate that schools were chosen based on their willingness to respond to questions about their instructional practices in religion and history because of the sensitive nature of the topic. What was discovered were conflicting interpretations of history which generally reinforced existing sectarian narratives. In addition, the schools lacked multi-faith understanding policies. Although approaches to religious instruction were diverse, many teachers attributed a lack of multi-faith policies to an unspoken policy based on conflict avoidance. None of the schools accommodated for the religious practices of students from different backgrounds. In general, religious instruction reinforced segmentation based on ethnoreligious identity.

Abouchedid and Nassar also explored the extent that students think they know about the beliefs and cultures of religious groups different than their own. Questionnaires were collected from 236 students enrolled in secondary education at these schools and semi-structured interviews were conducted with 26 students. The questionnaires collected demographic information such as religion, parent's educational background, and gender. The questionnaire focused on student perceptions of their knowledge of the beliefs and lifestyles of people from other religious groups as well as their perceptions of how much other students knew about them. The small, non-representative sample of Lebanese students preclude the ability to generalize the results, but it does present a small picture of student perspectives. Most applicable to this dissertation, students attributed their lack of knowledge of others to the failure of the schools to promote mutual understanding.

Similarly, Shuayb (2012) explores the role of education in promoting social cohesion in Lebanon. She engaged in semi-structured interviews with 26 principals and 62 teachers of civic education, social studies, history and religion in ten public schools and 14 private schools across Lebanon's eight provinces. The interviews covered topics such as school philosophies, priorities, aims and values, management structures, pedagogies, school environment and extra-curricular activities, and school-community relationships. The data from the interviews was analyzed to identify different approaches to social cohesion in Lebanese schools. In addition, Shuayb administered a questionnaire to 900 grade 11 students using the framework of the CivEd survey focusing on students' civic knowledge, values, attitude, and skills. The responses from the student questionnaires were used to help verify the data collected from the qualitative interviews.

In spite of certain limitations, what is informative in Shuayb's discussion is that only three of the 24 schools surveyed considered cross-sectarian social cohesion as a goal of the educational institution. Particularly interesting was the perception that avoidance of controversial topics was the official approach of the Ministry of Education. In one area of Lebanon, public schools were physically divided based on sectarian affiliation in order to create homogenous environments. Teachers also reported being asked to avoid discussions that might lead to conflict. Within the nine schools adopting what Shuayb characterized as the passive approach, the two main priorities were completing the curriculum and achieving a high success rate in the official exams (Shuayb, 2012). A weakness in Shuayb's study is that she does not provide detailed statistics across the discussion or a clear rationale for the labels she utilizes. The study also attempts to cover a broad range of topics and, from these discussions, create clear bounded-set descriptions of what is happening in Lebanese schools.

The data from student questionnaires was used to compare student responses from schools using the labels constructed by Shuayb. The presentation of the data makes it difficult to get a more general picture of student perceptions of sectarianism. Even so, a few useful patterns emerge. A high percentage of students, ranging from 53% to 78%, stated that they trusted people from their sect. In contrast, a low percentage of students, ranging from 27% to 42%, claimed to trust people from other religions. In addition, a high percentage of students, ranging from 40% to 83%, agreed that opinions of religious leaders should be considered as most important when deciding on crucial state matters. Shuayb concludes that the prevailing school environments in Lebanon “hinder students’ ability to develop critical thinking skills which can help them challenge some of the prejudices inherited from their social and religious background” (Shuayb, 2012, p. 152). More specifically, she presents a portrait of school environments in Lebanon that are characterized by the avoidance of controversy and a failure or fear of promoting engagement with diverse worldviews.

Shuayb’s conclusions are supported by research on the complex relationship between ethnoreligious identity and the fear of discussion of what are seen as sensitive topics. Ommering (2011) examined the relationship between education and violent conflict using an ethnographic, child-centered research approach among elementary schools in Lebanon. Whereas elementary students naturally incorporated discussion of sectarian conflict in their peer interactions after the 2006 Lebanese war, school administrators adopted strict policies forbidding the discussion of politics and religion in school. Students demonstrated a willingness to engage in discussion of conflict and identity, but educators generally resorted to banning such discussions. The rationales given by school leaders were centered on the importance of defusing tension and preventing conflict. As one principal stated “talking about problems is the ultimate way to reach agreement.

At this time, however, talking only results in conflict. It is simply too early to start thinking about that. Divisions are at their max right now. And we don't need another war!" (p. 551).

Nagle (2015) analyzes secondary interview data from leading representatives of Lebanese political parties and non-sectarian civil society movements to explore the relationship between ethnic identity, politics, and views of political reform. One point Nagle draws out is how "any attempt to introduce legislative change, no matter how minimal or incremental, designed to weaken political sectarianism is framed, tout court, by some political elites as an issue that threatens security" (p. 15). In addition, in al-Habbal's (2011) discussion of the failures of the post-Taif reforms, she presents research on educational policy decisions and religious-based personal status laws that demonstrate how sectarian leaders use political and educational systems to preserve their own power and interests. Al-Habbal contends that the sectarian educational and judicial systems do not allow a space for discussing what may be perceived as sensitive or threatening issues.

Similarly, Mattar (2012) presents a cross-sectional study of 10 Lebanese public schools, five high-achieving and five low-achieving, in order to address the question of which factors affect the level of performance in Lebanese public schools. Mattar chose the schools based on Lebanon's Centre of Education for Research and Development (CERD) school ratings which utilize criteria such as percentage of student successes in official examinations over the past five years and the quality of teachers. The research consisted of semi-structured interviews with two teachers from each school as well as informal discussions with each of the school principals. The research was based on a convenience sample of teachers who expressed a willingness to participate. As a result, the feedback of the interviewees cannot claim to represent prevailing views of teachers in public schools across Lebanon.

For the purpose of this dissertation, a few relevant observations can be drawn from Mattar's research. She discusses the fear that teachers expressed that participation in research would threaten their jobs, lives, or reputations. This observation is supported by the research of Karami-Akkary (2014) indicating a belief among teachers in the Arab context that "taking initiative and bringing new ideas is too risky as it might upset people in critical positions and trigger retaliations" (p. 184). Mattar also highlights how politicians place pressure on schools to appoint certain teachers, irrespective of whether or not these teachers are qualified for the post, another indication of the role of political sectarianism in Lebanese education. This aligns with Joseph's (1997) study of the way that Lebanese have transported the structures of patriarchal kinship into public institutions whereby political leaders employ kinship to privilege their relatives and kin expect special resources and services from relatives in positions of power. Finally, Mattar presents a hierarchical, authoritarian structure of school leadership that is consistent across high-achieving and low-achieving schools. This aligns with the conclusions of Bashur (2005) and Jurdak and El-Amine (2005) that the structure of schools in the Arab world are generally characterized by a hierarchy where teachers are expected to be "mere executors and uncritical followers" (Karami Akkary, 2014, p. 187).

A final set of characteristics in the Lebanese educational context that are relevant to the discussion of critical thinking are the cultural concepts of collectivism, shame, and authority. The individualism-collectivism spectrum is a construct that has been utilized in a range of disciplines (Buda & Elsayed-Elkhoully, 1998; Charters, Shweder, Minow, Markus, & Bledsoe, 2004; Fessler, 2004; Ha & Tangney, 1995; Hofstede, 1997; Ibrahim & Howe, 2011; S. Khalaf & R. Khalaf, 2009; McCabe, Feghali, & Abdallah, 2008; Nisbett & Norenzayan, 2002; Tian & Low, 2011). The construct consists of cultural orientations that represent patterns of shared attitudes,

values, and beliefs (Hofstede, 1997; Triandis, Mccusker, & Hui, 1990). In general terms, individualism is characterized by the subordination of the goals of the group or collective to those of the individual. In contrast, collectivism involves the subordination of individual goals to those of the group (Ayyash-Abdo, 2001). Hofstede (1997) argues that individualists think in terms of “I” and perceive themselves as separate from their social group whereas collectivists think in terms of “We” and are “integrated into strong, cohesive in-groups, which throughout people’s lifetimes continue to protect them in exchange for unquestioning loyalty” (p. 76). Arab societies have generally been described as collectivist (Ali, Krishnan, & Camp, 2006; Buda & Elsayed-Elkhouly, 1998; Hofstede, 1997; Ibrahim & Howe, 2011; S. Khalaf & R. Khalaf, 2009; McCabe et al., 2008; Wikan, 1984). In her anthropological research, Joseph (1993) traces the social connectivity of the collectivist Lebanese society which is characterized by “the primacy of the family over the person....the sense of responsibility for and to others, (and) the experience of one’s self as an extension of others and others as an extension of one’s self” (p. 479). The collective-individualist paradigm mirrors that of the interdependent-independent categories outlined in the Social Orientation Hypothesis.

Ayyash-Abdo (2001) is interested in the correlation between an individualistic-collectivistic orientation and language, gender, and religious affiliation in the Lebanese student population. She used the Twenty Statement Test, Traidis’ attitude items, and Schwartz’s 56 values items, instruments designed to identify collectivistic-individualist orientations, to survey 517 students across five Lebanese universities. The data revealed that 67.3% of the population could be categorized as collectivistic as opposed to 27.9% individualistic. Within the group of those who scores as collectivists, 48% responded in Arabic whereas in the individualist population, 47.2% used English and 42.4% answered in French. Ayyash-Abdo points out that her

data corroborate findings in other research that indicate that countries that use a language which allows pronouns to be dropped show a lower level of individualism. Unfortunately, the data are potentially skewed since the researcher included 51 students from non-Lebanese backgrounds, the majority of her participants were females (380 to 137) and all the participants were studying psychology. In spite of the limitations of the study, the research places Lebanon in the category of a collectivist society and raises the question of how language impacts cultural identity. In comparing Lebanese and US students, McCabe, Fenghali, and Abdallah (2008) also use the individual-collective paradigm to explain the differences in perspectives on academic dishonesty. Their research discovered collectivist behavior among Lebanese students where students perceive cheating using a collectivist lens of working together to navigate a difficult task. Ayyash-Abdo and McCabe, Fenghali, and Abdallah highlight the collective nature of the Lebanese educational environment.

A second important concept for understanding the Lebanese context is that of shame. Anthropological, psychological, and cognitive-science researchers debate how best to articulate the meaning of shame (Fessler, 2004; Gilbert, 1998; Greenwald & Harder, 1998; Shweder, 2003). Shame is considered a moral emotion (Tangney, 1991; Tangney, Stuewig, & Mashek, 2007) that involves the complex dynamic between emotions, cognition, behavior, and interpersonal relationships (Gilbert, 1998). In simple terms it is “the deeply felt and highly motivating experience of the fear of being judged defective” (Shweder, 2003, p. 1115). Wong and Tsai (2007) trace differences in the experience of shame in individualistic and collectivist cultures. Whereas in individualist cultures shame is related to how one feels about oneself, in collectivist cultures shame is a group experience. Collectivist shame is the emotional response to how an individual action impacts an extensive network of connected relationships (Camras &

Fatani, 2004). Thus, the social consequences for shameful behavior are greater in a collectivist society.

Herrera (2010) presents school-based, ethnographical research from Egypt to draw a broader picture of an Arab educational environment that promotes the use of shame as the predominant pedagogical practice used to maintain control and ensure high academic performance. Shaming is used to encourage conformity and to communicate that an academic or behavioral misstep dishonors the family and community. Similarly, Wikan (1984) describes how all actions are viewed through the lens of shame among the poor in the backstreets of Cairo. People are primarily concerned with what others will say and how their actions will be evaluated and judged. “Mediterranean people do not, in their daily lives, speak of their own and each other’s honour. But they do speak of shame” (p. 638). The result is that “no one has any freedom of action” (p. 636). Building on her research from the school-based reform program Tammam, Karami-Akkary (2014) echoes this point in her discussion of Arab pride, the flip-side of shame. She writes “an intense sense of pride among the people of the Arab world causes discomfort when it comes to acknowledging mistakes, and becomes a barrier to any attempt at evidence-driven evaluation, self-reflection, and critical thinking. Maintaining good relationships with others and protecting personal feelings take precedence over seeking evidence/data as the basis for constructive criticism and action towards the achievement of goals” (p. 187).

Similarly, the Lebanese educational context is built on authoritarianism. As mentioned above, schools in the Arab world are characterized by a steep hierarchy (Jurdak & El-Amine, 2005) where decision are made in a top-down manner. The school setting reflects the larger societal culture of patriarchal kinship. Patriarchy in the Lebanese Arab context refers to “the dominance of males over females and elders over juniors (males and females) and the

mobilization of kinship structures, morality, and idioms to institutionalize and legitimate these forms of powers” (Joseph, 1993, p. 460). Top-down, male-centered patriarchy is enmeshed in Lebanon’s state institutions, ideologies, and processes. “Given the weakness of the state, Lebanese citizens have experienced kin as the anchor of their security, acting as the central metaphor for social relationships” (Joseph, 1997, p. 79). Elders, both male and female, are accorded a respected place in the social hierarchy where the patriarch speaks for the collective whole and “conflates his will with the will of the family” (p. 461). Authority and shame are interrelated in patriarchal systems where it is perceived as shameful to question a person in authority. In the shame-based Chinese educational system, Li and Wegerif (2014) discuss how Chinese students often fail to ask challenging questions because of their desire to avoid shaming a person in authority.

Research regarding the history of Lebanese education and the current educational context raise important questions that potentially impact the assessment and identification of patterns of critical thinking. Lebanon’s educational and political history is characterized by instability and the reinforcement of sectarian identity with schools largely divided along sectarian lines. The privatized and ethnoreligious nature of schooling reinforces sectarian agendas. Religious communities, not the state, provide for the needs of Lebanese sectarian groups in a patron-client relationship. Religious communities wield significant power over educational policy and curriculum choices and have resisted national initiatives aimed at promoting pluralism and social cohesion. Teachers are often asked to avoid controversial topics, lack training, and fear the consequences of presenting new ideas or taking initiative. The threat of conflict, perceived or real, is used by those in power to maintain the status quo. Polemical and rhetorical discourse is utilized to reinforce communal identity; often at the expense of thoughtful reflection. The

prevailing educational atmosphere is characterized by fear, a lack of trust, conflict avoidance, and protectionism. In addition, the perceived consequences of failure embedded in Lebanon's collectivist, shame-oriented, and authority-based culture, are prominent considerations that influence choice.

Factors such as those articulated above create an environment where approaches typically associated with critical thinking such as withholding judgment, gathering multiple points of view, etc., become high-stakes or threatening activities. The freedom to explore alternative points of view concerning taboo topics may be seen as threatening to social position. In this context, it can be expected that it would be difficult to promote the exploration of divergent solutions, the constructive use of failure as a means to improve, and an educational spirit of exploration and knowledge construction; all values of the critical thinking movement. It may be that students will be more concerned with choosing what is perceived as the right answer (understood as the answer which aligns with a particular sectarian ideology) than providing a well-reasoned and reflective argument. It may also be that Lebanese students prove proficient in what Paul labels weak-sense critical thinking and deficient in strong-sense critical thinking. They may be able to use evidence to support and defend already existing beliefs, but unable to critically reflect on their own assumptions and consider alternative points of view.

Conclusion

The prevailing definitions of critical thinking emphasize the role of critical thinking in determining what to believe and do (Ennis, 2016). As seen in this review, there is an on-going debate over objectivist and subjectivist conceptualizations of critical thinking. At the heart of this debate is a disagreement over the purpose of critical thinking, the nature of the standards used for evaluating evidence and making judgements, and whether critical thinking epistemologies are

domain-specific and socially located or extend across intellectual domains and cultures. Studies on the relationship between culture, language, and thinking support the contention that different patterns of reasoning exist. As a result, critical thinking scholars must address the broader question of how the goals of critical thinking instruction interact with the norms and values of divergent cultural contexts. In particular, they must address whether or not seeking to transform culturally specific patterns of reasoning through critical thinking instruction is justified.

In addition, a number of critical thinking tests have been designed to evaluate specific critical thinking skills and dispositions. The scope of the validity and reliability of these assessments remains unclear. Questions have been raised about the effectiveness of these tests such as whether selection response tests are able to provide an accurate picture of critical thinking reasoning processes; whether the critical thinking skills these tests measure are transferable; and, whether these tests require specific background knowledge or test for alignment with the extra-critical-thinking assumptions of the test makers.

Finally, if the ability to question beliefs or take alternative actions is significantly shaped by a particular cultural context, it raises the question of whether or how contemporary conceptualizations of critical thinking can be successfully developed in a country like Lebanon. It also raises the question of whether the concept of critical thinking needs to be altogether re-conceptualized and re-aligned with the thinking processes used in the context in which it is embedded or whether critical thinking should be promoted as a specifically Western educational ideal.

CHAPTER THREE

Methodology

The purpose of this study is to examine the role of culture, context, and language in the critical thinking processes of bilingual Lebanese students. Someren, Barnard, & Sandberg (1994) state that “in order to define an experiment to obtain data about a cognitive process you need to define, beside the cognitive process, the following set of elements: a set of problems, a verbalization procedure and subjects” (p. 170). This chapter describes the methods that were utilized to answer the following questions.

1. What reasoning processes do Lebanese undergraduate students utilize to frame, interpret, and answer critical thinking questions from the Cornell Critical Thinking Test Level Z designed to measure skills of *deduction, induction, observation and credibility of sources, assumption identification, and meaning*?
2. How do undergraduate Lebanese students frame and self-report on critical thinking questions from Insight Assessment’s Sample Reasoning Mindset Test designed to assess dispositions of *inquisitiveness, open-mindedness, truth-seeking, critical thinking self-confidence, and maturity*?
3. Do undergraduate Lebanese students employ culturally-specific reasoning processes in responding to questions on the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test?
4. Do bilingual students use comparable reasoning processes in answering equivalent questions in Arabic and English from the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test?

The chapter begins with a description of how and why think-aloud protocols (TAPs) have been utilized to collect data on cognitive processes. It then addresses the rationale for selecting participants and describes the instrumentation and procedures that were used to collect and analyze data. It concludes with a discussion of the steps that were taken to ensure a high ethical standard throughout the research process.

Research Design

Think-aloud protocol analysis (TAP) has been used in a variety of domains to explore human cognitive processes (Ericsson & Simon, 1998; Nisbett, & Wilson, 1977; Johnstone et al., 2006; Nielsen, Clemmensen, & Yssing, 2002; Norris, 1990; Someren, Barnard, & Sandberg, 1994). Nisbett and Wilson (1977) demonstrated that when humans were asked to describe post hoc their thinking about a problem, that the activity of retrospection did not always result in an accurate description of what actually occurred. TAP's goal is to capture the immediate, natural occurring thinking processes that are used in reasoning while avoiding confounding variables such as confirmation bias, choice-supportive bias, consistency bias, social desirability bias, and egocentric bias. In retrospection, information is retrieved from long-term memory whereas TAP focuses on information that appears in working memory during problem analysis. As such, TAPs aim to present a clear picture of how participants think during a specific activity. TAPs treat recorded verbal processes as objective data. The method is generally used to "obtain a model of the cognitive processes that take place during problem solving or to test the validity of a model that is derived from a psychological theory" (Someren et al., 1994, p. 8). Ericsson and Simon (1992) argue that think-aloud protocols are a valid method for the research of cognitive processes as long as data are carefully collected and interpreted properly. Someren et al. (1994) contend

that TAP is “one of the few techniques that give direct data about the reasoning processes” (p. 11).

The collection and recording of students’ thought processes provides a rich source of data for comparing thinking across different groups and languages. For example, Ercikan, Simon, and Oliveri (2010) used the TAP to examine and confirm sources of differential item functioning for test items in different languages. The use of a TAP uncovered that “for nine out of 20 DIF items, student verbalizations did not provide supporting evidence for the differences identified by the bilingual experts as being the sources of DIF” (p. 32). Ercikan and her colleagues concluded that TAPs provide vital data missed by expert reviewers about how linguistic differences impact student cognitive processes and performances in multilingual assessments. Similarly, Someren et al. (1994) state that TAPs are an effective means of demonstrating global differences between two groups of subjects solving a certain type of problem. Baxter and Glaser (1998) consider the use of TAPs critical for the empirically testing of cognitive processes, constructs, and validity.

In TAPs, participants are asked to verbally articulate whatever thoughts come to mind while engaged in a specific task (Gass & Mackey, 2016). TAPs avoid external interruptions, suggestive prompts, and questions. The only acceptable interjection in a TAP is to remind a participant to continue talking out loud in the event that he or she forgets to verbally process. Participants are also asked to refrain from interpreting or explaining why they are thinking in a particular way. The recommended procedures for collecting think-aloud data include providing clear instructions, pre-task training, and practice (Barkhuizen & Ellis, 2005). Because the challenge of thinking aloud may result in incoherent or incomplete utterances, researchers often use a post-protocol interview to collect supplemental information to help interpret and

understand the verbal data (Branch, 2000; Johnstone et al., 2006). Structuring the data is the work of the researcher responsible for analyzing the protocol.

One question that has been raised about TAPs is whether the task of thinking aloud changes the cognitive process. Norris (1990) presents research to support the claim that verbal processing does not impact reasoning or test scores. In a study of 343 tenth, eleventh, and twelfth grade students he concluded that “the elicitation of verbal reports of thinking did not alter subjects' performance and, by inference, did not alter their thinking; and the different procedures for eliciting verbal reports yielded essentially the same information of the quality of subjects' think” (p. 47). Ericsson and Simon (1998) present similar research to support the idea that thinking aloud does not systemically or significantly impact the outcome or process of thinking.

In spite of the advantages of using TAPs, think-aloud protocols have a number of limitations. According to Ericsson and Simon (1998), there are significant differences in the ease with which people verbalize their thoughts. Although training and post-protocol interviews can help reduce these differences, the impact of this variable cannot be altogether eliminated. As mentioned above, the TAP method may also result in incomplete or incoherent cognitive data. “A cognitive process takes longer when the think-aloud method is used. This means that people are able to slow down the normal process to synchronize it with verbalization. However, subjects frequently report that sometimes verbalization does not keep up with the cognitive process and their report is incomplete. This is consistent with the observation that occasionally protocols contain ‘holes’ of which it is almost necessary to assume that an intermediate thought occurred here” (Somerén et al., 1994, p. 33). The use of a post-protocol interview is intended to help mitigate this limitation. In addition, Leighton (2004; 2017) highlights the importance of using appropriately leveled material in TAPs in order to collect meaningful data. She discusses studies

that indicate that overly simple items are processed immediately without a detailed cognitive process whereas items that are too difficult create a cognitive load that overload the capacity limits of human working memory with the additional demand for verbal processing. It is important to state that TAPs capture the contents of working memory and do not claim to represent the entire cognitive process. These limitations require that an effective TAP makes sure that the level of difficulty of the task is appropriately matched to the sample population and that the instrument used in a TAP is designed to assess particular cognitive processes. It also necessitates the use of proper training for participants and a clear data-collecting strategy.

Critical thinking is by definition a process-oriented activity. One weakness of selection response critical thinking assessments is that these tests are designed to measure the product of reasoning instead of the processes of reasoning (Norris, 1989). In addition, Norris (1988) argues that such tests “cannot be used to distinguish variance in scores due to differences in those background beliefs of examinees which are not part of ability to think critically from variance due to differences in critical thinking ability” (p. 2). The goal of the TAP in this study is to collect data on the direct critical thinking processes employed by Lebanese undergraduate students as they solve appropriately leveled critical thinking questions in Arabic and English.

Sampling and Participants

The think-aloud protocol is a labor-intensive methodology that yields a large response data set (Johnstone et al., 2006). As a result, the sample size used in TAP research is small and purposeful. Nielsen (1994) suggests that a sample size of 5 participants is sufficient for most TAP research. Leighton (2017) contends that the labor-intensive nature of TAP research is not a valid justification for small samples sizes. Instead, she argues that sample sizes must be appropriately aligned with project goals. Leighton presents research to suggest that sample sizes

should range from between 15-50 participants. In qualitative TAP research, participants are generally chosen to represent demographics relevant to a particular set of research questions (Johnstone et al., 2006). The participants in this study were chosen using a purposive sample of 24 students going into their junior or senior years at a Lebanese university. The university was selected because it consists of a student body with a diverse ethnoreligious background and has a price point that represents a middle-class socio-economic status. It has 35 undergraduate programs and 8 graduate programs with a total enrollment of approximately 700 students. Anecdotally, the university is considered a second-tier academic university in Lebanon and has less rigorous academic programs than first-tier universities. It is unranked locally and internationally and has faculty who are actively engaged in critical thinking research.

The purposive sample of students was selected using the following criteria. The Cornell Critical Thinking Test Level Z has been designed for undergraduate, graduate, and adult level students. As such, students going into their junior or senior year were recruited to participate in the study in an effort to match the test level with student proficiencies. It aimed to include an equal number of male and female students. The sample also consists of a similar number of participants from Sunni, Shiite, Arminian Orthodox, and either Maronite or Druze ethnoreligious backgrounds.

The purpose of selecting students from different ethnoreligious backgrounds and genders was to create a student sample that generally reflects Lebanon's diverse population. Participants indicated that they had a college-level proficiency in Arabic and English. Since the university is an English-language university it was assumed that students had demonstrated proficiency in English by their junior year. Arabic-language proficiency was determined by student self-reports of their language abilities.

Table 1

Demographics of Student Population at Research Project University – Spring 2017

Demographic	Count	Percentage
Gender		
Male	204	37
Female	350	63
Ethnoreligious Background		
Armenian	236	43
Non-Armenian	318	57
Senior Student Population	174	100
Gender		
Male	50	29
Female	124	71
Ethnoreligious Background		
Armenian	79	45
Non-Armenian	95	55
Junior Student Population	139	100
Gender		
Male	49	35
Female	90	65
Ethnoreligious Background		
Armenian	66	47
Non-Armenian	73	53
Total Undergraduate	554	100

**The university only records sectarian background in terms of Armenian and non-Armenian.*

Table 2
Demographic Characteristics of Participants (N=24)

Demographic characteristic	Count of sample	Percent of sample
Grade		
Seniors	14	58
Juniors	10	42
Gender		
Females	17	71
Males	7	29
Ethnoreligious Background		
Sunni	8	33
Shiite	9	38
Druze	3	13
Armenian Orthodox	1	4
Greek Orthodox	1	4
Armenian Catholic	1	4
Maronite	1	4
Major		
Psychology	4	17
Bus Admin	7	29
Biology	2	8
Education	5	21
Social Work	2	8
Nutrition Science	2	8
English Language	1	4
Computer Science	1	4
Education in Lebanon		
All education in Lebanon	21	88
Grades 9-12 in Lebanon	2	8
Grades 2-3, 5-12 in Lebanon	1	4
Previously taken a CT Class		
Yes	9	38
No	15	63
Total	24	100

Instrumentation and Administration

The two instruments that were used in this study are the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test. The Cornell Critical Thinking Test Level Z (CCTT) is a selection response test that evaluates critical thinking skills related to *deduction*, *induction*, *observation and credibility of sources*, *assumption identification*, and *meaning*. The

Level Z test is specifically designed for advanced and gifted high school students, college students, graduate students, and other adults. The CCTT manual presents reliability estimates ranging from .49-.87 based on studies that used the Kuder-Richardson and Spearman-Brown methods. It also states that the Kuder-Richardson is not a justified way to evaluate the CCTT's internal consistency because of the heterogeneous nature of critical thinking. As articulated in the literature review, the CCTT manual provides evidence to support the context-dependent construct validity of the Level Z test and its use as a basis for assessing critical thinking ability.

The CCTT Level Z consists of 52 selection-response items designed to be finished in 50 minutes. It is divided into seven sections. The first two sections present a series of debates between two participants. Section one includes ten questions that test *deduction* where student must determine whether particular conclusions follow necessarily from the statements given, contradicts the statements given, or neither follow necessarily or contradict the statements. Section two consists of eleven questions that test *verbal and linguistic aspects of argument* where students are asked to pick the best reason why some of the thinking presented is faulty. Sections three, four, and five require students to reflect on an experiment. Four questions test *observations* and the ability to evaluate the *credibility of sources* by asking students to determine which of three statements is most believable. Eight questions evaluate *induction in hypothesis testing* by asking if the information presented supports, goes against, or is neutral to the conclusion. Four questions examine induction by asking students to make predictions in planning an experiment. The final two sections address definition and *assumption identification*. Eight questions have been designed to test the criterion a student uses to fill a gap in reasoning.

The CCTT attempts to account for the impact of different auxiliary assumptions on induction decisions by adopting a score of 85% agreement to indicate mastery of the skill.

Individual items were chosen through a collaborative process by members of the Illinois Critical Thinking Project. The test does not claim to represent a real or imaginary sampling of a universe of test items and a detailed discussion of each answer is included (Millman, Tomko, & Ennis, 2005). The CCTT is an English language assessment. The Critical Thinking Co. granted permission to the researcher to translate or use a translation of the test in Arabic. An Arabic version of the CCTT Level Z produced by the Debono Center for Teaching Thinking in Amman, Jordan was located and the center granted the researcher the rights to use this translation for the study. See Appendix B for stipulated agreements. See Appendix C and D for CCTT Level Z items in English and Arabic.

The Sample Reasoning Mindset Test is free application available in English and Arabic that has been developed by Insight Assessment to measure critical thinking dispositions. It consists of 24 questions designed to measure self-reported perceptions towards *truth-seeking*, *open-mindedness*, *analyticity*, *systematicity*, *critical thinking self-confidence*, *inquisitiveness*, and *maturity*. The items in the Sample Reasoning Mindset Test have not been psychometrically tested. Thus, the Sample Reasoning Mindset Test does not claim to be a reliable or valid instrument. The sample items are intended to provide an idea of what type of questions can be asked to evaluate critical thinking dispositions. See Appendix E and F for the Sample Reasoning Mindset items in English and Arabic.

The length of the two tests, the amount of verbal data that would need to be collected, and the potential for cognitive and psychological fatigue for participants if asked to verbally process 76 questions, led the researcher to choose specific questions from each section of the CCTT Level Z and the Sample Reasoning Mindset Test to be used in the TAP. Five out of 10 questions were used from the CCTT Level Z Section 1; 5 out of 11 questions from Section 2; 2

out of 4 questions from Section 3; 5 out of 13 questions from Section 4; 2 out of 4 from Section 5; 2 out of 4 from Section 6; and 3 out of 6 from Section 7. In addition, 10 out of 24 questions were selected from the Sample Reasoning Mindset Test. In sum, participants were asked to verbally articulate their cognitive processes for 34 out of 76 questions. The researcher chose specific questions for the TAP based on three criteria, (1) his personal judgement as to which of the item pool of questions would best achieve the goals of the project, (2) a desire to comparably represent each section of the CCTT, and (3) the decision to target the five critical thinking dispositions of *inquisitiveness*, *open-mindedness*, *truth-seeking*, *critical thinking self-confidence*, and *maturity*. The content of the questions was not altered for the purpose of the study.

The procedures for this project's TAP methodology are well-informed by Someren et al.'s (1994) work on modeling cognitive processes. Participants were recruited through an email that generally explained the project and a survey to determine whether students who responded met the project criteria. Students that indicated an interest in the project and met the project criteria were subsequently contacted. At this point, the researcher explained the details of the project with potential participants either verbally or through a follow-up email. Participants were divided into two procedural groups based on the test language. A similar number of ethnoreligious backgrounds and genders were represented within these procedural groups. An incentive of a \$10 gift card was offered to encourage student participation. Participants from group A took the TAP in Arabic. Participants in group B completed the TAP in English.

Participants were contacted through a recruitment email and in-class presentations about the project. The researcher invited participants to meet him at a specified location on campus. Given that TAPs require high-level cognitive functioning to be applied in the verbal protocol and on the test items, a quiet place was selected so that the participant would not be easily distracted.

The researcher administered the IRB-approval consent form and asked the participant to take his or her time in reviewing the forms together with the researcher. The researcher explicitly went over each IRB item in detail and reassured the participant that only cognitive problem-solving processes and reasoning mindset dispositions were under investigation; i.e., neither the problem solution, nor non-cognitive domains (such as affect) would be critiqued. After the IRB consent form was signed, the researcher:

1. Provided a brief description of the CCTT Level Z and Insight Assessment Sample Reasoning Mindset Test and test-items.
2. Provided a brief description of the TAP methodology as well as a simple example of the TAP process.
3. Explained that if the participant began to mutter under his breath or exhibit non think-aloud behaviors to problem solving or verbalizes in a language different than the test language, he would be prompted to “speak louder” or “think aloud” or “keep talking” or “speak in English” or “speak in Arabic.”
4. Described the order of the TAP which was divided into eight sections. In each section the participant was asked to think aloud on selected items from the CCTT Level Z or Sample Reasoning Mindset test and then was asked to complete the rest of the questions in the section non-verbally.
5. Explained that the participant would be offered a break between each section of the test, that snacks and juice would be available during breaks, and that the total test time would not exceed 120 minutes.
6. Explained that at the end of the TAP a post-protocol interview may be conducted to gather information to help understand and interpret TAP data.

If no further questions, hesitation, or refusal to sign the consent form were expressed, the TAP study began and the researcher turned on the video and tape recorders. The researcher double-checked that the recorders were working intermittently throughout the procedure, but also took hand-written notes during the session.

7. Once the TAP session and post-protocol interviews were completed, the research thanked the participant and turned off the recorder. At this point, the student was given a \$10 gift card and no further TAP study questions were discussed.

Analytical Procedures

The English-language TAP files were transcribed by the researcher. The Arabic-language TAP files were transcribed by a professional translator and then reviewed in detail by the researcher. After transcription, the raw data was divided into segments using boundary phrases or pauses as markers (Ericsson & Simon, 1992). Segments were coded as statements of *interpretation, analysis, evaluation, inference, or self-regulation* based on the descriptions outlined in the APA Delphi consensus definition of critical thinking (Facione, 1990). One additional category was included in the coding scheme; a category for *personal opinion*. Statements which were not directly related to critical thinking processes such as personal comments ('I am thirsty'), non-task related comments ('I need to talk to my mother after this'), evaluation of the protocol ('It is tiring to talk so much'), silent periods, actions (for example, writing a note), etc., were not coded. (Somerén et al., 1994).

A process analysis of the content data was conducted after transcribing and coding participant verbalizations. English-language responses from each coding category and each stage of the protocol were compared looking for evidence of ways that participants consistently framed critical thinking questions; consistently used divergent, potentially culturally specific, patterns of

reasoning; and consistently provided similar types of responses or justifications to questions designed to identify critical thinking dispositions. Arabic-language responses were transcribed, coded, and compared using the same criteria. Once this process was completed in each language, a cross-linguistic comparison was made to see if participants used comparable reasoning processes and patterns of justification in answering equivalent questions in Arabic and English. Finally, the verbal data collected from each participant was compared to his or her overall score on the CCTT Level Z to evaluate whether the verbal data generally reflected the overall reasoning processes used throughout the test. In addition, overall scores from the English and Arabic versions of the CCTT Level Z were examined to see if the overall scores were comparable.

The researcher used the process analysis data to identify thematic patterns in the critical thinking processes of Lebanese students. There are a number of patterns that the researcher anticipated would emerge. The researcher anticipated that questions would be consistently framed in moral, religious, or collectivist terms. The researcher predicted that for select items there might be a consistent pattern where the assumptions, inferences, and justification used by students would lead to the same wrong answer. The researcher expected to see evidence of shame-based and possibly collectivist/sectarian influences in statements of *interpretation*, *analysis*, *evaluation*, *inference*, *explanation*, and *self-regulation*. In general, the researcher expected negative responses to questions designed to measure dispositions of *truth-seeking*, *open-mindedness*, and *maturity*. The researcher hypothesized that differences would emerge in Arabic and English reasoning patterns.

Research Ethics

To ensure the protection of the participants in this study and to comply with university policy and procedure, the researcher submitted the appropriate IRB form to the George Fox University IRB committee for review and approval prior to data collection. In addition, the appropriate form or forms were submitted to the participating university and IRB approval was granted before collecting data. Because the project required the collection of recorded audio and video data, the researcher took steps to ensure that student confidentiality and anonymity was protected. Audio data was collected using a dedicated device. Video data was stored on an SD card dedicated exclusively to data collection for the research project. Audio and video data were transferred and stored on a password protected external hard drive that is being kept in a locked safe on the researcher's premises for a period of three years after the completion of the study, at which time it will be securely deleted. The transcription of audio and video data has been stored on a password protected external hard drive that is being kept in a locked safe on the researcher's premises for a period of three years after the completion of the study, at which time it will be securely deleted. Signed informed consent forms have been collected and are being stored for 5 years in a locked safe on the researcher's premises for a period of five years after the completion of the study, at which time the forms will be shredded. Only demographic data relevant to the study was collected. Pseudonyms were assigned to participants and the transcription of verbal protocols. Scores from the CCTT Level Z and Sample Reasoning Mindset Test do not include student names or descriptions. After the collection of all data, all participant names were securely deleted.

Steps were taken to make sure that the project did not subject participants to physical, social, psychological, legal, or economic risks. The TAP protocol did not involve physical

activity. Social, legal, and economic risks were avoided through the steps outline above to protect the anonymity of the participants. Participants were assured that the researcher would not use, discuss, or benefit from the data gathered from the research without informed consent. Since the study required participants to intellectually and verbally perform on two critical thinking assessment instruments, it is possible that the TAP session could result in psychological stress. This psychological stress did not exceed anything greater than the stress typically induced by a classroom test of subject-matter knowledge. To help reduce potential stress, the researcher verbally explained the measures that would be taken to safeguard student anonymity. In addition, the researcher made it clear that individual participant performance would not be critiqued and that only cognitive problem-solving processes and reasoning mindset dispositions were under investigation. In addition, participants were informed that their participation was voluntary and that they were free to stop at any time without coercion to continue or risk of penalty. Participants were also allowed to complete the TAP at their own pace within the time limit of 120 minutes and were offered a break with snacks and juice at the end of each test section. Given that TAPs require high-level cognitive functioning to be applied in the verbal protocol and on the test items, a quiet place with comfortable conditions was selected for the administration of the protocol to ensure that the participants were at ease.

The researcher is not aware of any potential conflicts-of-interests related to this project. Even so, the researcher does have an interest in seeking employment at a university in Lebanon in the future and may apply for a position at the participating university. The topics and questions for this study have arisen out of the researcher's experience of living cross-culturally in Lebanon for 16 years. This experience includes his learning of Arabic, his marriage to a Lebanese national, six years of teaching cross-culturally, and his children's participation in

Lebanese schools. As such, the researcher has a vested interest in the development of critical thinking in the Lebanese context.

A non-exclusive license agreement was entered into with The Critical Thinking Co. for the use of the Cornell Critical Thinking Test Level X and Z granting the researcher the right to (1) translate the material into Arabic, (2) administer 40 tests maximum via paper and pencil form or via a test distribution and management system such as Qualtrics, (3) reformat, or use a portion thereof, or modify the Material for use in the Licensee's version of the hardcopy or digital test, (4) publish the test results of the Material for use with a thesis and subsequent articles and/or papers. Permission to use the Arabic translation of the Cornell Critical Thinking Tests Level X and Z was obtained from the Debono Center for Teaching Thinking. The Sample Reasoning Mindset Test is a free application and Insight Assessment confirmed that no proprietary rights are required to use these questions as long as the application is cited (see Appendix B for stipulated agreements).

CHAPTER FOUR

Results

The purpose of this study was to examine the reasoning processes used by bilingual Lebanese undergraduate students on assessments designed to evaluate critical thinking skills and dispositions. Using data collected through a Think-Aloud Protocol, I performed a qualitative analysis of participant verbal responses on 24 of 52 questions from the Cornell Critical Thinking Test (CCTT) designed to test skills in *deduction, induction, observation and credibility of sources, assumption identification, and meaning*. I examined verbal data from participant responses to 10 questions from the Sample Reasoning Mindset Test (SRMT) designed to assess dispositions toward *inquisitiveness, open-mindedness, truth-seeking, critical thinking self-confidence, and maturity*. The three main objectives of the analyses were to identify specific reasoning processes employed by bilingual Lebanese undergraduate participants, evaluate the extent to which patterns in the reasoning processes could be described as culturally specific, and to analyze whether participants used comparable reasoning processes in answering equivalent questions in Arabic and English. Participant responses on the CCTT were coded using the consensus descriptions of the core critical thinking skills and sub-skills of *interpretation, analysis, evaluation, inference, explanation, and self-regulation* outlined in the APA Delphi Report (Facione, 1990a). Participant opinion was added to the coding key as an additional category. Responses on the SRMT were coded based on whether statements were framed in *moral terms, pragmatic terms, logical terms, religious terms, social/relational terms, or ideological terms*. Additional patterns that emerged in the verbal data were labelled and utilized as appropriate.

In addition to the qualitative analyses of verbal data, I ran a quantitative analysis of selection response choices on the CCTT and Likert-scale responses on the SRMT. Participant overall scores were compared to user norms presented in the CCTT manual. Independent t-tests were run to identify differences in test scores by the variables of language, gender, and grade level. One-way ANOVAs were run to examine differences in scores by ethnoreligious background and major. Independent t-tests and frequencies tables were used to compare Arabic and English responses on the section and item levels. Results from the quantitative operations were also used to help direct and enhance the qualitative analyses. All quantitative data were coded using the Critical Thinking and Culture Project Codebook in Appendix H.

This chapter begins with a description of the TAP data collection process, the demographics of the participant population, and selected results from the quantitative analyses. It will then present the section and item-level verbal data collected from the CCTT and SRMT. In addition, it will trace patterns of reasoning that emerged in the verbal data. It will conclude with a comparison of quantitative and qualitative results that examined participant responses to equivalent item-level questions in Arabic and English.

TAP Data collection process

Participants were recruited through the distribution of a mass email and an in-class presentation. The presentation was given to approximately 100 junior and senior students enrolled in six summer classes and one fall semester class. All together, 52 students completed the initial online recruitment survey. Twenty-four students who met the stipulated criteria agreed to participate in the study. These 24 students were divided into two similar groups based on gender, class, major, and ethnoreligious background. Group A was given the Arabic translation of the CCTT and SRMT and asked to think-aloud in Arabic (Lebanese dialect). Group B was

given the English version of the CCTT and SRMT and asked to think-aloud in English. Four of the 24 students agreed to participate in both an English and Arabic TAP session. A total of 28 TAP interviews were conducted between July 19-September 22, 2017. Participants were allowed to complete the CCTT and SRMT at their own pace. Sessions were recorded on audio and video for subsequent transcription and examination. The researcher attempted to minimize the impact of moderator presence by sitting out of sight of the participants although he was available to clarify questions and directions when asked. Moderator input was included in the transcription documents.

In total, participants provided verbal data on 34 out of 62 questions from the CCTT and SRMT. During the TAP sessions, there were occasional verbal gaps in the reasoning processes where it was evident that a non-verbalized, intermediate thought had occurred (Somerén et al., 1994). The difficulty of certain items appeared to limit the verbal processes of select participants. In addition, it was evident that it was easier for some participants to verbalize their thoughts than others (Ericsson & Simon, 1998). Given the length of the session, the number and difficulty level of questions, and that TAPs require high-level cognitive functioning to be applied in the verbal protocol, the decision was made to not conduct an extended post-protocol interview. After each session, participants were asked to give their general impressions of the experience and to share which section they found most difficult. The supplemental information collected in the post-protocol interviews was not useful for interpreting and clarifying the verbal data.

After the first TAP Arabic session, the wording of question 6 was changed from the Sample Reasoning Mindset Test. Participant one's response made it clear that the question did not communicate the same meaning as its English equivalent. After the third Arabic TAP session, I discovered an error in the translation of question 4 from the SRMT. As stated in

chapter 3, I did not do a back-translation of the SRMT based on Insight's claim that all of its products have been properly evaluated. As a result, participants 3, 4, and 5 did not have an accurate written translation of question 4. I clarified the meaning of question 4 for participants 4 and 5 upon their request.

The content of the two TAP practice problems taken from Leighton (2017) were problematic. The first question required students to name 10 items that they would find in a supermarket. A number of participants found this task difficult and commented that they do not regularly visit the supermarket. The second question asked students to name the sixth letter after the letter C in English and the sixth letter after the letter **ﺕ** in Arabic. Participants did not have difficulty with the English version of this question but only one of the 12 Arabic session participants was able to recite the order of the Arabic alphabet. A few of the participants commented that they do not learn the order of the Arabic alphabet as part of their education. Although the content of the practice questions was not contextually appropriate, the purpose of the practice problems, to give participants the opportunity to practice verbally articulating their thinking processes, was achieved.

Participant Demographics

The aim in this study was to recruit a purposive sample of upper-level undergraduate students that represent the broader Lebanese demographics. Of the 24 total participants, 58% were seniors and 42% were juniors. Seventy-one percent of the participants were female and 29% were male. Ethnoreligious backgrounds were represented as follows: 38% from a Shiite background, 33% from a Sunni background, 16% from a Christian background (Orthodox, Catholic, Maronite), and 13% from a Druze background. Students from eight different majors participated in the study. Twenty-one of the 24 participants (87.5%) received all of their

education in Lebanon with the remaining three (12.5%) receiving at least their grade 9-12 education in Lebanon. In comparison to country-wide demographics, the sample had a higher female to male ratio (“Lebanon Population 2018” n.d.), a lower percentage of Christian background participants and a higher percentage of Muslim background participants (Salloukh, et al., 2015). In spite of these discrepancies, the participant demographics can be said to generally reflect the diversity of Lebanon’s population. Table 3 provides a summary of the demographic characteristics of participants.

Table 3
Demographic Characteristics of Participants (N=24)

Demographic characteristic	Count of sample	Percent of sample
Grade		
Seniors	14	58
Juniors	10	42
Gender		
Females	17	71
Males	7	29
Ethnoreligious Background		
Sunni	8	33
Shiite	9	38
Druze	3	13
Armenian Orthodox	1	4
Greek Orthodox	1	4
Armenian Catholic	1	4
Maronite	1	4
Major		
Psychology	4	17
Bus Admin	7	29
Biology	2	8
Education	5	21
Social Work	2	8
Nutrition Science	2	8
English Language	1	4
Computer Science	1	4
Education in Lebanon		
All education in Lebanon	21	88
Grades 9-12 in Lebanon	2	8
Grades 2-3, 5-12 in Lebanon	1	4
Previously taken a CT Class		
Yes	9	38
No	15	63
Total	24	100

Table 4 shows the distribution of participants in the Arabic-language procedural group A.

Table 4

Demographic Characteristics of Procedural Group A: TAP Arabic (N=12)

Demographic characteristic	Count of sample	Percent of sample
Grade		
Seniors	6	50
Juniors	6	50
Gender		
Females	9	75
Males	3	25
Ethnoreligious Background		
Sunni	4	33
Shiite	5	42
Druze	2	17
Armenian Orthodox	1	8
Major		
Psychology	3	25
Bus Admin	3	25
Biology	2	17
Education	2	17
Social Work	1	8
Nutrition Science	1	8
Education in Lebanon		
All education in Lebanon	11	92
Grades 9-12 in Lebanon	1	8
Previously taken a CT Class		
Yes	5	42
No	7	58
Total	12	100

Table 5 shows the distribution of participants in the English-language procedural group B.

Table 5

Demographic Characteristics of Procedural Group B: TAP English (N=12)

Demographic characteristic	Count of sample	Percent of sample
Grade		
Seniors	8	67
Juniors	4	33
Gender		
Females	8	67
Males	4	33
Ethnoreligious Background		
Sunni	4	33
Shiite	4	33
Druze	1	8
Greek Orthodox	1	8
Armenian Catholic	1	8
Maronite	1	8
Major		
Psychology	1	8
Bus Admin	4	33
Education	3	25
Social Work	1	8
Nutrition Science	1	8
English Language	1	8
Computer Science	1	8
Education in Lebanon		
All education in Lebanon	10	83
Grades 9-12 in Lebanon	1	8
Grades 2-3 , 5-12 in Lebanon	1	8
Previously taken a CT Class		
Yes	4	33
No	8	67
Total	12	100

Quantitative Analysis

The participant sample size was not large enough to produce significant quantitative results. Even so, a series of quantitative operations were run for exploratory purposes. The quantitative analyses were used to evaluate participants scores against user norms provided in the CCTT manual; to examine the relationships between select variables and participant scores; and to help direct the qualitative analysis. Participant responses were coded according to variables of

gender, ethnoreligious background, grade level, major, test language, overall and test specific times, TAP and non-TAP questions, correct or incorrect answers, and question specific answers (see Appendix H). Analysis of the verbal data and video recording demonstrated that one participant (E23) mismarked her answer sheet in CCTT section 2 resulting in a five-point difference between her actual score and the reported score in the quantitative data. Quantitative operations were not rerun since the difference in scores did not significantly impact results.

The mean score on the CCTT using Rights-Only scoring was 21.96 ($SD = 3.14$). The mean score using the Rights-Minus One-Half Wrongs scoring was 6.94 ($SD = 4.76$). Participant scores were lower than those of similarly leveled students provided in the CCTT Manual as seen in Table 6.

Table 6
CCTT Comparative Population User Norms

Group	Rights Only Scoring		
	N	Mean	Std. Dev.
Participant Scores	24	22.0	3.1
Z3	128	30.3	5.0
Z4	52	29.8	5.3
Z7	224	29.4	5.1
Z13	100	28.5	5.0
Z26	153	27.1	4.8
Z33	24	22.6	4.9
Group	Rights Minus One Half Wrong Scoring		
	N	Mean	Std. Dev.
Participant Scores	24	6.94	4.8
Z2	261	17.0	7.0
Z5	234	19.5	6.9
Z6	231	20.4	6.2

Z2: Students at community colleges in a Pacific Coast state (N=261)

Z3: Undergraduates at a Midwestern state university (N = 128)

Z4: Undergraduate elementary education majors in a philosophy of education course at a New England college (N = 52)

Z5: Undergraduate at a Pacific Coast state university (N=234)

Z6: Undergraduates at another Pacific Coast state university (N=231)

Z7: Undergraduate students in a junior-level educational psychology at a Midwestern state university (N = 224)

Z13: Undergraduates in a small state university in upstate New York (N = 100)

Z26: Upper-division students in sections of a course in educational media and technology at a Southern mid-size university (N = 63), (Luckett, R., 1991)

Z33: Undergraduates in an interdisciplinary course on ethical reflection focused on ethical issues in psychology (N = 24), (Allegrette & Frederick, 1995).

A series of independent t-tests were run to determine if there were differences in CCTT scores based on gender, grade level, and test language. The results showed no statistical differences in the CCTT test scores of males (22.14 ± 2.79) and females (21.75 ± 3.36); $t(21) = 0.270$, $p = 0.789$; juniors (21.7 ± 2.79) and seniors (22 ± 3.49); $t(21) = -0.222$, $p = 0.826$, and Arabic-language (22 ± 2.89) and English-language (21.72 ± 3.52); $t(21) = 0.204$, $p = 0.841$ participants.

Table 7

T-Test for Equality of Means Results for CCTT Scores by Multiple Variables

Variables		F	Sig.	t	df	Sig 2	MD	Std. ED	95% CI	
									Lower	Upper
Gender	EVA	0.49	0.49	0.27	21.0	0.79	0.39	1.45	-2.63	3.41
	EVNA			0.29	13.8	0.78	0.39	1.35	-2.51	3.29
Grade Level	EVA	0.63	0.44	-0.22	21.0	0.83	-0.30	1.35	-3.11	2.51
	EVNA	0.63	0.44	-0.22	21.0	0.83	-0.30	1.35	-3.11	2.51
Language	EVA	0.94	0.34	0.20	21.0	0.84	0.27	1.34	-2.51	3.06
	EVNA				19.4	0.84	0.27	1.35	-2.55	3.10

Note: EVA = Equal variance assumed; EVNA = Equal variance not assumed;
 Sig 2 = Sig (2-tailed); MD = Mean Difference; Std. ED = Std. Error Diff;
 CI = Confidence Interval

A series of one-way ANOVA operations examined possible correlations between CCTT scores and specific and general ethnoreligious backgrounds as well as CCTT scores and major.

There were no statistically significant differences between CCTT scores and specific ethnoreligious backgrounds ($F(5,17) = 1.797, p = 0.167$), CCTT scores and general ethnoreligious backgrounds ($F(2,20) = 2.771, p = 0.087$), and CCTT scores and major ($F(7,15) = 1.018, p = 0.457$).

Table 8

ANOVA Results for CCTT Scores by Specific and General Ethnoreligious Backgrounds and Majors

Variables		CCTT Total	Sum of Sq	df	Mean Sq	F	Sig.
Specific Ethnoreligious Backgrounds	Between		74.886	5	14.977	1.797	0.167
	Within		141.722	17	8.337		
	Total		216.609	22			
General Ethnoreligious Backgrounds	Between		47.001	2	23.500	2.771	0.087
	Within		169.608	20	8.480		
	Total		216.609	22			
Majors	Between		69.785	7	9.969	1.018	0.457
	Within		146.824	15	9.788		
	Total		216.609	22			

Research Question 1

The CCTT is divided into seven sections. Each section is designed to measure a test-taker's ability in a particular critical thinking skill or combination of skills. Participants in this study were asked to verbally express their thinking processes using a Think-aloud Protocol on 24 out of 52 CCTT questions. The verbal data were collected and organized to address the following research question.

1. What reasoning processes do bilingual Lebanese undergraduate students utilize to frame, interpret, and answer critical thinking questions from the Cornell Critical Thinking Test Level Z designed to measure skills of *deduction, induction, observation and credibility of sources, assumption identification, and meaning?*

Section 1: Deduction

CCTT section 1 is designed to measure *deductive skills*, specifically, “the importance of being able to reason neutrally with suggestive content” and the ability to analyze the relationships between statements (Millman et al., 2005, p.45). Section 1 is divided into parts A and B. Questions are presented in the context of a debate between two men. Section 1A involves a debate about voting by eighteen-year-olds. Section 1B is a debate on immigration. Each item presents a set of statements and an underlined conclusion. The test-taker is instructed to choose whether the conclusion follows necessarily from the statements given, contradicts the statements given, or neither follows necessarily nor contradicts the statements given. The instructions also state that the test-taker should not be concerned with whether or not the conclusions or statements are true and to consider each item independent of the others. Participants were asked to verbally process 5 out of 10 questions. Participants received their second highest aggregate section level score in section 1 with a mean score of 5.09/10 ($SD = 1.35$).

Two of the 24 participants (E15, E18) provided either limited or no verbal processing. E15 immediately answered each question after reading the question. E18 struggled with understanding the questions. Her lack of verbal processing could have been related to the difficulty level of the task (Leighton, 2017).

Six of the 22 participants (E1, A4, A7, E12, E19, A21) who provided verbal data demonstrated the ability to reason neutrally and use analytical reasoning to identify the relationship between the statements and the conclusion. For example, E1 stated, “Ok, that’s (a) contradiction because at first he agreed and then the conclusion says that they’re a bad group.” E1, A7, E12, and A21 correctly answered all five TAP questions. E1, A7, and E12 scored 7/10 on the overall section. A4 misread question 1 and E19 misunderstood question 2. A4, E19, and A21 scored 6/10 on the section. All 6 participants missed non-TAP question 4. Five out of 6 missed non-TAP question 10

Twelve of the 22 participants (E2, A3, A5, E6, A8, E9, A11, E13, A14, A17, E23, A25) who provided verbal data evaluated each question based on his or her personal opinion of the conclusion and/or overall argument. For example, the majority of the verbal processing of E2 was centered on explaining his point of view regarding the underlined conclusions. E9 equated “necessarily follows” with “I agree” and “contradicts” with “I disagree.” She never selected option C, neither follows nor contradicts. E23 stated, “I contradict this” because the statements did not make sense to her. She also chose C on question 1 because she “didn’t know if it’s true or not.” Two of these 12 participants (A5, A25) scored 7/10 on the selection-response choices although they did not use analytical skills to reason neutrally or deduce the relationships between statements and conclusions. For example, question 1 states

Mr. Wilstings says that eighteen-year-olds haven't faced the problems of the world, and that anyone who hasn't faced these problems should not be able to vote. What he says is correct, but *eighteen-year-olds still should be able to vote*. They're mature human beings, aren't they?

A5 responded, "No one 18 or even 21 has faced all the world's problems." She disagreed with the overall argument and chose B, the conclusion contradicts the statements given, based on her person opinion. Similarly, although A25 presented limited verbal processing, she stated that the basis of her choices on questions 3 and 7 was that she agreed with the argument. Although these lines of reasoning were not related to the relationship between statements or reasoning neutrally, they led participants to choose the correct answers.

Three of the 22 participants (E10, A16, E22) produced a mixture of evaluative reasoning based on opinion and analytic analysis of the relationship between statements. For example, E10 responded to the questions in section 1A about voting by evaluating the statements against his opinion, but on the questions in 1B about immigration, he analyzed the relationship between the statements and the conclusion. A16 was able to analyze the relationship of statements when she was convinced that the overall argument was relevant. For example, on question 7 she concluded that the 19th century has nothing to do with whether a country should open its door to immigrants in the present and, therefore, she determined that the conclusion neither follows necessarily nor contradicts. She failed to analyze the relationship between statements because she determined that the overall argument was irrelevant. E22 responded to questions 1,2,3, and 6 based on whether she agreed or disagreed with the idea, but on question 7, she accurately analyzed the relationships between statements even though she disagreed with the conclusion.

One of the 22 participants (A20) answered the questions based on her analysis of how the different speakers' opinions were related to each other and the subject matter. For example, on question 1 she determined that Mr. Khoury both agrees and disagrees with Mr. Kanaan. As a result, she chose option C, the conclusion neither follows necessarily, nor contradicts, meaning Mr. Kanaan neither agrees, nor disagrees. On question 2, she determined that Mr. Khoury disagrees with Mr. Kanaan's argument and on question 3, Mr. Khoury agrees with Mr. Kanaan's argument. On question 6 she determined that although Mr. Khoury is generally in opposition to Mr. Kanaan, that he does not contradict Mr. Kanaan because he agrees on some areas and disagrees on others. On question 7, she stated that the conclusion definitely follows because Mr. Kanaan is the originator of the idea. Table 9 presents the results of the analysis of the verbal data in section 1.

Table 9

Analyses of TAP Processes in CCTT Section 1: Deduction

Description of Participant Responses	Participants
Demonstrated use of good analytic reasoning	E1*, A4, A7*, E12*, E19, A21
Evaluative response based on personal opinion	E2**, A3, A5*, E6, A8**, E9, A11, E13, A14, A17, E23, A25*
Mixture of analytic reasoning and evaluative responses based on personal opinion	E10*, A16, E22
Analysis based on perception of speakers' opinions	A20**
No or limited verbal processing	E15, E18

*Scored at least 7/10

**Scored a maximum of 3/10

Section 2: Meaning & Fallacies

In section 2, participants were asked to verbally process 5 out of 11 questions. Section 2 is designed to assess the verbal and linguistic aspects of argument, including fallacy. Participants received their lowest aggregate section level score on section 2 with a mean score of 2.96/11. The section presents a series of verbal exchanges between two individuals over the issue of the chlorination of water supplies. The test-taker is instructed to pick the one best reason why the thinking is faulty in each item and is provided three possible choices. The instructions also indicate that the test-taker need not know anything about the chlorination of water supplies to correctly answer each question.

There were three types of answers in section 2. Type 1 answers involve equivocation, the use of a word in more than one way. Examples of type 1 answer choices are “Dobert is using a word in two ways” or, “Algan is not using ‘know’ in its ordinary sense, yet he is expecting the effect that follows for its being used in the ordinary sense.” Type 2 answers involve an error in thinking. Examples of type 2 answer choices are, “Dobert is mistakenly assuming that there are only two alternatives,” or, “There is a serious mistake in the thinking in this part.” Type 3 answers involve the misuse of emotional language or evidence to support an argument. Examples of type 3 answer choices are, “Dobert is using emotional language that doesn’t help to make his argument reasonable,” or, “Dobert, in using secret evidence, is not being fair, since this evidence is not available to everyone for inspection.” Of the three possible choices on each question, one answer is a type 1 response, one answer is a type 2 response, and one answer is a type 3 response. Type 1 is the correct choice on 7 of 11 questions. Type 2 is the correct choice on 3 of 11 questions. Type 3 is the correct choice on 1 of 11 questions.

TAP Reasoning Responses

I divided the verbal reasoning responses used in section 2 into four categories. Two participants (A8, A17) did not provide verbal data that was informative. Seven participants (E1, A3, A5, E9, A11, A14, E23) evaluated and verbally responded to only one of the three answer choices on at least 4 out of 5 TAP questions. Six participants (E6, E10, A16, E19, A20, A21) considered more than one option and arrived at their answer through the process of elimination on at least 4 out of 5 questions. Nine participants (E2, A4, A7, E12, E13, E15, E18, E22, A25) used a mixture of either evaluating only one answer or using the process of elimination (a 3/2 split).

Table 10

Categories of Responses on TAP questions in CCTT Section 2: Meaning & Fallacies

Description of Participant Responses	Participants
Evaluated and responded to only one answer on at least 4 out of 5 TAP questions	E1*, A3*, A5*, E9*, A11*, A14*, E23
Considered more than one option and arrived at their answer through the process of elimination on at least 4 out of 5 questions.	E6*, E10*, A16*, E19*, A20*, A21
Used a mixture of evaluating either only one answer or using the	E2*, A4*, A7*, E12*, E13, E15*, E18**, E22*, A25
Did not provide meaningful verbal data	A8*, A17*

Equivocation

The combination of results from selection responses and verbal data indicated that 22 out of 24 participants did not understand the concept of equivocation, type 1 answers. Verbal data from 14 participants (E1 A4, E6, E9, E10, A11, E12, E13, E15, A14, A16, E19, A20, E22) demonstrated a misunderstanding of the use of the same word differently. For example, E1 and E6 both asked themselves, “What do they mean by a word in two ways?” and never considered a type 1 answer. On question 15, E6 said, “I’m guessing they’re referring to the word medication

and they are not exactly using it differently, they simply interpret it differently.” In reference to the answer “Algan is using the same word in two ways,” E19 stated, “I don’t get what this statement means, like it’s used several times and it’s not being processed in my mind.” Two participants (A7, A21) produced selection patterns that indicate a general misunderstanding of equivocation, although they identified the correct answer on question 15. Three participants (A8, A17, A25) provided limited or no verbal processing although their patterns of answers indicate a misunderstanding or lack of consideration of type 1 choices. Three participants (E2, A3, A5) never verbally assessed or considered the choices related to using a word in two ways. Two participants (E18, E23) asked the moderator to explain the meaning of using a word in two ways and then correctly chose multiple type 1 answers.

Table 11

Analysis of Verbal Responses on Section 2 Questions involving Equivocation

Description of Participant Response	Participants
Did not understand the concept of equivocation, a word being used in two ways	A4*, E6*, E10*, A11*, A14*, A16*, E19*, A20*, E22*
Misunderstood or ignored the concept of equivocation or arrived at the correct answer through the process of elimination	E1*, A7*, E9*, E12*, E13, E15*, A21
Limited or no verbal processing. Patterns of answers indicated a misunderstanding or lack of consideration of type 1 choices	A8*, A17*, A25
Did not verbally assessed or considered type 1 answers related to using a word in two ways	E2*, A3*, A5*
Asked the moderator to explain the meaning of using a word in two ways and then correctly chose multiple type 1 answers	E18**, E23

*Scored a maximum of 2/7

**Scored 5/7

In total, 19 out of 24 participants scored a total of 0, 1, or 2 answers correct on the 7 questions with correct type 1 answer. Four participants score 3 out of 7 correct and only participant (18E) answered 5 out of 7 type 1 questions correctly. Table 12 shows the mean scores of correct answers on questions with correct type 1 answers.

Table 12
Means Scores of Correct Answers on Type 1 Equivocation Questions

Section 2: Type 1 Answers	N	Mean Correct	Std. Dev.	Variance
Question 12*	24	.17	.381	.145
Question 13*	24	.17	.381	.145
Question 15*	24	.42	.504	.254
Question 16	24	.04	.204	.042
Question 18	24	.17	.381	.145
Question 19	24	.29	.464	.216
Question 21	24	.17	.381	.145

*TAP questions

Item level responses on TAP questions 12 and 13

On question 12, the speaker, Dobert, uses the term health in two different ways. Five participants (A16, E18, A21, E23, A25) selected the correct answer C. The verbal data indicated that only 1 of the 5 participants (E23) who selected C chose the answer based on an accurate understanding of a word being used in two ways. A16, E18, and A25 arrived at the answer by the process of elimination. For example, E18 stated “he’s not thinking wrong, so it’s not B, and it’s not emotional language, it’s more scientific, so it’s not...A.” A21 misunderstood the meaning of the type 1 choice and stated “it is C because he is trying to compare healthy living with how it should be.”

On question 13, the speaker, Algan, uses the term know in two ways. Five participants (A3, E12, E13, E18, E23) selected the correct answer A. The verbal data indicated that only 1 of the 5 participants (E23) who selected A chose the answer based on an accurate understanding of equivocation. Three participants (A3, E18, E23) selected A using the criteria that neither speaker

can know what they are claiming; Algan can't know that an error was made in the investigation and Dobert can't know that the water is pure. For example, A3 said, "First thing, Algan definitely can't know if an error was made in the test and Dobert also can't know for sure that the water is pure if he doesn't have proof and evidence." P18 expressed, "Algan can't know that an error was made in the investigation but neither can Dobert know that...it's...pure water." E23 stated, "You never know if the water is pure and the other way is true, so (it also) goes for the investigation." Two participants (E12, E13) used the process of elimination to arrive at the correct conclusion. They concluded that options B and C were accurate statements and therefore A was inaccurate. For example, E13 expressed, "Algan, yes, can't know there is an error made in this investigation and the secret evidence is not being available to everyone for inspection...so question A is right."

Item level responses on TAP question 15

Twelve participants (E1, A5, A7, E9, E12, E13, A14, E15, A17, E18, A21, E23) uncharacteristically selected the type 1 answer on question 15. Three participants (A17, E18, E23) provided no relevant verbal data.

Five of the 9 participants (E1, E9, E12, E13, E15) who provided verbal data agreed with Dobert's argument which eliminated options A and B and left C as the only possible choice. For example, E9 stated, "I think it is medication because Algan is trying to kill the germs, like they're just...fighting each other." E13 expressed, "Chlorinating the water or medicating the water would affect us...his way of thinking is reasonable." Two participants (A5, A14) misunderstood the meaning of the type 1 choice. A5 chose the type 1 selection because "what is different is what their plan is (to kill germs)." A14 stated, "Algan is trying to have healthier water and Dobert is getting into a lot of details so he is tying things together. Each one is

speaking his perspective and each one is thinking of something different.” Only A21 selected the correct choice for the right reasons stating, “It’s C because both of them are using the same word in different ways.”

Table 13

Analysis of Verbal Responses on TAP Question 11

Description of Participant Response	Participants
Agreed with Dobert’s argument and therefore automatically eliminated options A and B	E1, E9, E12, E13, E15
Misunderstood the meaning of C	A5, A14
Provided no relevant verbal data	A17, E18, E23
Selected C for the right reasons	A21

Similar responses on TAP questions 11 and 14

Questions 11 and 14 are framed similarly but have different correct answers. On both questions, the speakers state that there are two alternatives and use what might be considered emotionally charged language such as crackpots and fool on question 11 and bad-smelling and disease-ridden, on question 14. The answer options on both questions are either “is mistakenly assuming or hasn’t shown that there are two alternatives,” “is using a word in two ways,” or “is using emotional language that doesn’t help to make the argument reasonable.” On question 11, the correct choice is “using emotional language that doesn’t help to make the argument reasonable.” On question 14 it is “hasn’t show that there are two alternatives.”

Twelve of out 24 participants (E1, E2, A4, A5, E10, A11, E12, E13, A14, A17, A20, A25) provided the same answer on both questions, either considering both sets of statements to mistakenly assume two alternatives (E1, E2, A5, A11, A14, A20), to misuse emotional language (A4, E12, E13, A17), or to use a word in two ways (E10, A25). Five participants (A3, E6, A8, E18, E23) flipped the correct answers and selected “mistakenly assumes two alternatives” when the correct answer was “using emotional language” and “using emotional language” when the

correct answer was “mistakenly assumes two alternatives.” Five participants (E9, E15, A16, E19, A21) chose the correct answer, “using emotional language” on question 11, and the wrong answer, “using the same word in two ways” on question 14. One participant (E22) chose “mistakenly assuming two alternatives” on question 11 and “using the same word in two ways” on question 14. Only one participant (A7) chose the correct answer on both questions. Five of the 6 participants (E1, E2, A5, A11, A14) who selected “mistakenly assumes two alternatives” only verbally considered one option on both questions.

Table 14

Same Types of Answers on TAP Questions 11 and 14

Description of Selection	Participants
Selected “mistakenly assumes two alternatives” on both questions	E1, E2, A5, A11, A14, A20
Selected “is using emotional language that doesn’t help to make his argument reasonable” on both questions	A4, E12, E13, A17
Selected “is using a word in two ways” on both questions	E10, A25
Flipped the correct answers and chose “mistakenly assumes two alternatives” on #11 and “uses emotional language” on #14	A3, E6, A8, E18, E23
Chose “uses emotional language” on question 11 and “uses the same word in two ways” on #14.	E9, E15, A16, E19, A21
Chose “mistakenly assumes two alternatives” on #11 and “uses the same word in two ways” on #14	E22
Selected the correct answers on #11 and #14	A7

Item level responses on TAP question 11

On question 11, seven participants of the 24 participants (A8, A11, A14, E15, A16, A17, E18) did not provide meaningful verbal data.

Eight of the 17 participants (E1, E2, A3, A5, E6, A20, E22, E23) who provided verbal data chose the incorrect answer A, “Dobert is mistakenly assuming two alternatives.” Six

participants (E1, E2, A3, A5, E6, E23) selected A using the criteria that there are other possible ways to clean water. For example, E1 stated, “Since he only thought of two options, he didn’t think of any other alternatives.” E2 said, “I think Dobert is...mistakenly assuming, there are other ways to make or clean (water).” A3 expressed, “I don’t think Dobert knows a lot about this issue.” A5 stated, “There should be more than two options because both options are wrong.” E6 expressed, “There might be other alternatives to whatever reason he wants to chlorinate the water for which I’m guessing is probably hygienic reasons.” E23 said, “There is never only two alternatives.” Two of the 8 participants (A20, E22) arrived at their choice through the process of elimination. A20 stated, “He did not use a word in two ways if he explained the idea.” E22 concluded, “It’s not about emotional language.”

Two of the 17 participants (E10, A25) who provided verbal data selected the incorrect option B, Dobert uses a word in two ways. Both participants arrived at their answer through the process of elimination. Neither participant considered fool or crackpot emotional language. For example, E10 stated, “He didn’t mention two alternatives. Ah, yea he did, he said that we should and we shouldn’t. Dobert used crackpots, I don’t think that’s just emotional way to put it, so I’m gonna go with B.”

Seven of the 17 participants (A4, A7, E9, E12, E13, E19, A21) who provided verbal data chose the correct answer C, “Dobert is using emotional language that doesn’t help to make his argument reasonable.” Five of the 7 participants (A7, E12, E13, E19, A21) arrived at their choice through the process of elimination. For example, A7 stated, “There is no choice other than that he is saying crackpots and fool.” E12 said, “They have two ways, either to chlorinate or not, so its C.” E13 stated, “Yes there are only two alternatives, it is to chlorinate the water or not chlorinating it...so the answer is C.” E19 said, “Is mistakenly assuming that there are only two

alternatives, no he's not...I think he is kind of being dramatic." Two of the 7 participants (A4, E9) only considered the correct option. A4 stated, "Because he uses very emotional language...this doesn't allow him to think in a logical way." E9 expressed, "They did not convince me in his reasons honestly, I think yes he's using emotional language."

Table 15

Reasons for Answer Selections on TAP Question 11

Description of TAP Process	Participants
Used the criteria that there are other possible ways to clean water to select A	E1, E2, A3, A5, E6, E23
Arrived at A through the process of elimination	A20, E22
Arrived at B through the process of elimination	E10, A25
Arrived at C through the process of elimination	A7, E12, E13, E19, A21
Only considered correct option C	A4, E9
Did not provide relevant verbal data	A8, A11, A14, E15, A16, A17, E18

Item level responses on TAP question 14

On question 14, four of the 24 participants (A8, A17, E18, A25) did not provide meaningful verbal data.

Thirteen of the 20 participants (A3, A4, E6, E9, E10, E12, E13, E15, A16, E19, A21, E22, E23) who provided verbal data selected the incorrect answers B or C. Ten of the 13 participants (A4, E6, E10, E13, E15, A16, E19, A21, E22, E23) who provided verbal data and selected B or C expressed that they understood the correct answer A, "hasn't shown that there are only two alternatives," to mean hasn't presented two alternatives. For example, A4 commented, "He said that there are two alternatives." E6 stated, "I guess he is using emotional language...aside from stating only two alternatives which he did really show actually." E10 expressed, "He didn't mention two alternatives, ah, yea he did, he said that we should and we

shouldn't." E13 said, "Algan showed that there are only two alternatives...but there are other alternatives." E15 stated, "Allan hasn't shown there are...actually he has shown." E19 expressed, "Algan hasn't shown that there are only two alternatives, yes he did." A21 said, "Actually he has shown there are two alternatives." P22 expressed, "Actually he shows that there are only two alternatives...it's obvious that he only have these two alternatives in mind and of course they're gonna be more other solutions."

Three of the 13 participants (A3, E9, E12) who provided verbal data only considered option B, "Algan is using emotional language that doesn't help to make the argument reasonable." For example, A3 stated, "I think Algan is using a bit of emotional language because when he talks about disease-ridden...this is something that is sensitive to the world." E9 said, "obviously no one wants to drink bad-smelling or diseased water."

Seven of the 20 participants (E1, E2, A5, A7, A11, A14 A20) who provided verbal data chose the correct answer A, "Algan hasn't shown that there are only two alternatives." One of the 7 participants (A7) selected the correct answer on both questions 11 and 14. Six of the 7 participants (E1, E2, A5, A11, A14 A20) selected the same *incorrect* answer on question 11. The verbal data indicated similar reasons for the choice of A on question 14 as the choice of A on question 11, other possible ways to clean water. For example, E1 stated, "I guess because maybe there are other options than chlorination or just leaving the water as it is so he can't just think that way." E2 said, "There are other ways to like clean water such as having a plant." A5 expressed, "Same thing, Algan is giving two options which are very limited." A14 said, "These are definitely not the only two possible answers. Adding chlorine doesn't make water clean...more chlorine is harmful to people."

Table 16

Verbal Reasons for Answer Selections on TAP Question 14

Description of TAP Process	Participants
Understood the statement “hasn’t shown that there are only two alternatives” to mean hasn’t presented two alternatives	A4, E6, E10, E13, E15, A16, E19, A21, E22, E23
Only verbally considered B, uses emotional language	A3, E9, E12
Used the criteria that there are other possible ways to clean water to select A	E1, E2, A5, A11, A14 A20
Selected the correct answer on questions 11 and 14	A7
Did not provide relevant verbal data	A8, A17, E18, A25

Section 3: Observation & Credibility of Sources

In sections 3, 4, and 5 of the CCTT, test-takers are required to read about an experiment that tested what happens to ducklings that eat cabbage worms. They are provided a description of the experiment, a chart of the data collected, and the conclusion that cabbage worms are poisonous to ducklings. The information from this experiment serves as the basis for how test-takers are supposed to respond to the questions in these three sections.

Section 3 is designed to assess skills in *observation* and *judgments about credibility*. On each question, the test-taker reads two underlined statements related to the ducklings experiment with information in parentheses after each statement. The test-taker is asked to use the information provided and the information in parentheses to determine which statement is more believable or to select that neither statement is more believable than the other. Participants received their second lowest aggregate section level score on section 3 with a mean score of 1.25/4 ($SD = .94$). Six participants (A7, E13, A17, E18, A21, A25) missed all 4 questions. Nine participants (E1, E2, E6, A8, E9, A11, E19, E22, E23) scored 1 out of 4 correct. Eight

participants (A3, A5, E10, E12, A14, E15, A16, A20) scored 2 out of 4 correct. One participant (A4) scored 3 out of 4 correct.

Table 17

Participant Scores on CCTT Section 3: Observation & Credibility of Sources

Participants	Score
A7, E13, A17, E18, A21, A25	0/4
E1, E2, E6, A8, E9, A11, E19, E22, E23	1/4
A3, A5, E10, E12, A14, E15, A16, A20	2/4
A4	3/4

Table 18

Means Scores of Correct Answers in Section 3: Observation & Credibility of Sources

Section 3 Questions	N	Mean Correct	Std. Dev.	Variance
Question 22*	24	.08	.282	.080
Question 23*	24	.58	.504	.254
Question 24	24	.42	.504	.254
Question 25	24	.17	.381	.145

*TAP questions

Similar responses on TAP questions 22 and 23

Participants were asked to verbally process on 2 out of 4 questions. Six participants (A8, E9, A11, E15, A17, A25) did not provide relevant verbal data on both questions. A16 provided relevant verbal data on question 22, but not question 23.

One of the 17 participants (A4) who provided verbal data on both questions attempted to assess which statement was more believable using the criteria outlined in the CCTT answer key. On question 22 she concluded that observation is more precise than inference. On question 23 she recognized that a firsthand source is more credible and authoritative than a second-hand source. For example, on question 22 she stated, "I feel like the second one is more correct because this is what the experiment says." On question 23 she expressed, "I feel like the second one is more accurate because they (the doctors) wrote the report...the second one is directly from the source."

Ten out of the 17 participants (E2, A3, A5, A7, E10, E13, A14, A20, A21, E23) who provided verbal data on both questions attempted to determine which statement was correct or incorrect instead of evaluating which of the two statements was more *believable*. For example, A5 stated, “The first statement is the one that should be true.” A7 expressed, “(Option A) true, (option B) false.” A14 said, “Definitely, the first week all of the ducklings died is wrong.” A21 stated, “It is definitely C because the ill ducklings didn’t die.”

Four of the 17 participants (E1, E6, E12, E22) used the criteria outlined in the CCTT answer key on only one of the two TAP questions. Two of the 17 participants (E18, E19) provided verbal data that were unclear as to whether questions were being framed as correct/incorrect or more/less believable.

Table 19

Participants Approaches to TAP Questions 22 and 23 in Section 3

Description of Approach	Participants
Answered using criteria of correct or incorrect instead of evaluating which statements was more <i>believable</i>	E2, A3, A5, A7, E10, E13, A14, A20, A21, E23
Answered both questions using criteria outlined in the CCTT answer key	A4
Answered one of two questions using criteria outlined in the CCTT answer key	E1, E6, E12, E22
Provided unclear verbal data	E18, E19
Did not provide relevant verbal data on both questions	A8, E9, A11, E15, A16, A17, A25

Item-level responses on TAP question 22

Participants achieved the lowest item-level score on question 22 with only 2 of the 24 participants choosing the correct answer B. Eighteen of the 24 participants selected option A as more believable. Four of the 24 participants chose option C, that neither statement was more

believable. Six of the 24 participants (A8, E9, A11, E15, A17, A25) did not provide meaningful verbal data.

Two of the 18 participants (A4, E12) who provided verbal data selected the correct answer B and demonstrated evaluative reasoning using the criteria of precision. A4 expressed, “The second one is more correct because this is what the experiment says.” E12 stated, “B, let’s be more precise.”

Eight of the 18 participants (E1, A3, A7, E10, E13, E18, A20, A21) who provided verbal data selected the incorrect options of A or C and made a mistake in reading the experiment data chart. For example, E1 stated, “Six Canvasbacks died during the week of the experiment, ok, we have only three dead, so basically A is the answer because it reflects the conclusion.” A3 said, “It is wrong (options B) because only 3 died who ate worms.” E10 expressed, “Six canvasbacks died during the first week of the experiment, I don’t think so.” A20 said, “If it was during the week, more than six (died).” A21 stated, “No, 3 Canvasbacks (died) not 6.” E13 concluded that both statements were not believable, although he did not express his reasons for rejecting A.

Five of the 18 participants (E2, A5, A14, E22, E23) who provided verbal data selected option A as correct or more believable and did not check the chart to determine if six Canvasbacks died. Four (E2, A5, A14, E23) selected option A because it was a restatement of the experiment’s conclusion. For example, A5 stated, “It was evident that more of the ducklings who ate the worms died meaning the problem is with the worms the ducklings are eating.” A14 expressed, “According to the information here, cabbage worms aren’t good for ducks, when you know that a lot ducks died as a result (of cabbage worms). Definitely A.” E23 said, “Since the conclusion was cabbage worms are poisonous to ducklings, then 22, A is correct.” One participant (E22) selected A and expressed, “B is a derivative actually of A...so I guess A.”

Three of the 18 participants (E6, A16, E19) who provided verbal data selected option C, neither statement is more believable than the other for other reasons. A16 and E19 expressed that both statements were believable whereas E6 doubted the source on both options because, “I don’t know if its necessarily said by Dr. Kolter...I really don’t know who said what.”

Table 20

Item-level Verbal Data on TAP Question 22

Description of Response	Participants
Selected A: Misread data chart and concluded that B was in error	E1, A3, A7, E10, E13, E18, A20, A21
Selected A: Did not the check data chart to evaluate B	E2, A5, A14, E22, E23
Selected B: Used evaluative reasoning using the criteria of precision	A4, E12
Selected C: Concluded both statements were believable	A16, E19
Selected C: Questioned the credibility of the source	E6
Did not provide meaningful verbal data	A8, E9, A11, E15, A17, A25

Item-level responses on TAP question 23

Question 23 produced the highest percentage of correct answers in section 3, 58.3%. The question provides two statements. Statement A reads “*During the week following the experiment, all of the ill ducklings died.* (From an article in a magazine that can be found on almost every newsstand. The author, a popular international writer, stated that he obtained his information from Drs. Brown and Kolter.)” Statement B reads “*During the week following the experiment, the rest of the worm-fed ducklings died* (from the report written by Drs. Brown and Kolter).” Choice C is “Neither statement is more believable.” According to the CCTT manual, the correct choice is B because “although both statements are observation statements, statement B is firsthand and offered by a source that is more authoritative” (Millman et al., 2005, p. 46).

Five of the 24 participants (9E, A11, 16A, A17, A25) provided no meaningful verbal data. Fourteen of the 19 participants (E2, A5, A7, A8, E10, E12, E13, A14, E15, E18, E19, A20, A21, E23) who provided verbal data paid no attention to the information in the parentheses and attempted to answer the question with reference to the italicized statements alone. Five of the 19 participants (E1, A3, A4, E6, E22) who provided verbal data evaluated the credibility of the source in the parentheses as the criteria for selecting the correct answer.

Ten of the participants (A7, A8, E12, E13, E18, A14, E15, E19, A20, A21) verbally expressed confusion over the statements that all of the ill or worm-fed ducklings died. These participants failed to recognize that the question statements reference the week *after* the experiment and, therefore, are not concerned with the details provided in the original experiment.

Table 21

Participant Approaches to TAP Question 23

Description of Approach	Participants
Attempted to answer #23 with reference to the italicized statements alone	E2, A5, A7, A8, E10, E12, E13, A14, E15, A17, E18, E19, A20, A21, E23, A25
Evaluated the credibility of the source in the parentheses as the criteria for selecting the correct answer	E1, A3, A4, E6, E22
Provided no meaningful verbal data	9E, A11, 16A

One participant (A5) who provided verbal data only considered the incorrect option A. She concluded A was correct because worms will make ducklings sick and then they will die. She stated, “Like we said, worms are poisonous to ducklings, so they are causing the ducks who get ill to immediately die. They aren’t allowing the ducklings to live.”

Twelve of the 19 participants (E1, E2, A3, A4, E6, E10, A14, E15, E19, A20, E22, E23) who provided verbal data selected the correct answer B. Five of the 12 participants (E1, A3, A4, E6, E22) who selected B evaluated the credibility of the source in the parentheses as the criteria

for selecting the correct answer. For example, E22 stated “It’s more credible if the report is actually written and the result is actually mentioned by the people who did the experiment.” A4 expressed, “I feel like the second one is more accurate because they wrote the report.” E6 said, “The report...was written by the doctors who actually did the experiment rather than being reported by a third party, so I believe statement B is more believable.” Seven of the 12 participants (E2, E10, A14, E15, E19, A20, E23) only evaluated the italicized statements. These participants used the conclusion that cabbage worms are poisonous to ducklings as the criterion for their choice that it was more likely that worm-fed ducklings would die than ill ducklings. As such, these participants chose the correct answer but did not evaluate the credibility of the source. For example, E10 stated, “The ill ducklings did die in the worm diet, during the regular diet out of three ill ducks, only one died...so I’m gonna go with B.” E19 expressed, “I don’t know if they died or not, can I believe it? During the week following the experiment the rest of the worm-fed ducklings died, second is more believable.” E23 said, “B is more believable since again the conclusion was that they (the worms) are poisonous.”

Six of the 19 participants (A7, A8, E12, E13, E18, A21,) who provided verbal data chose option C, neither statement is more believable, because the information included in the statements was not explicitly mentioned in the experiment. For example, A8 expressed, “We don’t know if they died or not...this is not written here...ok C.” E12 stated, “No one said that the ill ducklings were dead.” E13 said, “Well, referring to the table during the week following the experiment the rest of the worm-fed ducklings didn’t die all, and nothing is stated about the magazine’s...that all the ill-ducklings died...so neither statement is more believable.” E18 expressed, “We don’t have the results after...what happened, we don’t have the result...after one

week, so neither statement is more believable.” A21 said, “All the ducklings didn’t die (after option B)...it is definitely C because the ill ducklings didn’t die.”

Table 22

Item-level Verbal Data on TAP Question 23

Description of Response	Participants
Selected A: Only evaluated option A	A5
Selected B: Evaluated the credibility of the source in the parentheses as criteria for selecting B	E1, A3, A4, E6, E22
Selected B: Used the conclusion that cabbage worms are poisonous to ducklings as criteria for selecting B	E2, E10, A14, E15, E19, A20, E23
Selected C: Selected C because information in the statements was not mentioned in the experiment	A7, A8, E12, E13, E18, A21
Provided no meaningful verbal data	E9, A11, A16, A17, A25

Section 4: Induction (Hypothesis Testing)

Section 4 is designed to assess skills in *induction*. The material provided with the CCTT describe induction as “given a specific hypothesis or observation, one combines observation and prior knowledge to reach a general conclusion.” The CCTT answer key states “best-explanation criteria apply to judging these induction items. A hypothesis is supported by its ability to explain facts, by the inconsistency of competitors with facts, by its not being itself inconsistent with facts, and by its plausibility” (p. 46).

In section 4, the test-taker is reminded of the conclusion “cabbage worms are poisonous to ducklings” from the experiment they used to answer questions in section 3. Section 4 includes 13 questions. Each question consists of a series of statements that either provide additional information about the original experiment, information from repeat experiments, or information from similar kinds of experiments. The test-taker is instructed to select option A if the

information in the question supports the conclusion of the original experiment, option B if the information goes against the conclusion, and option C if the information does neither.

Participants received their highest aggregate section level score on section 4 with a mean score of 7.25/13 ($SD = 1.48$).

Six questions in section 4 present a replication study with different results and/or different variables. For example, question 36 states “the experiment is repeated in Canada with three different varieties of ducklings. All of the ducklings die, whether worm-fed or not.” Over 60% of the participants selected the correct choice on 4 of the 6 replication study questions.

Table 23

Means Scores of Correct Answers on Replication Study Questions in Section 4: Induction

Replication Study Questions	N	Mean Correct	Std. Dev.	Variance
Question 26*	24	.63	.495	.245
Question 31	24	.83	.381	.145
Question 32	24	.92	.282	.080
Question 34	24	.25	.442	.196
Question 36	24	.21	.415	.172
Question 37	24	.88	.338	.114

*TAP question

Four questions present variables from the original experiment that were discovered after the original experiment concluded. For example, question 27 reads “it is discovered that during the original experiment the regular-fed ducklings had less sunlight than the worm-fed ducklings. It is not known whether or not the difference in the amount of sunlight would have an effect on the health of ducklings.” On questions where the discovered variable did not impact the conclusion, over 70% of participants selected the correct answer. On questions where the discovered variable had an effect on the conclusion, 17% of the participants selected the correct answer.

Table 24

Means Scores of Correct Answers on Additional Variables Questions in Section 4: Induction

Replication Study Questions	N	Mean Correct	Std. Dev.	Variance
Question 27*	24	.17	.381	.145
Question 29*	24	.83	.381	.145
Question 33	24	.71	.464	.216
Question 38	24	.17	.381	.145

*TAP questions

Three questions involve reports about similar types of experiments that are not directly related to the original experiment. For example, question 30 states “a similar experiment is performed with young dogs. Another is performed with young turtles. In both cases the results are similar to those of the original duckling experiment.” Over 66% of the participants selected the correct choice on 2 out of 3 similar experiment questions.

Table 25

Means Scores of Correct Answers on Similar Type Questions in Section 4: Induction

Replication Study Questions	N	Mean Correct	Std. Dev.	Variance
Question 28*	24	.79	.415	.172
Question 30*	24	.67	.482	.232
Question 35	24	.21	.415	.172

*TAP questions

Item-level responses on TAP question 26: Repeat experiments

Question 26 reads, “The experiment is repeated in Canada with twice as many ducklings. None of the ducklings die. At the end of the week, two of the regular-diet ducklings are ill, and three of the worm-diet ducklings are ill.” Five of the 24 participants (A8, E15, A16, A17, A25) provided no meaningful verbal data.

Three of the 19 participants (E9, A14, A21) who provided verbal data selected the incorrect choice A, if true, this information supports the conclusion. One of the 3 participants (A14) did not consider the results and selected A because the experiment was a similar experiment. She stated, “Ok, it is almost the same as the one done by Drs. Brown and, what’s his

name, it's about the same, so true, they are like each other." One of the 3 participants (A21) only compared the number of ill duckling who ate the regular diet in both experiments and, since these numbers were similar, selected A. She said, "Here two were ill and there 3 were ill, so this information, it seems here they also died and got sick, the ones who ate the regular-diet...this information supports the conclusion." One of the 3 participants (E9) misunderstood the statement. She expressed, "But after they did the diet, yes three were ill and two were healthy."

Three of the 19 participants (E1, A3, E6) who provided verbal data selected the incorrect choice C, this information does neither. These participants selected C because the information did not confirm the conclusion of the original experiment and did not produce a conclusion that contradicted the original experiment. For example, E1 stated, "It doesn't necessarily support nor goes against because there is no proof why they are dying." E6 said, "It doesn't necessarily go against because the number of ill ducklings who were given the worms diet was more than the regular diet ducklings which were ill, but I don't think it's really significant because it's only one, the difference is only one."

Thirteen of the 19 participants (E2, A4, A5, A7, E10, A11, E12, E13, E18, E19, A20, E22, E23) who provided verbal data selected the correct answer B, this information goes against the conclusion and used analytical reasoning to arrive at the correct conclusion. For example, A11 stated, "This goes against the conclusion because it (the conclusion) was are poisonous, so more than this would need to die." E12 said, "It goes against because it's the same experiment and different results."

Table 26

Item-level Verbal Data on TAP Question 26: Repeat Experiments

Description of Response	Participants
Selected A: Because it was a similar type of experiment	A14
Selected A: Because there was a similar number of ill ducklings	A21
Selected A: Misunderstood the statement	E9
Selected B: Used analytic reasoning to select correct answer	E2, A4, A5, A7, E10, A11, E12, E13, E18, E19, A20, E22, E23
Selected C: Repeat experiment did not produce a conclusion that supported	E1, A3, E6
Provided no meaningful verbal data	A8, E15, A16, A17, A25

Item-level responses on TAP questions 27 and 29: Additional variables

Questions 27 and 29 present statements about additional variables from the original experiment that were discovered after the experiment concluded. Five of the 24 participants (E13, A16, E15, A17, A25) did not provide meaningful verbal data.

Two of the 19 participants (E9, A11) who provided verbal data chose the correct answers, B on question 27, and, C on question 29. E9's verbal processes indicated that she misunderstood what she was supposed to evaluate on both questions. On 27 she stated, "(In) the experiment they did not say anything about sunlight, they only mentioned warmth." On 29 she expressed, "Ok, but nothing about that was mentioned in the paragraph I read." She selected the correct answers for the wrong reasons and thought that the questions were testing her ability to remember what was in the original experiment. A11 analyzed the statements in question 27 and concluded, "They don't know (if the sunlight has an effect), so this supports the conclusion, goes against the conclusion." Although he did not provide additional verbal processing, he focused on the variable of sunlight and chose the correct answer. A11 did not provide meaningful verbal data on question 29.

Thirteen of the 19 participants (E1, E2, A4, E6, A7, E12, A14, E18, E19, A20, A21, E22, E23) who provided verbal data selected C on both questions, the additional information neither supported nor went against the conclusion. Nine of the 13 participants (E2, A7, A14, E18, E19, A20, A21, E22, E23) expressed that the discovery of an additional variable had nothing to do with the experiment, therefore it neither supports nor goes against the conclusion. For example, question 27 includes the variable of sunlight on only one group of ducklings. E2 said, “This doesn’t prove anything about the cabbage worms.” A14 stated, “What does sunlight have to do with it...sunlight is good.” E19 said, “It is not known whether or not the difference in amount of sunshine would have an effect, ok, so, doesn’t really affect much.” E22 stated, “It’s not...a big deal whether there are sunlight or not, so I guess it’s neither.” E23 expressed, “The amount of sunshine wouldn’t have that big of an effect, so C I guess.” Using the same logic, these participants concluded that the water in question 29 had nothing to do with whether or not cabbage worms are poisonous. For example, E2 said, “Well it does not say if this (water) was contaminated by worms or not or anything so this information does neither.” E18 expressed, “Neither...supports nor goes against, it’s (a) different idea.” Four of the 13 participants (E1, A4, E6, E12) who selected C on both questions expressed that because the impact of the variable is unknown, the information neither supports nor contradicts the conclusion. On question 27, A4 stated, “From this information we can’t know if cabbage worms are poisonous or not, so it doesn’t affect the conclusion.” P6 said, “Well since it’s not really known (if) the amount of sunlight would have an effect, I guess this doesn’t really go against or support anything.” E12 expressed, “This information does neither because it doesn’t show that sunlight affects the health of ducklings, it’s neither.” On question 29, E1 said, “We cannot say.” A4 stated, “What does this

have to do with anything, how is the pan of water related.” P12 E expressed, “What does this have to do with anything...this is not related to the experiment.”

Four of the 19 participants (A3, A5, A8, E10) who provided verbal data did not produce a consistent selection pattern. One of these 4 participants (E10) provided verbal data on question 27 that added information to the statement. He concluded, “If they discovered it and obviously the difference in sunshine would have an effect on the ducklings, so *because they found it out and it does have an effect on ducklings*, (I) will go with A.” On question 29, E10 determined that the water “has nothing to do with the worms, at all...so I’m gonna go with C.” Two of the 4 participants (A3, A8) selected C on question 27 and B on question 29. On question 27, A3 evaluated the statement accurately and concluded that the conditions should be the same in both experiments. She said, “First thing in an experiment is that both of them have the same set of conditions...so because of this, this information goes against the conclusion.” She then changed her mind and selected C because it is possible that the information could support the conclusion, “No, not necessarily goes against. This information could support the conclusion” On question 27, A8 simply stated “what does this have to do with anything” and selected C. On question 29, it was unclear why A3 and A8 selected B. One of the 4 participants (A5) selected C on question 27 and A on question 29. On question 27, she stated, “They should both be the same so we can make sure if the problem is with cabbage worms.” It is unclear why she then selected C. On question 29, she reasoned that since the ducklings both drank the same water, water could be removed as a possible reason why the ducks died, leaving only sunlight or worms as the possible cause. Based on this conclusion, she selected A, the information supports the conclusion.

Table 27

Item-level Verbal Data on TAP Questions 27 and 29: Additional Variables

Description of Response	Participants
Inconsistent selection pattern: A and C	E10
Inconsistent selection pattern: C and A	A5
Inconsistent selection pattern: C and B	A3, A8
Selected B and C*: Misunderstood what was required	E9
Selected C and C: Additional variable had nothing to do with the experiment	E2, A7, A14, E18, E19, A20, A21, E22, E23
Selected C and C: Impact of additional variable unknown	E1, A4, E6, E12
Did not provide meaningful verbal data	A11, E13, A16, E15, A17, A25

*Correct answers

Item-level responses on TAP questions 28 and 30: Similar experiments

Questions 28 and 30 involve reports about similar types of experiments that are not directly related to the original experiment. Four of the 24 participants (A8, E9, A17, A25) did not provide meaningful verbal data on questions 28 and 30.

Fourteen of the 20 participants (E1, E2, A4, A5, E6, A7, E10, A11, A14, A16, E18, E19, A20, E23) who provided verbal data correctly selected A on questions 28 and 30 and demonstrated the skill of analysis, the ability to accurately determine that the information in the reports/experiments supported the conclusion of the original experiment. For example, E1 said, “Ok, that supports the conclusion since the cabbage worms are poisonous and (it) states that they cannot be in a cabbage environment.” E2 stated, “This experiment will show that cabbage worms are poisonous not only to ducklings but also to other young animals.” A4 expressed, “This strengthens the idea that cabbage worms are poisonous if the same thing happened with dogs and turtles.” E6 stated, “Usually when experiments...can be generalized (to a) broader population...I think it will make the conclusion more credible.” E10 said, “Duck breeders...should have

information about this...so I guess it is dangerous for them to run in the cabbage patch because of the worms.” A11 expressed, “This supports because the cabbage patch is the source of poisonous worms.” E23 stated, “True, maybe because cabbage worms are poisonous to all animals” E23. One of the 13 participants (A5) used analytical reasoning, but her verbal processes indicated that she did not think that dogs and turtles could be compared to ducks even though she selected that the information supported the conclusion. A20 mismarked question 28. Although she selected B, she stated, “It supports more than it being neutral.” On question 30, she expressed, “As long as (the results) are similar, it supports.”

Three of the 20 participants (A3, E12, A21) who provided verbal data selected the correct option A on question 28 and option C, this information does neither, on question 30. These participants used analytical reasoning to choose the correct answer on question 28. On question 30, these participants did not show the ability to generalize the results of the experiment. A3 stated, “This information supports, but not necessarily, it is not necessarily the same thing for dogs and turtles.” E12 expressed, “They (the dogs and turtles) were exposed to different things...other than the ducklings so...it’s neither nor because it doesn’t show evidence.” A21 said, The conclusion that they arrived at here was that cabbage worms are poisonous to ducklings, here we are talking about dogs. What does that have to do with it, we are talking about dogs and turtles.”

One of the 20 participants (E13) who provided verbal data incorrectly chose B on question 28, goes against the conclusion, and corrected selected A on question 30, supports the conclusion. E13 concluded that the information in question 28 was too vague to support the specific conclusion that cabbage worms are poisonous to ducklings. He said, “They didn’t say (running in a cabbage patch) might lead to death and they didn’t specify...what might happen

exactly in the cabbage patch that would harm these ducklings.” On question 30 he accurately reasoned, “Since cabbage worm(s) may cause illness then it would support it.”

Two of the 20 participants (E15, E22) who provided verbal data chose the correct answer A on question 28 and the incorrect answer B on question 30. On question 28, both participants used analytic reasoning to select the correct answer. E22 stated, “The main conclusion is that cabbage worms are poisonous and as those breeders found out ...the running (in) the cabbage patch is causing harm for ducklings, so it supports the main idea.” On question 30, both participants did not show the ability to generalize the results of the experiment. E22 said, “Because the word duckling is mentioned in the main conclusion...and the study is replicated on dogs and turtles, I guess that even though they reach the same conclusion...it’s not for ducklings.” E15 simply stated, “These are two other different kind(s) of animals, it’s not related.”

Table 28

Item-level Verbal Data on TAP Questions 28 and 30: Similar Experiments

Description of Response	Participants
Selected A and A*: Accurately analyzed the relationship between the reports and original experiment	E1, E2, A4, A5, E6, A7, E10, A11, A14, A16, E18, E19, A20, E23
Selected A and C: Accurately analyzed #28 but failed to generalize the results of the experiment on #30	A3, E12, A21
Selected A and B: Accurately analyzed #28 but failed to generalize the results of the experiment on #30	E15, E22
Selected B and A: #28 too vague. Accurately analyzed #30	E13
Did not provide meaningful verbal data	A8, E9, A17, A25

*Correct answers

Section 5: Induction (Planning Experiments)

Section 5 is designed to assess skills of *induction* and *deduction*. Four questions are designed to identify the ability to plan and evaluate a scientific experiment. The CCTT answer key states the following criteria for scoring each item. “In planning an experiment it is desirable to have a control group (especially with random assignment to experimental and control groups), to generate results that could be in conflict with the hypothesis (by virtue of the hypothesis’ implying the opposite, give acceptable assumptions), and to be fairly specific” (p. 47).

Participants were asked to think out loud on 2 of 4 questions. The aggregate section level score on section 5 was a mean of 1.38/4 ($SD = 0.77$). Less than 40% of participants selected the correct answer on each item from 39-42.

Table 29

Means Scores of Correct Answers on Section 5: Induction (Planning Experiments)

Section 5 Questions	N	Mean Correct	Std. Dev.	Variance
Question 39*	24	.25	.442	.196
Question 40*	24	.38	.495	.245
Question 41	24	.38	.495	.245
Question 42	24	.38	.495	.245

*TAP questions

The instructions read “a researcher sets out to test the truth of the statement: *If any duckling eats a cabbage worm, the duckling will die within six hours.* The researcher has developed an accurate, painless, and non-injurious stomach-testing method for telling whether a duckling has eaten a cabbage worm during the previous twelve hours. The method can be used both with dead ducks and live ducks. In planning his experiments, he needs to make some *predictions from the above statement.*” The instructions then provide the following two statements about predictions “*Predictions tell what would be true, if the statement were true,*” and, “*Predictions should be useful in guiding an actual experiment.*” Using these two statements,

the test-taker is asked to evaluate seven possible predictions labelled J-P. On each question, the test-taker is required to identify the best prediction from three choices, J-K-L on question 39, N-O-P on question 40, K-L-M on question 41, and M-N-O on question 42.

Eight participants (A3, A5, E9, E13, E15, A16, A17, A25) demonstrated contradictory selection patterns. For example, test-takers are instructed to choose the best prediction from J-K-L on question 39 and the best prediction from K-L-M on question 41. Four participants (A5, E13, A17, A25) selected K on question 39 and L on question 41. If K is a better prediction than L on 39, it is also necessarily a better prediction than L on 41. Similarly, test-takers must choose between N-O-P on question 40 and M-N-O on question 42. Three participants (A3, E9, E15) selected O on question 40 and N on question 42. One participants (A16) selected N on question 40 and O on question 42.

On questions 39 and 41, nine of the 24 participants (A4, A8, E9, E10, A11, E12, E15, A21, E23) selected the same possible prediction on both questions. Four of the 9 participants (A4, A11, A21, E23) selected the correct prediction, letter L, on both questions. Five of the 9 participants (A8, E9, E10, E15, A21) selected the incorrect prediction, letter K, on both questions. On questions 40 and 42, seven of the 24 participants (E2, A3, A5, A11, E12, A16, E23) selected the same incorrect answer, either N or O, on both questions.

Table 30

Selection Patterns on Section 5 Questions

Selection Patterns	Participants
Contradictory selection patterns on #39/#41	A5, E13, A17, A25
Contradictory selection patterns on #40/#42	A3*, E9*, E15*, A16*
Selected same letter, correct answer, #39/#41	A4, A11, E12*, E23*
Selected same letter, incorrect answer, #39/#41	A8, E9*, E10, E15*, A21
Selected same letter, incorrect answer, #40/#42	E2, A3*, A5, A11, E12*, A16*, E23*

*Two categories

Item-level responses on TAP question 39

On question 39 there are three statements. Option A (letter J) is a restatement of the hypothesis and testing procedure. Option B (letter K) is a restatement of the hypothesis using the opposite terms “if any duckling does not die within six hours after a given period, then it did not eat any cabbage worms during that period.” Option C (letter L) describes an experiment that involves putting hungry ducklings in a cabbage patch for an hour and then in a clean cage for six hours with the hypothesis “if any do not die during that period, the results of the stomach test will show that these ducklings did not eat any cabbage worms.” The correct answer is answer C since “the other two options are no more specific than the hypothesis and the testing procedures” (p. 47). Twelve of the 24 participants (A5, A8, E9, A11, E12, E15, A16, A17, E18, E19, E23, A25) did not provide meaningful verbal data.

Seven of the 12 participants (E1, E2, A3, E6, E13, A14, A20) who provided verbal data selected A. These participants evaluated the statements by trying to discern which answer was right and which were wrong. E1, E2, E6, and E13 disregarded that a statement was being tested and questioned the validity of the initial statement. For example, on option B, E2 stated, “He may eat it but die after seven hours.” E6 said, “Cabbage worms might actually not be harmful or fatal to ducklings.” E13 expressed, “It is not necessary that the six hours prediction would be right...then it’s not true.” For option C, E1 stated, “L doesn’t make any sense because...the test should show that they have eaten cabbage worms if they did die or not..” E2 said, “If they’re out there for one hour...and not all of them died, it means that some of them also may have died after six hours but then they pretty much died from something else probably not a cabbage worm.” E6 expressed, “They are only put in the cabbage patch...this doesn’t really mean that the ducklings will necessarily eat from the cabbage, so I don’t think this is accurate.” E13 said, “It’s

not necessary that the test will show that they didn't eat cabbage worm(s), they might be eating cabbage worms and didn't die from them" A3 and A20 stated that both A and C were true but selected A because it included the testing procedure and was therefore more precise. A14 struggled with her choice because every option was accurate. She eventually selected A because she thought it was the most effective.

One of the 12 participants (E10) who provided verbal data selected B. E10 did not consider option C. He selected B after determining that A was inaccurate. He mistakenly determined that A was wrong because it said, "After eating the worm and in the example before it says that they should do the test...during the 12 hours, not after." The actual statement from the CCTT states "during the *previous* twelve hours."

Four of the 12 participants (A4, A7, A21, E22) who provided verbal data selected the correct answer C. A4 and A7 chose C after eliminating A and B. A4 disregarded the statement being tested and determined that option B was wrong because, "(The ducklings) can die from other things unrelated to cabbage worms." She decided that C was more convincing than A. A7 stated that options A and B were meaningless. She selected C because it was "more logical...because they had a control group" although there was no control group in C. A21 disregarded the statement being tested and determined that option B was wrong stating, "How do we know that the cabbage worms didn't affect the ducklings." E22 provided limited verbal processes and selected C because it was, "More reasonable."

Table 31

Item-level Verbal Data on TAP Question 39

Description of Response	Participants
Selected A: Disregarded that a statement was being tested and questioned the validity of the statement.	E1, E2, E6, E13**
Selected A: Used the criteria that A was more precise than C	A3, A20
Selected A: Used the criteria that A was the most effective	A14
Selected B: Misunderstood A and did not consider C	E10
Selected C*: Used process of elimination	A4, A7
Selected C*: More reasonable	E22
Did not provide meaningful verbal data	A5, A8, E9, A11*, E12, E15, A16, A17, E18, E19, A21*, E23*, A25

*Correct answer

**Mismarked answer sheet

Item-level responses on TAP question 40

On question 40 there are three statements. Option A (letter N) includes the random selection of ducklings and feeding them cabbage worms. Option B (letter O) involves the random selection of ducklings and releasing them in a cabbage patch. Option C (letter P) consists of the random distribution of ducklings into two groups with one group that is fed worms and one that is not. The correct answer is answer C since “random assignment to experimental and control groups is used in P” (p. 46). Seven of the 24 participants (A8, E9, A11, E12, A16, A17, E18) did not provide meaningful verbal data.

Six of the 17 participants (E2, A3, A4, E6, E19, E23) who provided verbal data indicated A was the correct answer. These participants selected A because it was the simplest, most specific, and most controlled option. E2 stated, “When you have a prediction you will need to know that you’re sure of it.” He used his own definition of prediction as the criteria for his

choice. Similarly, E23 said, “N can be predicted because in O and P there might be other variables leading to the death of the ducklings.” A4 said that B and C were complicated and, “If the statement is saying that all the (ducklings) that eat will die in 6 hours...the first one is true.” A3 mistakenly selected B on the answer sheet. She stated, “I don’t think hunger has anything to do with it...so N (option A) is the best answer.” E6 and E19 were confused because all the options were possible predictions. E6 chose A because, “I don’t think that turned loose has the same meaning as fed a cabbage worm...I’m gonna go with N because I think it’s more...stable.” E19 stated, “This is right because if the prediction matches, cabbage worm equals death.”

Five of the 17 participants (A7, E13, E15, A20, E22) selected option B. E15 stated that the questions were “too philosophical” and didn’t “even want to think about it, so I’ll just pick N, which is B.” Three participants (A7, E13, E22) eliminated A. A7 didn’t verbally consider option C. E22 selected B over C because B included a testing procedure. E13 determined that A and C were not true because, “We’re not sure if...eating the cabbage worm will lead to death during the six hours.” One of the participants (A20) evaluated all three options and determined that all three were good experiments. She selected B because, “O is the easiest for guiding an actual experiment.”

Six of the 17 participants (E1, A5, E10, A14, A21, A25) who provided verbal data selected the correct answer C. Two of the participants (E1, A5) stated having a control group was the criteria they used to choose C. E1 stated, “That makes the most sense because they actually have a control group.” A5 said, “They are dividing them...randomly, one (group) given worms, one group without worms.” Two of the 8 participants (A21, A25) did not verbalize criteria for their choice. A21 simply stated that, “This (C) is the most true.” A25 said, “(A) wrong, (B) normal, ok C.” One of the participants (E10) eliminated A and B as incorrect. He eliminated A

because it mentioned six broods and the original experiment did not say anything about six broods. He eliminated B because the ducklings may die of something else. He stated that C was the most controlled, “It makes the most sense since they’re being fed the worms so they know that they’re eating the worms for sure.” One of the participants (A14) selected C because, “Maybe they will die and maybe they won’t die (in C).”

Table 32

Item-level Verbal Data on TAP Question 40

Description of Response	Participants
Selected A: Used the criteria that A was the simplest, most specific, or most controlled choice	E2, A3**, A4, E6, E19, E23
Selected B: Guessed	E15
Selected B: Eliminated A/Did not consider C	A7
Selected B: Eliminated A/Chose B because it has a testing procedure	E22
Selected B: Eliminated A and C because they were not true	E13
Selected B: Easiest for guiding an actual experiment	A20
Selected C*: Because of control group	E1, A5
Selected C*: Eliminated A and B using flawed process of elimination	E10, A25
Selected C*: Based on possibility of ducks living	A14
Selected C*: Most true	A21
Did not provide meaningful verbal data	A8*, E9, A11, E12, A16, A17, E18*

*Correct answer

**Mismarked answer sheet

Section 6: Definition & Assumption Identification

Section 6 is designed to assess skills in *deduction*, *assumption identification*, and *meaning*. *Deduction* is also assessed in sections 1 and 5. *Meaning* is assessed in section 2.

Section 6 adds the skill of *identifying assumptions*. According to the information provided with

the CCTT, “An assumption fills a gap in reasoning; you must decide what is being taken for granted.” The instructions in this section state, “Items 43 through 46 provide situations in which a definition is called for. From the three definitions that follow each description, pick the one (A, B, or C) that gives the best meaning.” Participants were asked to think-aloud on 2 of 4 questions and achieved a mean aggregate section level score of 1.5/4 ($SD = 1.06$). The think-aloud questions revolve around the definition of a stock car.

Item-level responses on TAP question 43

Question 43 involves a discussion between Bill and his mother. Bill’s mother states “that’s a nice stock car you have there,” and then Bill explains why his car is not a stock car. Based on Bill’s response, the test-taker must choose between three sentences that define the meaning of stock car. Option A includes two contradictory ideas that are both stated in Bill’s response. Option B consists of two clearly stated ideas from Bill’s response that differentiate Bill’s car from a stock car. Option C, the correct answer, is the unstated idea that “a stock car is a standard automobile, as turned out by the factory and sold to the public.” It is this unstated assumption that Bill is reacting against in defining why his car is not a stock car. Three of the 24 participants (A7, E12, E15) did not provide meaningful verbal data.

Seven of the 21 participants (A3, A5, E6, A16, E18, E19, A25) who provided verbal data selected option A. Two participants (A16, A25) evaluated all three options as wrong. A16 did not say why she chose A. A25 only stated, “I think it’s A because from the three choices, this one makes the most sense.” Four of the participants (A3, E6, E18, E19) either ignored or immediately eliminated the correct option C. E6’s initial expression was, “I don’t think it’s C.” A3 said, “First thing it is not C.” After reading C, E18 stated, “No, it’s not C.” A3, E6, and E19 missed that what Bill described was *not* a stock car. For example, E19 stated, “So a stock car is

one with bumpers, ok, no fenders and special bumpers.” A3 expressed, “A stock car is a car that has bumpers made out of heavy pipe.” E6 said, “Ok, so it has heavy pipe and no fenders, ok, missing fenders and special bumpers.” It was unclear why E18 selected A. One of the 7 participants (A5) used her own notion of a stock car as the criteria for choosing A. She stated, “On a normal car that you see, everything is the same, but a car that is stock has much newer details and is much nicer and even more luxurious than a normal car.”

Ten of the 21 participants (E1, A4, A8, E9, E10, A11, A17, A21, E22, E23) who provided verbal data selected B. Two participants (A11, A17) verbally eliminated A and did not consider C, but it was unclear from the verbal data why they selected B. Eight participants (E1, A4, A8, E9, E10, A21, E22, E23) accurately deduced that a stock car has fenders and does not have bumpers made of heavy pipe, but missed the importance of the automobile manufacture and dealer’s showroom in Bill’s response. For example, A4 stated, “Logically a stock car must have fenders and not be made from pipe like he said.” E9 expressed, “He said that...if it turns out with no fenders, its got fenders, so (a) stock car is an automobile that has fenders.” E10 said, “I’m gonna go with B since that’s exactly what he said and they’re asking Bill’s notion.” E22 stated, “As he said, it is, was clear that (he) was mentioning or pin-pointing out the bumpers and about that there are no fenders in the car, so it’s B.” These participants engaged in partial or incomplete analysis of Bill’s response. E1, A4, A8, E9, and E23 only verbally considered B. E10, A21, E22 verbally eliminated C as a possible option stating, “That’s not what he meant” E10, “C is not it, definitely not” A21, “No, it’s not C” E22.

Four of the 21 participants (E2, E13, A14, A20) who provided verbal data selected the correct answer C. Two of the 6 participants (E2, E13) used the information from Bill’s response to create a general definition of a stock car. They then used this definition as the basis for

selecting C as the most strongly supported conclusion. For example, E2 stated, “Making heavy steel pipe for a bumper and a fender means that non-standard work has been done on the vehicle, there is no manufacturer that puts that stuff on to the cars as the standard stock configuration, thus C is...the definition.” E13 expressed, “The right (answer) is C...since B and C include specific things missing...but these...are only found in Bill’s case or there might be other things related to the stock car or the non stock car, so the stock is the standard automobile that is sold by the factory to the public.” One participant (A14) expressed her own conception of a stock car as a fancy, fully-equipped, expensive automobile. She stated that none of the choices were accurate, but did not explain why she chose C. One participant (A20) eliminated A and B as incorrect and selected C by the process of elimination. She stated, “A can’t be correct, B also no, so I can only choose C.”

Table 33

Item-level Verbal Data on TAP Question 43

Description of Response	Participants
Selected A: Evaluated all three answers as wrong. No criteria for choice	A16, A25
Selected A: Ignored or eliminated C. Missed that Bill's description was <i>not</i> a stock car	A3, E6, E19
Selected A: Ignored or eliminated C. Unclear criteria for choice	E18
Selected A: Used own notion of stock car as criteria for choice	A5
Selected B: Partial or incomplete analysis of information	E1, A4, A8, E9, E10, A21, E22, E23
Selected B: Verbally eliminated A, did not consider C	A17, A11
Selected C*: Created general definition as criteria for choice	E2, E13
Selected C*: Verbalized own definition. Did not express criteria for choice	A14
Selected C*: Used process of elimination	A20
No meaningful verbal data	A7, E12, E15

*Correct answer

Item-level responses on TAP question 44

In question 44, Joan provides one condition that is necessary and sufficient to make a car a stock car, "It has an ordinary engine that hasn't been changed since it came off the assembly line." Option A uses information taken from question 43 to define a stock car. The correct answer B reads, "A stock car is an automobile with a standard engine." Option B includes the genus classification of automobile with the differentia of a standard engine to define stock car. Option C states, "A stock car is where the engine is standard." C is incorrect because the phrase "is where" fails to give the general category and as a result "the definition does not provide a set of words equivalent in meaning to the term being defined" (R, Ennis, personal communication,

February 2018). Nine of the 24 participants (A4, A5, E6, A7, A8, A14, E15, A16, E23) did not provide meaningful verbal data.

One of the 15 participants (E9) who provided verbal data selected A. She chose A using the process of elimination. She did not accept Joan's definition of a stock car and assumed that a stock car can have the engine removed and still remain a stock car. As a result, she eliminated B and C because, "They can remove the engine as they want and replace it with another one."

Eight of the 15 participants (E1, E2, E10, E12, E13, E18, E19, A21) who provided verbal data selected the correct answer B. None of the participants produced verbal data that indicated that they selected B for the reasons articulated in the CCTT answer key. Two of the participants (A4, A5) only considered B and provided no clear criteria for their selection. Two of the participants (E1, E12) stated that they did not understand the difference between options B and C and did not provide clear criteria for their selection. For example, referring to B and C, E1 stated, "It's the same." E12 said, "What's the difference (between B and C) no one knows." Two of the participants (E18, E19) verbally eliminated A and provided no clear criteria for their selection. Four of the participants (E2, E10, E13, A21) created criteria for their choice unrelated to either Joan's statement or the answer. For example, E2 stated, "Joan is also not a mechanic so she doesn't know anything about cars, a stock car is an automobile with a standard engine, that's her notion probably, so B." E10 expressed, "Standard engine I guess, not engine is standard. Engines are standard in all cars so I'm gonna go with B." E13 said, "For a car to be called a stock car the main thing or...the first factor should be that the engine is standard from the factory and not changed, other parts come later, so the answer is B (although B does not mention the factory or changed parts)." A21 expressed, "I'm confused between B and C. I don't really understand (the statement) where the engine is standard so I'll put B."

Six of the 15 participants (A3, A11, A17, A20, E22, A25) who provided verbal data selected C. Two of the participants (A11, A17) stated no to A and B and then chose C without verbalizing the criteria for their choice. Two of the participants (A3, A25) said that the answer was C because Joan stated that a stock car has a standard engine. For example, A3 said, “It’s C because it has to have a standard engine in it.” 25A stated, “Right, it said it has an ordinary engine so C.” One of the participants (A20) chose C because, “He said this alone makes it a stock car as if this is sufficient.” One of the participants (E22) used criteria that was not included in the answer choice. She said, “It’s the issue of...not changing the engine for a long time...so C.”

Table 34

Item-level Verbal Data on TAP Question 44

Description of Response	Participants
Selected A: Used process of elimination	E9
Selected B*: Verbalized they did not understand difference between B and C. No criteria for choice	E1, E12
Selected B*: Eliminated A. No criteria for choice	E18, E19
Selected B*: Created unstated criteria	E2, E10, E13, A21
Selected C: Eliminated A and B. No criteria for choice	A11, A17
Selected C: Based on statement that a stock car has a standard engine	A3, A25
Selected C: Based on statement that this alone makes it a stock car	A20
Selected C: Created unstated criteria	E22
Did not provide meaningful data	A4*, A5*, E6*, A7, A8, A14, E15*, A16*, E23*

*Correct answer

Section 7: Assumption Identification

Section 7 consists of 6 questions designed to assess skills in *deduction* and *assumption identification*. Participants were asked to think-aloud on 3 of 6 questions and achieved a mean aggregate section level score of 2.46/6 ($SD = 1.50$).

On each question a speaker makes a statement referring to the behavior of children in the city of Galton. The test-taker is informed that “an assumption is a statement that is taken for granted” and asked to identify the unstated assumption in each item. According to the CCTT answer key, the test-taker is required to deduce which statement fills a gap in reasoning (p. 47). The correct answer for each question is the premise of a syllogism. The conclusion of the syllogism is either that Galton’s children misbehave or behave properly. The question statement includes the middle term of the syllogism. For example, question 50 reads, “The fact that Galton’s children have been forced to work explains their misbehavior.” The correct answer is, “Children who have been forced to work behave improperly.” To restate this question in the form of a syllogism, it would read, “Children who have been forced to work behave improperly, Galton’s children have been forced to work, therefore Galton’s children behave improperly.”

Each question presents three possible answers. As mentioned above, the correct answer is the premise of the syllogism. One of the incorrect answers presents the premise of the syllogism with the terms reversed. For example, on question 50 instead of, “Children who have been forced to work behave improperly,” option B reads, “Children who behave improperly have been forced to work.” The other incorrect answer presents the opposite form of the premise. On question 50 instead of, “Children who have been forced to work behave improperly,” option A reads, “Children who have never been forced to work behave properly.”

None of the participants who provided verbal data attempted to answer the question or identify the gap in reasoning by analyzing the relationship between terms and premise. Six of the participants (E1, E15, A16, E19, A21, E22) never selected an answer with the terms reversed. Five of the participants (A3, E6, A8, A14, A17) never selected an answer with the opposite form of the premise. Two of the participants (E19, A20) never selected the correct answer. Twelve of the participants (E2, A4, A5, A7, E9, E10, A11, E12, E13, E18, E23, A25) selected at least one choice from all three types of answers.

Table 35

Selection Patterns on Section 7 Questions

Selection Patterns	Participants
Never selected an answer with reversed terms	E1, E15, A16, E19*, A21, E22
Never selected an answer with opposite form of the premise	A3, E6, A8, A14, A17
Never selected a correct answer	E19*, A20
Selected at least one choice from all three types of answers	E2, A4, A5, A7, E9, E10, A11, E12, E13, E18, E23, A25

*Fit in two categories

Selection patterns on TAP questions 47 and 48

Questions 47 and 48 are the same syllogism with opposite middle terms. Question 47 states that “children have been severely punished” and therefore misbehave. Question 48 states “these youngsters have never been punished” and therefore misbehave. Four of the 24 participants (E2, A8, E15, E22) selected the correct answer on both questions. Three of the 24 participants (A3, A11, A14) selected the flipped middle term on both questions. Four of the 24 participants (A16, E19, A20, A21) selected the opposite form of the premise on both questions. Four of the 24 participants (E1, A4, A7, E12) selected answers consistent with a particular point of view on punishment and misbehavior. Six of the 24 participants (E6, E10, A17, E18, E23,

A25) selected one correct answer and one flipped middle term answer. Three of the 24 participants (A5, E9, E13) produced inconsistent selection patterns.

Table 36

Selection Patterns on TAP Questions 47 and 48

Selection Patterns	Participants
Both correct answers	E2, A8, E15, E22
Both flipped middle term	A3, A11, A14
Both opposite form of premise	A16, E19, A20, A21
Consistent with particular point of view on punishment and misbehavior	E1, A4, A7, E12
One correct answer and one flipped middle term answer	E6, E10, A17, E18, E23, A25
Inconsistent selection pattern	A5, E9, E13

Nine of the 24 participants (E2, A7, A8, E10, E12, A16, A17, E18, A25) did not provide meaningful verbal data.

Eight of the 15 participants (A3, A11, A14, E15, E19, A20, A21, E22) who provided verbal data selected the same type of answer on both questions indicating the possible use of the same criteria on both questions. Two participants (E15, E22) selected the correct answer on both questions although they expressed that the correct answer and the opposite form answer are the same. On question 47, E15 stated, “A and C...revolve around the same meaning but in two different ways.” E22 said, “The assumption is that children who are severely punished misbehave although children who haven’t been severely punished also behave properly.” E15 did not provide a clear reason for her choice of A over C. E22 selected the correct answer A because the opposite form answer was “not mentioned in the statement.” Three participants (A3, A11, A14) selected the flipped middle terms answer on both questions. On question 47, A3 selected the flipped middle term because it was the clearest restatement of the main idea in the question. She stated, “Because they misbehave maybe they’ve been severely punished.” On

question 48, she based her choice on her personal opinion about punishment expressing, “No, definitely they need to be punished...if there is no punishment their misbehavior will definitely continue, definitely B.” A14 expressed her personal opinion and then considered all the options the same on both questions. She agreed with the ideas in question 47 and disagreed with the ideas in question 48, but did not provide clear verbal processes that explained her choices. Three participants (E19, A20, A21) selected the opposite form of the correct premise on both questions. E19, A20, and A21 equated the term unspoken assumption with unspoken phrase. These participants selected their choice based on the criteria that the opposite form of the premise included words not mentioned in the question. For example, A20 stated, “Now they want an assumption that is not spoken and A is spoken, also (B) is spoken...and (C) is unspoken.”

Two of the 15 participants (E1, A4) who provided verbal data selected answers on questions 47 and 48 that were consistent with a particular point of view about the relationship between punishment and misbehavior. E1 presented inconsistent reasoning processes and did not clarify the criteria she used to make her choice. A4 only evaluated one option on question 47 and concluded that all three options were the same and not logical on question 48. It was unclear why she chose her answers.

Two of the 14 participants (E6, E23) who provided verbal data selected one correct answer and one answer with flipped middle terms. E23 agreed with the correct answer A on question 47 but selected B because, “It should be the other way around.” E6 assessed what she thought was the emphasis of the speaker and selected A on question 47 because, “He emphasized that the real problem is in the...severe punishment itself,” and B on 48 because, “B provides more of an explanation for the behavior rather than the punishment.”

Three of the 15 participants (A5, E9, E13) who provided verbal data produces inconsistent selection pattern. A5 and E9 made their choices based on personal opinions about punishment in child-rearing. A5 expressed, “It’s true the reason might be because they’ve been severely punished but we can’t apply this to the whole world,” and, “In my opinion, punishment is very important in child-rearing. Children, when they do something wrong and aren’t punished will definitely continue to misbehave.” E9 stated, “Children who have (been) severely punished, yes, misbehave because if they get punished all the time it’s not gonna matter anymore,” and, “From time to time punishment should be done so I think that yes children (who) are punished also behave properly.” E13 selected C on question 47 because the phrase “behave properly” was not stated. On question 48, his reasoning processes were confused and difficult to understand.

Table 37

Item-level Verbal Data on TAP Questions 47 and 48

Selection Patterns	Participants
Correct answer: Opposite form also true	E15, E22*
Correct answer: Opposite form not mentioned	E22*
Flipped middle terms: Personal opinions, no criteria for selection	A3, A11, A14
Opposite forms: Unspoken assumption understood as unspoken phrase	E19, A20, A21
Consistent point of view	E1, A4
One correct, one flipped middle term: matter of emphasis	E6
One correct, one flipped middle term: Should be other way around	E23
Inconsistent selection patterns	A5, E9, E13
No meaningful verbal data	E2, A7, A8, E10, E12, A16, A17, E18, A25

*Fit in two categories

Item-level responses on TAP question 49

Question 49 does not have an obvious gap-filler. The test-taker must identify that the correct answer “Children who behave badly have been punished at some time” is roughly equivalent to more obvious gap-filler “children who are not punished will behave well” (p. 47). Participants received their lowest item-level score in section 7 on question 49. Five of the 24 participants (A3, E6, A8, A14, A16) selected the correct answer A. Eleven of the 24 participants (E1, A5, A7, E10, A11, E12, E15, E19, A21, E22, E23) selected the opposite form choice B. Eight of the 24 participants (E2, A4, E9, E13, A17, E18, A20, A25) chose the flipped terms option C. Eleven of the 24 participants (A3, A5, A7, A8, A11, E12, A14, E15, A16, A17, E18,) did not provide meaningful verbal data.

One of the 13 participants (E6) who provided verbal data selected the correct answer A. E6 expressed that the correct answer was A and not B because of the verb tense. She stated, “Ok, that’s because he said that would take care of things which means that they’re already behaving badly and there must be something to be done about the issue and he’s assuming that all the children who behave badly have been punished at some point therefore what should be done is to never punish them later on, so I guess it’s A.”

Six of the 13 participants (E1, E10, E19, E22, A21, E23) who provided verbal data selected B and concluded that the statement meant that you are not supposed to punish a child because punishment will lead the child to misbehave. They used some form of the restated question as the criteria for their choice of B. E1 said, “Not punishing them is the answer for their behavior, so B is the assumption.” E10 stated, “So do not punish I guess is equal to no problem...I think this one (B) makes sense because to not is no problem but if you punish them they will misbehave, so I’m gonna go with B.” E19 expressed, “Never punish that they can

behave...that will take care of things if we never punish them, ok, B.” E22 said, “So the assumption over here is the children who are punished will misbehave, that’s why on the safe side we’re not supposed to punish any child so that...this would not lead him...to misbehave, so it’s B.” E23 stated, “It’s B since...he said to never punish them meaning...that would take care of things, meaning they will not cause any trouble or misbehave.” One of the 11 participants (A21) chose B because the words in B were not mentioned in the statement. She said, “(B) is the most correct or the one not mentioned is B.”

Six of the 13 participants (E2, A4, E9, E13, A20, A25) who provided verbal data selected C. E2 disagreed with the statements and then restated the question as the criteria for his selection. He stated, “His assumption would be that children who behave properly have never been punished, children who behave badly have been punished, yeah, if we stop punishing them that would take care of things. So if they’re no longer punished or if they have never been punished they will no longer behave improperly, so I guess his assumption is C.” A4 eliminated option B because of the verb tense of the statement. She stated, “(B) the assumption is this is something that already happened not something that will happen in the future...so not the second one.” She did not provide verbal data that explained why she chose C instead of A. E9 made her selection based on her personal opinion. E13 chose C because he concluded it was the wrong assumption. He said, “(A) this is an assumption since he said we should never punish them, (B) yes it may be an assumption, (C) ok, this is the wrong assumption.” A20 selected C because it was unclear who said C. She said, “(C) is unspoken because it is not know who said this and we can’t know.” A25 stated that all three answers were not answers for this question and then selected C.

Table 38

Item-level Verbal Data on TAP Question 49

Description of Response	Participants
Selected A*: Used criteria of verb tense	E6
Selected B: Restated question and used statement as the criteria for choice	E1, E10, E19, E22, E23
Selected B: Word in B not mentioned in answer choice	A21
Selected C: Eliminated B based on verb tense. No criteria for C over A	A4
Selected C: Restated question and used statement as the criteria for choice	E2
Selected C: Used personal opinion as criteria for choice	E9
Selected C: Because it was the wrong assumption	E13
Selected C: Because it is unclear who said option C	A20
Selected C: All three answers wrong	A25
Did not provide meaningful data	A3*, A5, A7, A8*, A11, E12, A14*, E15, A16*, A17, E18

*Correct answer

Research Question 2

Ten Sample Reasoning Mindset Test questions designed to assess the critical thinking dispositions of *inquisitiveness*, *open-mindedness*, *truth-seeking*, *critical thinking self-confidence*, and *maturity* were used in this study. Each disposition was addressed through two 6-point, Likert-Scale questions. Participants were asked to use a TAP Protocol to read the questions and make their selections. In addition, they were asked to verbally explain the reason for their selection choices. The verbal data were collected and coded based on the way that participants framed their responses. Predetermined categories were used to code answers framed in pragmatic, moral, logical, personal type/nature, religious, situational, social/relational, and

ideological terms. Additional patterns that emerged in the verbal data were labelled and utilized as appropriate. The verbal data were examined to address the following research question.

2. How do undergraduate Lebanese students frame and self-report on critical thinking questions from Insight Assessment's Sample Reasoning Mindset Test designed to assess dispositions toward *inquisitiveness*, *open-mindedness*, *truth-seeking*, *critical thinking*, *self-confidence*, and *maturity*?

Disposition of *Inquisitiveness*

Two questions from the SRMT were selected to measure the critical thinking disposition of *inquisitiveness*. Question one stated, *I need to know the reasons why things happen*. Question nine read, *I prefer assignments where I am told exactly what to do and how to do it*. Each participant's critical thinking disposition of *inquisitiveness* was calculated on a scale of 2-12 based on Likert-scale responses to these two questions. A score of two indicates the strongest disposition of *inquisitiveness* and a score of 12 indicates the weakest disposition of *inquisitiveness*. Eighteen of 24 participants (E1, E2, A3, A4, E6, E9, E10, E12, A14, E15, A16, A17, E18, A20, A21, E22, E23, A25) achieved a score of six or lower indicating a positive disposition of *inquisitiveness*.

Table 39
Likert-scale Response Scores for the Disposition of Inquisitiveness

Disposition Score	Participants
3	A20
4	A14, A17, E23, A25
5	E1, A4, E9
6	E2, A3, E6, E10, E12, E15, A16, E18, A21, E22
7	A8, A11, E13
8	A5, A7
9	E19

The verbal processes of the participants were examined to identify the ways that participants framed each question.

SRMT question one

On question one, *I need to know the reasons why things happen*, ten participants (E1, A3, A5, A7, E10, E15, A20, E22, E23, A25) framed their answers in the pragmatic terms of how they could benefit from information or only having an interest in information that would impact them directly. Four participants (E12, E13, E18, E19) framed answers in the general ideological terms. Three participants (A11, A14, A20) framed answers in primarily religious terms. Two participants (A4, E6) framed answers in the pragmatic terms of psychological well-being. Three participants (A17, A20, E23) framed their answers in terms of their personal type/nature. One participant's answer (A21) did not fit a specific category. Four participants (E2, A8, E9, A16) provided no meaningful verbal data.

Table 40

Framing of SRMT Statement: I need to know the reason why things happen

Ways Answers were Framed	Participants
Framed in pragmatic terms of benefit or direct impact	E1, A3, A5, A7, E10, E15, A20*, E22, E23*, A25
Framed in general ideological terms	E12, E13, E18, E19
Framed in primarily religious terms	A11, A14, A20*
Framed in pragmatic terms of well-being	A4, E6
Framed in terms of personal type/nature	A17, A20*, E23*
No category	A21
No meaningful verbal data	E2, A8, E9, A16

*Fit in multiple categories

Item-scale responses to SRMT question one

Eight of the 24 participants (E1, A3, E9, E12, A14, A16, E18, A20) *strongly agreed* with the question one statement "I need to know the reason why things happen." Two of the 8

participants (E9, A16) provided no clear or meaningful verbal data. Two of the 8 participants (E12, E18) expressed in ideological terms that everything happens for a reason. E12 stated, “I strongly agree because everything happened for a reason, almost everything happened for a reason, so I should know the reasons to know the results (of) why he did this or didn’t (do) that, why this event happened this day.” E18 said, “Things happen...for a reason, so that’s why I agree strongly.” Two of the 8 participants (A14, A20) framed the answer in terms of religion and personal responsibility. A14 stated, “I want to know why things happen, is it because it was what God willed? Or is it because of what I’ve done? Or is it God’s decree and predestined? Is it something that’s going to happen no matter what?” A20 said, “Why did this happen? Is it because I did it or because of a specific mistake or just something related to who I am as a Sunni Muslim? In addition, I want to deal with it, is there a specific lesson I need to learn?” A20 also stated in pragmatic terms, “How can I benefit from the people and things around me,” and expressed in terms of her personal nature/type, “I strongly agree...because I have the curiosity to know.” Two of the 8 participants (E1, A3) primarily framed their answers in pragmatic terms. E1 stated, “I have to...critically think about it to understand why it happened so I can benefit from it and I can take the positive aspect from it and not just say that well everything happens just for a reason.” She rejected the idea that everything happens for a reason and emphasized personal autonomy saying, “Everything I do is because I chose it, so that’s why I need to understand...the reason for everything.” A3 expressed, “It is important that I know how and why things happen so I can understand more about what is happening with me.”

Six of the 24 participants (A8, A11, E15, A17, E23, A25) *agreed* with the statement “I need to know the reason why things happen.” One of the 6 participants (A8) did not provide meaningful verbal data. Two of the 6 participants (E15, A25) framed their answer in pragmatic

terms. E15 said, “For example...a problem that I faced I want to know how to avoid it next time and if it was something good I want to know...the steps that or things that led to this good occasion.” A25 stated, “For example, if someone is telling me something that happened with him and wants a solution, if I don’t know how it happened...I won’t know how to answer to help him.” One of the 6 participants (A17) framed her answer in terms of personal nature/type. A17 stated, “I agree because I’m curious to know.” One of the 6 participants (E23) used a mixture of personal nature/type and pragmatic terms. She said, “I’m someone who’s very logical so for me to do something most of the time I need to know why.” One of the 6 participants (A11) framed his answer in terms of religion and personal responsibility. He said, “It depends on what is happening. There are things that are predestined to happen, things that you choose to happen, things that happen so you’ll do something... Nothing happens without a reason. Maybe it is fate or maybe you’re the reason for the problem...or maybe someone else is the cause.”

Eight of the 24 participants (E2, A4, A5, A7, E10, E19, A21, E22) *agreed a little* with the statement “I need to know the reason why things happen.” One of the 8 participants (E2) did not provide meaningful verbal data. Five of the 8 participants (A4, A5, A7, E10, E22) answered the question in pragmatic terms. A5 stated, “Sometimes we are responsible for what happens and sometimes others are responsible. So we need to know what is happening so we can avoid things, but if it is something outside our control or will, then there is no reason to know it.” A7 expressed, “If things are happening, like if the resistance is fighting so and so, I’m not interested in that. But recently, I know that there might be a war, this is something I want to know...But if something happens unrelated to my country or me...I’m not interested in what happened or why it happened.” E10 answered, “I would like to know the reasons why things happen if the reasons are tied to me, not to anyone else, or close friends and mostly family and myself. If it’s

for...friends that I don't really know, I wouldn't really care why things happen to them." E22 said, "I agree a little bit because this gives me a kind of control on everything that's going on in my life...agree a little bit because over thinking about it or... knowing every single reason or detail is an extreme." A4 framed her answer in the pragmatic terms of psychological well-being. She stated, "Sometimes when I know why things happen, it comforts me, I feel like I'm in control...but other times if I'm seeing why...bad things happen in the world like wars...it has a negative emotional impact on me." One of the 8 participants (E19) framed the answer in ideological terms. She stated, "Everything happens for a reason," but didn't explain why she agreed a little. One of the 8 participants (A21) was only interested in knowing answers to essential human questions, but not interested in knowing information about her personal experience. She said, "I want to know why we are here...why we were created...what will happen when we die...how the heart works...but there are things I don't really want to know. For example, things that happen suddenly or what will happen tomorrow...or when I'll die."

Two of the 24 participants (E6, E13) *disagreed a little* with the statement "I need to know the reason why things happen." One of the 2 participants (E6) framed the question in the pragmatic terms of psychological well-being. She said, "If I tire myself with constantly asking why did this happen, why didn't this happen...I don't think and I'm going to be able to live a happy life or at least a low stress sort of life and it's really important for you to be you to be happy." One of the 2 participants (E13) responded in ideological terms saying, "There are some things that cannot be known, they are mysterious for scientists even though (they have been) studying things for many long years."

Table 41

Verbal Data on SRMT Statement: I need to know the reason why things happen

Description of Response	Participants
Strongly Agree: Ideological terms, everything happens for a reason	E12, E18
Strongly Agree: Religious terms/Determining personal responsibility	A14, A20*
Strongly Agree: Pragmatic terms, personal benefit, personal impact	E1, A3
Strongly Agree: No meaningful verbal data	E9, A16
Agree: Pragmatic terms, personal benefit, helping others	E15, A25
Agree: Type/Nature of person, curious	A17
Agree: Mix of type/nature, pragmatic terms	E23
Agree: Religious terms/Determining personal responsibility	A11
Agree: No meaningful data	A8
Agree a little: Pragmatic terms, personal impact, control	A5, A7, E10, E22
Agree a little: Pragmatic terms, well-being	A4
Agree a little: Ideological terms, everything happens for a reason	E19
Agree a little: Essential human questions, not personal experience	A21
Agree a little: No meaningful verbal data	E2
Disagree a little: Pragmatic terms, well-being	E6
Disagree a little: Ideological terms, some things can't be known	E13

*Also answered in personal nature/type and pragmatic terms

SRMT question nine

On question nine, *I prefer assignments where I am told exactly what to do and how to do it*, eight participants (E2, E6, E10, A17, A20, E22, E23, A25) framed answers based on the values of creativity, independence, and self-reliance. Seven participants (E1, A4, E9, E13, A14, E15, A21) framed answers situationally. Six participants (A3, A5, A8, A11, E18, E19) framed

answers in pragmatic terms. One participant (A16) framed the answer in general ideological terms. Two participants (A7, E12) provided no meaningful verbal data.

Table 42

Framing of SRMT Statement: I prefer assignments where I am told exactly what to do and how to do it

Ways Answers were Framed	Participants
Value of creativity, independence, and self-reliance	E2, E6, E10, A17, A20, E22, E23, A25
Framed situationally	E1, A4, E9, E13, A14, E15, A21
Framed in pragmatic terms	A3, A5, A8, A11, E18, E19
Framed in ideological terms	A16
Provided no meaningful verbal data	A7, E12

Item-scale responses to SRMT question nine

Five out of 24 participants (E6, A17, A20, E23, A25) *disagreed* with the question nine statement *I prefer assignments where I am told exactly what to do and how to do it*. Three of the 5 participants (E6, A20, E23) expressed that they disagreed because they value creativity. A20 stated, “(The assignment) shouldn’t be very constrained to the extent that I can only do what is required because I know I can be creative as long as I’m given the general idea and how I’m supposed to work.” E23 said, “I would like some space...so I can be creative and do it my way.” E6 expressed, “I really believe that assignments should reflect in a way or another upon the person’s creativity, the person’s way of thinking, the person’s personality.” In addition, E6 emphasized the importance of self-expression stating, “Many students really underestimate their ability because they cannot fully express themselves because their assignments are really limited.” Two of the 5 participants (A17, A25) focused on the importance of self-reliance and initiative as the reason for preferring not to be told how to do an assignment. A17 said, “I don’t prefer this because in university you need to rely on yourself a lot.” A25 expressed, “I don’t

prefer to be told everything because I need to know when to take initiative to do something specific...to challenge myself.”

Six out of 24 participants (E2, E10, E13, A14, A21, E22) *disagreed a little* with the question nine statement *I prefer assignments where I am told exactly what to do and how to do it*. Two of the 6 participants (E10, E22) expressed the importance of creativity and independence. E10 said, “I like a little bit of creativity...I like being told what to do but I don’t like being (told) how to do it, I like doing it in my own way...I like some independence and freedom.” E22 expressed, “I do prefer assignments that are clear in the matter of what to do but now how to do it. I completely hate it when I get an assignment that (is) really structured...I’m more into the creative aspect. I love to be creative...I need to put a plan, but I would be the one who would put that plan.” Three of the 6 participants (E13, A14, A21) framed their answers situationally. E13 stated, “There are assignments it is better to know how exactly to do it and there are some assignments that need critical thinking and analysis.” A14 said, “Definitely there are things where I like to be told how to do something, to be pampered...but there are things that I like to think about, things I’m interested in, I like to think about the way to do it...but other things, no, I prefer to be told what to do and then be done with it.” A21 framed her answer situationally in terms of how she feels. She stated, “When someone tells me what I need to do and how to do it, I feel a bit reassured about the assignment, I feel I can do the assignment quickly. But I sometimes also like to do work whenever I want...not necessarily have to make a plan to complete the assignment.” One of the 6 participants (E2) valued initiative and self-reliance. He expressed that he likes to use the tools he has acquired in class to solve the assignment. He said, “If the assignment contains steps on what you should do then it’s not an assignment...assignments in life and work are not IKEA items.”

Four of the 24 participants (A4, E15, E9, E1) *agreed a little* with the statement *I prefer assignments where I am told exactly what to do and how to do it*. Two of the 4 participants (E1, A4) answered situationally, they generally like to be told what to do but also like some freedom. E1 said, “(When) I’m given something for the first time I actually don’t know how to do it and exactly what to do so in certain places I do need to be told what to do and how to do and then after that I can do it on my own.” A4 expressed, “I prefer for someone to tell me what to do so I can know how to do it the most appropriate and best way, but sometimes I like to be given space and freedom to figure out myself what the best way is for me.” Two of the 4 participants (E9, E15) expressed their answers situationally, depending on the assignment. E9 stated, “Sometimes no...um yeah, I prefer like I should do this.” E15 said, “I agree a little depending on the assignment.”

Eight of the 24 participants (A3, A5, A7, A8, A11, E12, A16, E18) *agreed* with the statement *I prefer assignments where I am told exactly what to do and how to do it*. Five of the 8 participants (A3, A5, A8, A11, E18) framed their answers in pragmatic terms. They said that being told what to do and how to do it makes things easier, gives good results, and makes everyone satisfied. For example, A3 stated, “The most important thing is for someone to be clear about what he wants. If someone is clear about what he wants, the second person can do what the first person wants efficiently and both parties will be satisfied.” A5 expressed, “This is better so that the results is assured...and faster...and better than having to figure it out himself.” A8 said, “I agree because it will be easier for you if you know what you need to do and how to do it.” A11 expressed, “Definitely, if you know the way to do it and how to get there, it is definitely a better assignment...they are deciding the way that is easiest for you. It is definitely better than you deciding and carrying the responsibility.” E18 stated that she likes to be told what to do

because, “Maybe I will do the wrong part of the assignment and I will not (be) able to do it as she or he wants, so of course, I prefer to be told.” One of the 8 participants (E12) answered based on his personal type/nature. He expressed, “I agree because I don’t like my assignments because it’s in my nature...yeah, because I want to need to do it and finish.” One of the 8 participants (A16) answered in ideological terms. She said, “Definitely, the whole world is like that.” One of the 8 participants (A7) provided limited verbal data. A7 only stated, “I like someone to tell me do this and this.”

One of the 24 participants (E19) *strongly agreed* with the statement *I prefer assignments where I am told exactly what to do and how to do it*. She stated in pragmatic terms, “It’s either I know exactly what the instructor tells me to do or I wouldn’t do it just like you, he, or she wants.”

Three participants (E10, E22, E23) made the specific distinction between being told what to do and being told how to do it. For example, E10 stated, “I like being told what to do but I don’t like being (told) how to do it. E22 stated, “I do prefer assignments that are clear...in the matter of what to do but not how to do it.” E23 said, “I prefer that instructions be clear, but not to be told how to do it.”

Table 43

Verbal Data on SRMT Statement: I prefer assignments where I am told exactly what to do and how to do it

Description of Response	Participants
Disagree: Values creativity	E6, A20, E23*
Disagree: Values initiative and self-reliance	A17, A25
Disagree a little: Values creativity and independence	E10*, E22*
Disagree a little: Situationally depends on the type of assignment	E13, A14
Disagree a little: Situationally depends on the how she feels	A21
Disagrees a little: Values initiative and self-reliance	E2
Agree a little: Situational, generally like to be told what to do but also like freedom	E1, A4
Agree a little: Situationally depends on the type of assignment	E9, E15
Agree: Pragmatic, easier, good results, everyone happy	A3, A5, A8, A11, E18
Agree: Type/Nature of person	E12
Agree: Ideological terms, everyone's preference	A16
Agree: No meaningful verbal data	A7
Strongly Agree: Pragmatic, wants to do it right	E19

*Distinguished between being told what to do and how to do it.

Disposition of Open-mindedness

Two questions from the SRMT were selected to measure the critical thinking disposition of *open-mindedness*. Question two stated, *Once I have made my decision, I do not change my mind*. Question five read, *Only weak-minded people change their minds*. Each participant's critical thinking disposition of *open-mindedness* was calculated on a scale of 2-12 based on Likert-scale responses to these two questions. A score of 12 indicates the strongest disposition of *open-mindedness* and a score of 2 indicates the weakest disposition of *open-mindedness*.

Eighteen of 24 participants (E1, E2, A4, A5, E6, E9, E10, E12, E13, A14, E15, A16, A17, E19, A21, E22, E23, A25) achieved a score of 8 or higher indicating a positive disposition of *open-mindedness*.

Table 44

Likert-scale Response Scores for the Disposition of Open-mindedness

Disposition Score	Participants
12	E12, E13
11	E9, A14, A16, A21
10	E1, E2, E10, E22
9	A4, A5, E6, E19, E23, A25
8	E15, A17
7	A7, A8, E18, A20
5	A3, A11

The verbal processes of the participants were examined to identify the ways that participants framed each question.

SRMT question two

On question two, *Once I have made my decision, I do not change my mind*, eight participants (E2, A4, A5, E9, E10, A14, A16, A17) framed the answer by describing the type of decision they would change. Six participants (E6, A7, E15, E19, A20, E22) framed the answer in terms of their personal type/nature. Three participants (E1, E13, A21) framed their answer situationally and discussed the role of circumstances in changing their minds. Three participants (A3, A11, E23) framed the answer based on confidence in their decision-making process. Two participants (E12, A25) framed their answer in the logical terms of if they were convinced. Two participants (A8, E18) provided no meaningful verbal data.

Table 45

Framing of SRMT Statement: Once I have made my decision, I do not change my mind

Ways Answers were Framed	Participants
Change based on type of decision	E2, A4, A5, E9, E10, A14, A16, A17
Framed in terms of type/nature	E6, A7, E15, E19, A20, E22
Framed situationally, based on circumstances	E1, E13, A21
Framed in terms of self-confidence	A3, A11, E23
Framed in logical terms	E12, A25
Provided no meaningful verbal data	A8, E18

Item-scale responses to SRMT question two

Three out of 24 participants (E12, E13, A14) *strongly disagreed* with the question two statement *Once I have made my decision, I do not change my mind*. One of the 3 participants (E13) focused on the role of circumstances in changing his mind. He stated, “Once I have made my decision many things may happen, maybe I’ll be forced to change my mind due to the circumstances around me, something suddenly happened, unexpected never came to my mind...most of the time I am not sure (one) hundred percent, so I might change my mind.” One of the 3 participants (A14) framed her answer based on the type of decision. She expressed, “Of course I change my mind because sometimes I make a quick decision and decide without enough knowledge and later I change my mind.” One of the 3 participants (E12) framed his answer in logical terms. He said that he always changes his mind if he is convinced.

Five of the 24 participants (E1, E2, E9, A16, A21) *disagreed* with the question two statement *Once I have made my decision, I do not change my mind*. Three of the 5 participants (E2, E9, A16) framed their answer based on the type of decision. For example, E2 equated educated decisions with those that lead to financial prosperity and uneducated decisions with those that lead to poverty. He stated that you should change your mind if you make an uneducated choice. E9 stated, “Sometimes I take a decision...very quickly or without thinking

about it and then I regret my decision.” A16 said, “There are things where I don’t really think about it.” Two of the 5 participants (E1, A21) focused on the role of circumstances in changing their minds. E1 said, “Everything is always changing...(I) might be in a certain state of mind when (I) makes this decision but can change it because something might happen...that affects the decision.” A21 expressed, “A lot of times I take decisions and then something changes in my life or circumstances or something and I change my decision.”

Nine of the 24 participants (A4, A5, E10, A17, E18, E19, A20, E22, A25) *disagreed a little* with the statement *Once I have made my decision, I do not change my mind*. Four of the 9 participants (A4, A5, E10, A17) framed their answer based on the type of decision. These participants referenced changing a wrong or stupid decision. For example, A4 stated, “When I make a decision and later find out more information, it helps me to review my decision...or maybe I assumed something and it turned out to be wrong, I will definitely change my mind.” A5 said, “Sometimes my choice is wrong...in addition I need to stay open to allowing others to correct me...you need to listen to the opinion of others to at least make sure that your decision won’t lead you to something wrong.” E10 described making a stupid decision. He said, “I would change my mind if the decision...was in a bad time, drunk, something else like that, and if my decision was stupid. I would not change my decision basically (if) I’m bound to an agreement, contract...if it’s in a professional field.” A17 expressed, “I disagree (a little) because sometimes I rethink something again and find out that I was wrong.” Three of the 9 participants (E19, A20, E22) answered based on their personal type/nature. E19 stated, “I do change my mind because I’m a hesitant person (and) sometime I overthink something right after I’ve made a decision.” A20 expressed, “Sometimes I think too much about things because of my nature, I am afraid I’m not giving something its due.” E22 said, “Things might change so I need to, I am an adaptable

person basically, so if something had changed or other plans had popped up, I basically need to change my mind.” One of the 9 participants (A25) framed her answer in logical terms. She stated, “Sometimes I make a decision and see it from a particular point of view and then maybe someone else comes and changes my mind. If he changes my mind I can change my decision if he was truly convincing.” One of the 9 participants (E18) provided no meaningful verbal data.

Four of the 24 participants (E6, A11, E15, E23) *agreed a little* with the statement *Once I have made my decision, I do not change my mind*. Two of the 4 participants (E6, E15) framed their answers based on their personal type/nature. For example, E6 stated, “I’m a moody person so I think I’ve mixed both but when I take a serious decision I don’t really back out from it. I either take the decision and continue to the very end of it or I don’t (take the decision) from the first place.” E15 said, “It’s tough for me to make a decision because I follow my emotions most of the time, but once I made it, I do not change unless something really urgent occurs.” Two of the 4 participants (A11, E23) framed their answers in terms of self-confidence. A11 expressed, “When I make a decision I am convinced that it is the right decision, the right choice, and I don’t want to change my decision because I have conviction about the decision, it is a good decision, the best decision for me...and if I changed my decision it might cause a bigger problem.” E23 stated, “It takes me a lot to make a decision so when I do make a decision I try not to change it.”

One of the 24 participants (A8) *agreed* with the statement *Once I have made my decision, I do not change my mind*. A8 did not provide sufficient verbal data to categorize his response. He only stated, “Most of the time I don’t like to change my mind.”

Two of the 24 participants (A3, A7) *strongly agreed* with the statement *Once I have made my decision, I do not change my mind*. One of the 2 participants (A3) framed her answer in terms of self-confidence. She said, “I strongly agree because when I make a decision I have

thought about it a lot and I don't make quick decisions. Because of this I don't change my decision because I am sure of it." One of the 2 participant (A7) answered based on her personal type/nature. She expressed, "I feel like I'm stubborn when I make a decision. I'm a really stubborn person...I don't change my decision even if it's something I regret."

Table 46

Verbal Data on SRMT Statement: Once I have made my decision, I do not change my mind

Description of Response	Participants
Strongly Disagree: Type of decision, quick/uninformed	A14
Strongly Disagree: Circumstances impact decision	E13
Strongly Disagree: If convinced of different perspective	E12
Disagree: Type of decision, uneducated/quick	E2, E9, A16
Disagree: Circumstances impact decision	E1, A21
Disagree a little: Type of decision, wrong/stupid	A4, A5, E10, A17
Disagree a little: Type/Nature, hesitant, overthinking, adaptable	E19, A20, E22
Disagree a little: If convinced of different perspective	A25
Disagree a little: No meaningful verbal data	E18
Agree a little: Type/Nature, moody, emotions	E6, E15
Agree a little: Self-confident	A11, E23
Agree: Insufficient verbal data	A8
Strongly Agree: Self-confident	A3
Strongly Agree: Type/Nature, stubborn	A7

SRMT question five

On question five, *Only weak-minded people change their minds*, thirteen participants (A4, A5, E6, A7, A8, E12, E13, A14, E19, A20, E22, E23, A25) framed their answers in general ideological terms. Five participants (E1, E9, E10, E15, E18) framed the answer in terms of personal experience. Four participants (E2, A16, A17, A21) framed the answer in the pragmatic terms of change is for the better. One participant (A3) framed her answer situationally. One participant (A11) misunderstood the statement.

Table 47

Framing of SRMT Statement: Only weak-minded people change their minds

Ways Answers were Framed	Participants
Framed in ideological terms	A4, A5, E6, A7, A8, E12, E13, A14, E19, A20, E22, E23, A25
Framed in terms of personal experience	E1, E9, E10, E15, E18
Framed in pragmatic terms	E2, A16, A17, A21
Framed situationally	A3
Misunderstood statement	A11

Item-scale responses to SRMT question five

Nine out of 24 participants (E6, A7, E9, E10, E12, E13, A16, A21, E23) *strongly disagreed* with the question five statement *Only weak-minded people change their minds*. Five of the 9 participants (E6, A7, E12, E13, E23) framed their answers in ideological terms. E6 and E13 stated that the willingness to change one's mind is a characteristic of strong-mindedness and maturity. E6 said, "I will go to extremes in this one even though I really don't like to go to extremes, but sometimes really open and strong-minded people choose to change their minds and their mentality...Actually, I find it really important that people change their mind." E13 expressed, "Changing their minds after knowing their mistakes shows that they are well-matured people." E12 simply stated, "There's a right thing in this statement with people who change their minds, but that's not a characteristic for weak-minded people." A7 and E23 stated that circumstances or logic *require* change. A7 stated, "Definitely no, when someone changes his mind there are specific circumstances that compel him to change his mind, it's not that he is weak." E23 said, "I believe that if someone gives a logical explanation or shows the other side of a point or something turned up to change the evidence...I believe if they don't change their minds then they are just stubborn people." Two of the 9 participants (E9, E10) framed their response in the terms of personal experience. E9 shared, "My grandfather used to tell me that

you're weak minded and you change your mind a lot...it hurts me now so now I strongly disagree." E10 said, "No, not really. I've changed my mind before...or it affects...yourself, myself, and my family in my case, then no, I would change my mind, I'd change it fast and well." Two of the 9 participants (A16, A21) answered in pragmatic terms indicating that you should change your mind if you find a better choice. A16 expressed, "No, no, no, it can be assumed someone saw something better to change his decision and this is not weak." A21 stated, "Maybe sometimes someone changes his mind for something good. For example, he was doing something before and thought something before and now he changes to something better and this change...isn't a sign of weakness."

Ten out of 24 participants (E1, E2, A4, A5, A8, A14, E15, E19, E22, A25) *disagreed* with the statement *Only weak-minded people change their minds*. Seven of the 10 participants (A4, A5, A8, A14, E19, E22, A25) framed their answers in ideological terms. Four of the seven participants (A4, A5, A8, A14) who framed answers ideologically expressed that the opposite is true; changing one's mind is a sign of being reasonable, open-minded, and strong-minded. For example, A4 said, "If someone changes his mind, this doesn't mean he is weak-minded, it means he is reasonable...it's the opposite, sometimes completely opposite. Someone is weak-minded because he...won't change his mind regardless of what happens, or regardless of evidence." A5 stated, "A person who is able to change his mind, to change his thinking, he's open-minded, he sees right from wrong." A8 expressed, "It's the opposite, this (changing your mind) is something good." A14 said, "The opposite is true, when someone sees something wrong and is able to change his mind, this is a strong-minded, not weak-minded person, he is powerful." Three of the 7 participants (E19, E22, A25) who framed answers ideologically expressed that changing your mind has nothing to do with weak-mindedness. E19 stated, "I don't think changing (one's) mind

is about if someone is weak-minded or not...it's not about weak-minded people, (it) doesn't have to be connected to how their mind is." E22 expressed, "It's not about whether you're weak or strong-minded and I don't know exactly what weak-minded is." A25 said, "Maybe someone had a particular idea and reconsidered and became convinced in a different idea. This has nothing to do with, doesn't demonstrate weak-mindedness." Two of the 10 participants (E1, E15) who *disagreed* framed their answers in terms of having personally changed their own mind. E1 expressed, "If I have to agree with that...I have to contradict myself up there when I said that I can change my mind and I can subjectively say that I am not a weak-minded person." E15 said, "I do not agree with this because when I make a decision then change my mind for a certain reason, most of the time I find that it was a good decision." One of the 10 participants (E2) who *disagreed* stated pragmatically that a person should change his mind if, "He figure out that what he's doing right now is not for his benefit or the benefit of others."

Two of the 24 participants (A3, A17) *disagreed a little* with the statement *Only weak-minded people change their minds*. A3 answered situationally. She said, "Maybe someone goes through circumstances or any situation that allows him to change his mind because of the circumstances or other conditions." A17 referred to his answer on question two and pragmatically stated, "Like I said above, maybe the second time when you think, you'll find it is better to change your mind."

Two of the 24 participants (E18, A20) *agreed a little* with the question five statement *Only weak-minded people change their minds*. One of the 2 participants (E18) framed her answer in terms of personal experience. She expressed, "There's sometimes I feel weak-minded when I change my mind...but it will be in the past so I had not to regret...it, so sometimes I feel I was weak-minded when I changed my mind, but I don't agree...I agree a little." One of the 2

participants (A20) responded ideologically and clarified that a person who changes his mind in all decisions, big and little, is weak-mindedness. She also stated this principle does not apply to people who change their minds when they find out they are wrong.

One of the 24 participants (A11) *agreed* with the question five statement but misunderstood the meaning of the question. He thought the statement meant that people with weak-minds should change their way of thinking. He said, “Yes, whoever has a weak mind should strengthen his mind...A weak mind doesn’t leads us to right things.”

Table 48

Verbal Data on SRMT Statement: Only weak-minded people change their minds

Description of Response	Participants
Strongly Disagree: Equated willingness to change with being strong-minded and mature	E6, E13
Strongly Disagree: Not a characteristic of weak-minded	E12
Strongly Disagree: Logic/Circumstances require change	A7, E23
Strongly Disagree: Based on personal experience	E9, E10
Strongly Disagree: Pragmatic, change for the better	A16, A21
Disagree: Opposite, characteristic of reasonableness, open-mindedness, strong-mindedness	A4, A5, A8, A14
Disagree: Nothing to do with weak-mindedness	E19, E22, A25
Disagree: Personal experience of changing mind	E1, E15
Disagree: Pragmatic, change is for the better	E2
Disagree a little: Situational, circumstances	A3
Disagree a little: Pragmatic, change is for the better	A17
Agree a little: Personal experience of changing mind	E18
Agree a little: If in big and little decisions	A20
Agree: Misunderstood statement	A11

Disposition of Self-confidence

Two questions from the SRMT were selected to measure the critical thinking disposition of *self-confidence*. Question three stated *Most of the time I feel confused*. Question eight read *I exaggerate how sure I am of my decisions*. Each participant’s critical thinking disposition of *self-*

confidence was calculated on a scale of 2-12 based on Likert-scale responses to these two questions. A score of 12 indicates the strongest disposition of *self-confidence* and a score of 2 indicates the weakest disposition of *self-confidence*. Fifteen of 24 participants (E1, E2, A3, A5, E6, E12, E13, A14, A16, A17, E19, A21, E22, E23, A25) achieved a score of 8 or higher indicating a positive disposition of *self-confidence*.

Table 49

Likert-scale Response Scores for the Disposition of Self-confidence

Disposition Score	Participants
12	E13
10	A5, A17, E22
9	E1, A3, E6
8	E2, E12, A14, A16, E19, A21, E23, A25
7	A7, A8, E10
6	A4, A11, A20
5	E15, E18
2	E9

The verbal processes of the participants were examined to identify the ways that participants framed each question.

SRMT question three

On question three, *Most of the time I feel confused*, nine participants (E2, A3, A11, E12, A16, E19, E19, A20, A21, E23) framed their answers situationally. Eight participants (E1, A4, E9, A14, E15, A17, E18, E22) framed their answers in terms of personal type/nature. Five participants (E6, A8, E10, E13, A25) responded based on self-confidence. One participant (A5) responded in ideological terms. One participant (A7) was indifferent to the statement.

Table 50

Framing of SRMT Statement: Most of the time I feel confused

Ways Answers were Framed	Participants
Framed situationally	E2, A3, A11, E12, A16, E19, A20, A21, E23
Framed based on type/nature	E1, A4, E9, A14, E15, A17, E18, E22
Framed based on confidence	E6, A8, E10, E13, A25
Framed in ideological terms	A5
Indifferent to statement	A7

Item-scale responses to SRMT question three

Two of the 24 participants (E13, A25) *strongly disagreed* with the statement *Most of the time I feel confused*. Both participants expressed self-confidence. E13 stated, “Most of the time I don’t feel confused. I can grasp several things quickly.” A25 said, “I don’t consider myself this way. I am confident in myself...sometimes depending on the thing, maybe I have a presentation and I’m not sure of it, I may appear uncertain, but that’s rare.”

Nine of the 24 participants (A5, E6, A7, A8, E10, A14, A17, E19, E22) *disagreed* with the question three statement *Most of the time I feel confused*. Three of the 9 participants (A14, A17, E22) produced responses based on their personal type/nature. A14 stated, “I’m not confused, I’m the opposite, I’m a really fun person, I’m a relaxed person.” A17 responded, “I disagree because I’m a person who is relaxed about life.” E22 expressed, “For me I hate uncertainty and I hate confusion. I try to know everything around me and if I feel like I’m gonna reach that state, I would stop and manage it before I reach the confusion state.” Three of the 9 participants (E6, A8, E10) responded with self-confidence. E6 stated, “I usually never do anything unless I do proper research.” A8 said, “I disagree because, maybe occasionally, but most of the time no.” E10 expressed, “Feel confused, not really, in education...I don’t feel confused, everything is going as planned, so no.” One of the 9 participants (A5) responded ideologically and expressed that if someone is confused most of the time, that person is not

mentally healthy. One of the 9 participants (E19) framed her answer situationally in personal terms and stated, “I think I’m clear on the stuff that goes in life, at least most of the stuff in my personal life I mean.” One of the 9 participants (A7) responded with indifference. She stated, “I don’t care about this at all.”

Three of the 24 participants (E1, A11, A16) *disagreed a little* with the statement *Most of the time I feel confused*. One of the 3 participants (E1) responded based on her personal type/nature. She stated, “I can’t say most of the time because I’m a reasonable person.” Two of the 3 participants (A11, A16) responded situationally. A11 equated confusion with insecurity and said, “If I went to a place that is unsafe, or something, maybe I’d be confused, or maybe if I’m in an exam...but nothing else other than that.” A16 expressed, “Some things yes, some things no.”

Seven of the 24 participants (E2, A3, E12, E18, A20, A21, E23) *agreed a little* with the statement *Most of the time I feel confused*. Six of the 7 participants (E2, A3, E12, A20, A21, E23) framed their response situationally. E2 stated, “You could be confused on...why things...just happen...or you look at a piece of abstract art (and) you’re confused...or you have lost a loved one yet you’re confused if you should cry or laugh or not feel anything...so confusion depends on...what just happens.” A3 expressed, “Someone may feel confused but not in all situations. Maybe there are situations where he is really comfortable and situations that are new to him...that make him confused.” E12 emphasized that he is mostly not confused. He said, “There’s certain things that I feel confused of, so I agree a little, but there’s almost everything (that I am) not confused about.” A20 said, “When something is really new, or really important to me like standing in a particular place in front of people, but generally I am not confused in other things, with friends, or even with professors.” A21 expressed, “For example, when I’m at home by myself, I say the same things, but when I’m out I talk differently and act differently.” E23

distinguished between what she called logical stuff and formal stuff. She stated that she is not confused with logical stuff, but always confused about formal stuff. One of the 7 participants (E18) responded based on her personal type/nature. She stated that she is confused, “Even in life when someone (asks) the simplest question, if you want to go to X restaurant or I don’t know...if I have another...priority, I feel confused, I have to go or no.”

One of the 24 participants (E15) *agreed* with the statement *Most of the time I feel confused*. She responded based on her personal type/nature and said, “I agree because I have this thing where I think a lot of the feelings of the person or the thing I’m dealing with more than I think of my own benefit.”

Two of the 24 participants (A4, E9) *strongly agreed* with the statement based on their personal type/nature. A4 stated, “One-hundred percent, even in simple things I feel confused. I feel like I don’t know everything and even if I knew everything, I feel like I can’t control my life. I feel lost if I can say that.” E9 expressed, “Actually not most of the time, all the time I feel confused because...I always feel that what I’m doing...they’re not perfect and honestly I love things being perfect, that’s why I’m always confused.”

Table 51

Verbal Data on SRMT Statement: Most of the time I feel confused

Description of Response	Participants
Strongly Disagree: Self-confident	E13, A25
Disagree: Type/Nature, fun, relaxed, hates uncertainty	A14, A17, E22
Disagree: Self-confident	E6, A8, E10
Disagree: State of confusion not mentally healthy	A5
Disagree: Indifferent	A7
Disagree: Situational, not in personal life	E19
Disagree a little: Type/Nature, reasonable	E1
Disagree a little: Situational	A11, A16
Agree a little: Situational	E2, A3, E12, A20, A21, E23
Agree a little: Type/Nature, confused about priorities	E18
Agree: Type/Nature, thinks of others instead of self	E15
Strongly Agree: Type/Nature, Life is out of control	A4
Strongly Agree: Type/Nature, perfectionist	E9

SRMT question eight

One question eight, *I exaggerate how sure I am of my decisions*, nine participants (A5, E6, E9, E10, E12, A14, E15, E19, A21) framed exaggeration as a tool. Five participants (E2, A3, A4, E13, E23) framed their answers in terms of self-protection. Four of the participants (A8, A11, E18, A25) provided verbal responses that were unclear as to whether they understood the meaning of the word exaggerate. Two of the participants (E1, E22) framed their answers based on personal type/nature. Four participants (A7, A16, A17, A20) did not provide meaningful verbal data.

Table 52

Framing of SRMT Statement: I exaggerate how sure I am of my decisions

Ways Answers were Framed	Participants
Framed exaggeration as a tool	A5, E6, E9, E10, E12, A14, E15, E19, A21
Framed in terms of self-protection	E2, A3, A4, E13, E23
Possibly misunderstood meaning	A8, A11, E18, A25
Framed in terms of type/nature	E1, E22
No meaningful verbal data	A7, A16, A17, A20

Item-scale responses to SRMT question eight

Two of the 24 participants (A3, E13) *strongly agreed* with the statement *I exaggerate how sure I am of my decisions*. Both participants responded based on self-protection stating that they don't exaggerate because they might be wrong. A3 said, "It is not necessary that I am always sure of my decisions and even if I am sure of my decision there is something in me that says that I might be wrong." E13 expressed, "I always think about my decisions...but I am not always sure of my decisions."

Nine of the 24 participants (E1, E2, A4, A5, E12, A17, A21, E22, E23) *disagreed* with the question eight statement *I exaggerate how sure I am of my decisions*. Three of the 9 participants (E2, A4, E23) responded based on self-protection stating that they do not exaggerate because there is a chance that they may be wrong. E2 stated, "You may state that you're going to do this and you go with it yet the results of what you did may fail...you should never exaggerate it only leads to pain and disappointment." A4 said, "I try not to exaggerate as much as possible so that if something turns out wrong, I won't be wrong." E23 stated, "No because there's always like 25% of any decision you know there's always some doubts, so I disagree." Two of the 9 participants (E1, E22) framed their answers in terms of their personal type/nature. E1 stated, "I'm not the type of person who openly talks about decisions that I make, I only state them and give a brief explanation because...I consider that private." Similarly, E22 said, "I'm not the kind

of person that likes to share every single detail about how I reached my decision...I would love to keep it clear and short so that's why I don't exaggerate." Two of the 9 participants (A5, A21) framed exaggeration as a tool they don't need because they are confident and clearly present the reasons for their decisions. A5 expressed, "Someone just needs to explain his decision and gives the reasons that make him sure of it, and give evidence, this is enough. There is no need for someone to exaggerate." Similarly, A21 said, "Always when I am certain of my decision I explain what the decision is and give the reasons why or points that explain why I made the decision." One of the 9 participants (E12) expressed that exaggeration is a tool to seek attention. One of the 9 participants (A17) did not provide meaningful verbal data.

Two of the 24 participants (E6, A16) *disagreed a little* with the statement *I exaggerate how sure I am of my decisions*. E6 framed her exaggeration as a tool she does not need. She expressed, "If I take a decision that I'm not sure of first of all before ...telling anyone else...I confront myself I tell myself that for example this might not be the right decision...but this doesn't mean that sometimes I don't do this unconsciously or without noticing." A16 did not provide meaningful verbal data.

Four of the 24 participants (A14, E15, E19, A20) *agreed a little* with the statement *I exaggerate how sure I am of my decisions*. Three of the 4 participants (A14, E15, E19) framed their answers in social/relational terms and expressed that they use exaggeration as a tool to convince others of their decisions. For example, A14 stated that she uses exaggeration with others when she has some doubts. She said, "I exaggerate that I'm sure of my decision but I might have some doubts about the issue." E15 uses exaggeration with others when she is sure of her decision. She stated, "It takes me a lot of time to make a decision so I become very sure of it and I have enough reasons or evidence to prove it, so I get a bit exaggerate." E19 expressed that

she uses exaggeration to stress how sure she is of her decision. She stated, “Sometimes I make it sound all dramatic and say...how I’m sure of my decisions.” A20 did not provide clear verbal data that clarified the reason for her selection.

Six of the 24 participants (A7, A8, E10, A11, E18, A25) *agreed* with the question eight statement *I exaggerate how sure I am of my decisions*. One of the 6 participants (E10) stated that he exaggerates as a tool to affirm his decision to himself. One of the 6 participants (A7) did not provide meaningful verbal data and simply stated, “Yes, I exaggerate a lot.” In the verbal data of 4 of the 6 participants (A8, A11, E18, A25) who *agreed*, it was unclear whether they understood the proper meaning of the term exaggerate. The Arabic word for “I exaggerate,” أبلغ, is similar to the Arabic word for “I inform,” ابلي. Although the two words are spelled differently, it was unclear whether or not the participants understood the statement *I exaggerate how sure I am of my decisions* to mean “I inform others how sure I am of my decision.” A8 seemed to misunderstand the term and stated, “I don’t usually tell others my decision unless I’m sure of it first.” A11 said, “I exaggerate (or inform others of) my decision when I am certain of it. Of course I want to explain it a lot and why I’m so committed to my decision.” A25 stated, “When I am certain of something I want to exaggerate (or inform others of) the decision and show that I am certain of it.” E18 did not understand the English word exaggerate. The moderator provided the Arabic word for exaggerate, but the participant’s verbal response indicated that she mistook it to mean “to inform.” She responded positively saying, “Maybe their opinion will help me.”

One of the 24 participants (E9) *agreed strongly* with the statement *I exaggerate how sure I am of my decisions*. She framed her response in social/relational terms as a tool to convince her family. She said, “A lot of times I exaggerate because honestly I would like to prove that my decision is correct especially in front of my family and parents.”

Table 53

Verbal Data on SRMT Statement: I exaggerate how sure I am of my decisions

Description of Response	Participants
Strongly Disagree: Self-protection, wrong decision	A3, E13
Disagree: Self-protection, outcome of decision unknown	E2, A4, E23
Disagree: Type/Nature, private person	E1, E22
Disagree: No need, simply present reasons	A5, A21
Disagree: Exaggeration a tool to seek attention	E12
Disagree: No meaningful verbal data	A17
Disagree a little: No need	E6
Disagree a little: No meaningful verbal data	A16
Agree a little: Social tool to convince others	A14, E15, E19
Agree a little: Unclear verbal data	A20
Agree: Personal tool to assure self	E10
Agree: No meaningful verbal data	A7
Agree: Unclear verbal data, to exaggerate or to inform	A8, A11, E18, A25
Strongly Agree: Social tool to convince others	E9

Disposition of Critical Thinking Maturity

Two questions from the SRMT were selected to measure the critical thinking disposition of *maturity*. Question four stated *Too much education can really mess a person up*. Question seven read *Facts are facts, no interpretation needed*. Each participant's critical thinking disposition of *maturity* was calculated on a scale of 2-12 based on Likert-scale responses to these two questions. A score of 12 indicates the strongest disposition of *maturity* and a score of 2 indicates the weakest disposition of *maturity*. Eleven of 24 participants (E1, A5, E6, A7, E13, A16, A17, E19, A21, E22, A25) achieved a score of 8 or higher indicating a positive disposition of *maturity*.

Table 54

Likert-scale Response Scores for the Disposition of Maturity

Disposition Score	Participants
11	E1, E13, E19
10	A5, A16, A21, E22
9	A7, A17
8	E6, A25
7	A3, A4, E10, E12, A14
6	E2, A11, E23
5	A8, E15, A20
4	E18
2	E9

The verbal processes of the participants were examined to identify the ways that participants framed each question.

SRMT question four

On question four, *Too much education can really mess a person up*, eight participants (E1, A5, E6, E13, E19, A21, E22, A25) framed their answers ideologically by describing the benefits of education. Three participants (E2, A7, A20) framed their responses ideologically by describing the best type of education. Three participants (A3, A17, E23) responded in general ideological terms. Three participants (E9, E12, E15) framed their responses in terms of personal experience. Two participants (A8, E10) framed their answers in social/relational terms. One participant (A4) responded to the statement using the terms of psychological well-being. One participant (A16) framed her answer in moral terms. Two participants (A14, E18) misunderstood the statement. One participant (A11) did not provide meaningful verbal data.

Table 55

Framing of SRMT Statement: Too much education can really mess a person up

Ways Answers were Framed	Participants
Ideological, benefits of education	E1, A5, E6, E13, E19, A21, E22, A25
Ideological, best type of education	E2, A7, A20,
Ideological, general terms	A3, A17, E23
Framed in terms of personal experience	E9, E12, E15
Framed in social/relational terms	A8, E10
Framed in terms of well-being	A4
Framed in moral terms	A16
Misunderstood statement	A14, E18
No meaningful verbal data	A11

Item-scale responses to SRMT question four

After the third Arabic TAP session, I discovered that the initial translation of question four provided from Insight Assessment was inaccurate. As a result, A3, A4, and A5 had a different written translation of the question than the remaining Arabic-language participant. A3's answer indicated that she correctly understood the meaning of the statement. I verbally clarified the meaning of the statement for participants A4 and A5 upon their request. After changing the translation, A14 and A25 still had difficulty understanding the intention of the statement. They understood the meaning of "mess a person up" as "limits a person."

Six of the 24 participants (E1, A5, E13, E19, E22, A25) *strongly disagreed* with the statement *Too much education can really mess a person up*. All six participants responded ideologically by listing the various benefits of education. E1 stated, "Through education you can become more open-minded, you can be introduced to more culture...in fact it makes you think in a different perspective not just one perspective." A5 said, "I strongly disagree because the more you learn, the more open-minded you are in everything you study. You also can analyze more, be more critical, so too much education definitely doesn't get someone lost, the opposite is true,

it helps you become more aware.” E13 expressed, “Studying more will make the person more knowledgeable...and good in several aspects of life.” E19 stated, “I think it boosts the brain’s mental capacity, not makes it decline.” E22 equated education with learning and expressed, “It’s gonna enrich their experience and their knowledge about life and their career, their choices, social interaction, relationships.” A25 simply stated, “The opposite is true, it benefits a person...I don’t think it will limit a person.”

Three of the 24 participants (E2, E12, E23) *disagreed* with the statement *Too much education can really mess a person up*. One of the 3 participants (E2) framed his answer ideologically by describing the best type of education. He expressed, “If a person is educated in engineering, programming, biology, and business, he may become a pretty successful person...It depends on what field you’re educated in, not how long you’re educated.” One of the 3 participants (E12) framed his answer in the terms of personal experience. He said, “I’ve seen people who are highly educated and they are a total mess, but there’s other people that...are too much educated but they are...I like these people...I disagree because the majority of people I met who were highly educated weren’t that mess(ed up).” One of the 3 participants (E23) expressed in the general ideological terms that it depends on how deeply you go into a topic. She said, “Too much education can straighten a person up but...being too engaged, you know really digging into everything that you’re taking or what you’re studying, yea, might mess a person up.”

Five of 24 participants (E6, A8, A16, A17, A21) *disagree a little* with the statement *Too much education can really mess a person up*. Two of the 5 participants (E6, A21) responded ideologically by listing the benefits of education. For example, E6 presented a high and broad view of education and stated, “I believe that education is way more than books and

schools...education can be through traveling around the world....and exploring new thing. I really don't think education can mess a person up. I think it's the thing that really builds a person." A21 expressed that education changes a person. She stated, "Education changes a person and changes what he thinks and what he believes, or he used to think something and then learns something new. It changes your way of thinking. You learn new things. I don't think it will be negative." One of the participants (A17) framed his answer in general ideological terms. He stated, "Education is the only thing that the more you do it, it doesn't harm you." One of the 5 participants (A8) framed his answer in social/relational terms. He expressed that book learning can ruin relationships or keep someone from knowing how to act in society. A8 stated, "Someone may understand books but not understand life." A16 framed her response in moral terms. She said, "Education can lead someone to do something bad or good."

Six of the 24 participants (A4, A7, E10, A14, E18, A20) *agreed a little* with the statement *Too much education can really mess a person up*. Two of the 6 participants (A7, A20) framed their response ideologically by describing the best type of education.

A7 stated, "If through education you are becoming more cultured...developing yourself, this definitely doesn't tire someone out but the opposite is true, you are raising your status. But, if your idea of education...is like we have here, memorization and study, this will definitely psychologically exhaust a person." A20 said, "If you are only learning talk without practical application, this definitely has a negative effect...education without application is of no use." One of the 6 participants (A4) stated her answer in the terms of psychological well-being. She expressed, "I agree that sometimes education can impact a person in a way we don't expect. For example, he begins learning about something he shouldn't or it has a negative impact on him emotionally...things really bad or not good. This is something that later he might say I wish I

didn't know that." E10 framed his response in social/relational terms. He made a distinction between "street smart" and "education smart" and commented on the possible negative impact of too much education. He said, "If you're only focusing on education then I don't think you would have a social life." Two of the 6 participants (A14, E18) misunderstood the question. A14 thought that the statement was saying that education restricts a person. E18 thought the statement meant that education will be messy.

Two of the 24 participants (A11, E15) *agreed* with the statement *Too much education can really mess a person up*. A11 provided unclear verbal processes. E15 framed her answer in terms of personal experience. She said, "I've seen someone very close to me who got caught up way too much by his education and by the time he grew...pretty old he realized that is was not that necessary for him to have all this done in his life."

Two of the 24 participants (A3, E9) *strongly agreed* with the statement *Too much education can really mess a person up*. A3 answered in general ideological terms stating that too much of anything is not good. E9 framed her answer in terms of personal experience. She said, "Yes 100%. I finished my first major at the age of 21. I did biomedical lab and now I'm here doing human resources and yes I'm really messed up because first I'm not working my first major and now I am convinced with HR but I'm getting bored because I'm...23 and I'm not working."

Table 56

Verbal Data on SRMT Statement: Too much education can really mess a person up

Description of Response	Participants
Strongly Disagree: Positive impact of education: open- minded, knowledgeable for life, boost mental capacity, enrich holistic experience.	E1, A5, E13, E19, E22, A25
Disagree: Depends on type of education	E2
Disagree: Framed in terms of personal experience	E12
Disagree: General terms, too deep not good	E23
Disagree a little: Positive impact of education: builds person up, changes what you believe and think	E6, A21
Disagree a little: General terms, no possible harm	A17
Disagree a little: Social, book/life learning	A8
Disagree a little: Moral terms, good or bad action	A16
Agree a little: Depends on type of education: cultured or memorization, theoretical or practical	A7, A20
Agree a little: Framed in terms of well-being	A4
Agree a little: Social, book/life learning	E10
Agree a little: Misunderstood statement	A14, E18
Agree: Unclear verbal processes	A11
Agree: Framed in terms of personal experience	E15
Strongly Agree: General terms, too much not good	A3
Strongly Agree: Framed in terms of personal experience	E9

SRMT question seven

On question seven, *Facts are facts, no interpretation needed*, five participants (A5, A7, E12, A17, A20) framed responses in general ideological terms. Five participants (A8, E9, E15, E23, A25) framed answer based on the ideological belief that all facts are clear and trustworthy. Three participants (E1, E13, E19) answered in ideological terms by distinguishing the difference between types of facts. Two participants (A14, E22) framed answers based on the ideological belief that all facts are tentative. Two participants (E2, E18) ideologically framed interpretation as deception or lies. Two participants (A4, E6) framed answers in affective terms. One participant (A3) framed answers in pragmatic terms. One participant (A21) framed her response

with a mixture of pragmatic and logical terms. One participant (E10) framed his answer situationally in personal/experiential terms. Two participants (A11, A16) provided unclear or insufficient verbal data.

Table 57

Framing of SRMT Statement: Facts are facts, no interpretation needed

Ways Answers were Framed	Participants
General ideological terms	A5, A7, E12, A17, A20
Ideological terms, facts clear and trustworthy	A8, E9, E15, E23, A25
Ideological terms, types of facts	E1, E13, E19
Ideological terms, facts are tentative	A14, E22
Ideological terms, interpretation as deception	E2, E18
Framed in affective terms	A4, E6
Framed situationally	E10
Framed in pragmatic terms	A3
Mixture of pragmatic/logical terms	A21
No meaningful verbal data	A11, A16

Item-scale responses to SRMT question seven

Question seven *Facts are facts, no interpretation needed* presented a challenge in the Arabic translation. The Arabic term used for interpretation in the SRMT, “تفسير,” also carries the meaning “explanation.” It was clear from the verbal processes of seven Arabic-language participants (A3, A5, A7, A17, A20, A21, A25) that they read the statement as “Facts are facts, no explanation necessary.” In addition, one English-language participant (E12) used the English terms interpretation with the meaning of explanation.

Four of the 24 participants (A3, A7, A16, A21) *strongly disagreed* with the statement *Facts are facts, no interpretation needed*. Three of the 4 participants (A3, A7, A21) clearly understood the meaning of the statement to refer to explanation, not interpretation. A3 framed her answer in pragmatic terms. She stated, “There is no need to explain but at the same time, no,

someone needs an explanation for these facts in order to be able to follow them.” A21 used a mixture of pragmatic and logical terms. She said, “There is always a need for explanation of a fact in case, for example, someone asked me something, I can say that this facts is this, but it is not necessary to always believe an explanation because someone needs to explain a fact and give evidence and studies about how he arrived at the fact for me to believe it.” A7 framed her answer in general ideological terms. She expressed, “Wrong, everything has an explanation in this world...No need for explanation! Definitely not.” It was unclear from the minimal verbal processes of A16 how she framed the question and whether she understood the meaning of تفسير as interpretation or explanation. She only said, “On the contrary, facts need explanation (or interpretation).”

Four of the 24 participants (E1, E13, A17, E19) *disagreed* with the statement *Facts are facts, no interpretation needed*. Three of the 4 participants (E1, E13, E19) made an ideological distinction between types of facts. For example, E1 stated, “I’m a scientific person. I do believe in facts. I just don’t believe in things that do not have proof but sometimes you do need further interpretations and further explanations...there is no absolute truth to everything.” E13 expressed, “There are facts that are based on accurate numbers or accurate studies that most people agree on and there are facts that people still till now interpret and debate about since the main components that led to this fact are also debated.” E19 said, “I think there’s (an) explanation to most of (the) things we have around, most not all, so that’s why interpretation is needed.” One of the 4 participants (A17) understood the term interpretation as explanation and framed his answer in general ideological terms. He stated, “Of course there needs to be explanations because not everyone in the world can immediately comprehend the facts.”

Seven of the 24 participants (A4, A5, E6, E10, A11, A14, E22) *disagreed a little* with the statement *Facts are facts, no interpretation needed*. Two of the 7 participants (A4, E6) framed their answer in affective terms. For example, A4 expressed, “I agree facts are facts...but sometimes there is a place for emotions and feelings, so facts are something and emotions are something else, so I think that sometimes a person...uses emotions to support facts.” E6 stated, “An instructor always told us...feelings are facts...she always told us that you can never tell a person that what they’re feeling is not true...they’re feeling it as fact so I think we might need to interpret in such a situation...and we really need to see things from their perspective.” Two of the 7 participants (A14, E22) focused ideologically on the tentative nature of facts. A14 stated, “Facts are fact for sure and there is discussion about a fact, but sometimes it may be wrong, the understanding is wrong...There is nothing stock and this is it, there are always things that interpret it.” E22 expressed, “Science and everything around us is tentative...so basically we do need to interpret and analyze...but we must also not underestimate...the processes that have been going to reach...those facts.” One of the 7 participants (E10) framed his answer in situational terms. He said, “If you’re married and you cheat, you did cheat, that’s a fact, but it is, you could be drunk...there are so many things that could be going on with you, the fact aren’t always facts.” One of the 7 participants (A11) produced unclear verbal processes. One of the 7 participants (A5) understood interpretation as explanation and framed her response in general ideological terms. She stated, “True that facts are facts but you also want to understand facts because there is no fact without anything and you need to understand what happened and why it happened especially if you can know this scientifically.”

One of the 24 participants (E15) *agreed a little* with the statement *Facts are facts, no interpretation needed*. Although she commented that in rare cases a fact can change, she framed her answer in the ideological terms of facts as clear and trustworthy.

Four of the 24 participants (A8, E12, A20, A25) *agreed* with the statement *Facts are facts, no interpretation needed*. Two of the 4 participants (E12, A20) mismarked the answer sheet. Their verbal processes indicated the general ideological belief that facts need to be explained. For example, E12 used the term interpretation with the meaning of explanation. He said, “No, there should be interpretations...to know why it became a fact...I agree that interpretation (is) needed.” A20 expressed, “I agree...because sometimes you need to understand facts and you need them explained so you can know why they are facts.” Two of the 4 participants (A8, A25) commented that facts are generally clear and do not need interpretation/explanation.

Four of the 24 participants (E2, E9, E18, E23) *strongly agreed* with the statement *Facts are facts, no interpretation needed*. Two of 4 participants (E2, E18) framed the concept of interpretation as deception or lies. E2 stated, “Once you make a lie and you make people know that this lie is a false fact they’re going to end up stumbling on the actual fact that is actually true and that the statement that you said was the actual truth, the absolute truth yet it keeps changing is false.” E18 expressed, “If you say something...without lies you don’t need to remember or think twice when after two years (you think) what was said.” Two of the 4 participants (E9, E23) framed their answers in the ideological terms of facts as clear and trustworthy. E9 stated, “I think they got to the point that they made it as a fact after a lot of probably scientific experiments and proofs.” E23 expressed, “I am very logical so when there is a fact...it’s a fact.”

Table 58

Verbal Data on SRMT Statement: Facts are facts, no interpretation needed

Description of Response	Participants
Strongly disagree: Interpretation as explanation, pragmatic terms	A3
Strongly disagree: Interpretation as explanation, pragmatic and logical terms	A21
Strongly disagree: Interpretation as explanation, general ideological terms	A7
Strongly disagree: Minimal verbal processes	A16
Disagree: Two kinds of facts	E1, E13, E19
Disagree: Interpretation as explanation, general ideological terms	A17
Disagree a little: Emotions play a role in facts	A4, E6
Disagree a little: Facts are tentative and changing	A14, E22
Disagree a little: Framed in situational terms	E10
Disagree a little: Interpretation as explanation, general ideological terms	A5
Disagree a little: Unclear verbal processes	A11
Agree a little: Facts are trustworthy	E15
Agree: Mismatched, Interpretation as explanation, general ideological terms	E12, A20
Agree: Facts are trustworthy, generally clear	A8, A25
Strongly agree: Interpretation framed as deception	E2, E18
Strongly agree: Facts are trustworthy	E9, E23

Disposition of *Truth-seeking*

Two questions from the SRMT were selected to measure the critical thinking disposition of *truth-seeking*. Question six stated *Like everyone else, I say whatever I need to say to get what I want*. Question ten read *Every belief should be evaluated*. Each participant's critical thinking disposition of *truth-seeking* was calculated on a scale of 2-12 based on Likert-scale responses to these two questions. A score of 12 indicates the strongest disposition of *truth-seeking* and a score of 2 indicates the weakest disposition of *truth-seeking*. Thirteen of 24 participants (E1, E2, E6,

A7, E10, E12, E13, A14, A16, A17, E18, E19, A25) achieved a score of 8 or higher indication a positive disposition of *truth-seeking*.

Table 59

Likert-scale Response Scores for the Disposition of Truth-seeking

Disposition Score	Participants
12	E1
10	E6, E12, E19, A25
9	A14, A16, A17, E18
8	E2, A7, E10, E13
7	A4, A5, A8, A20, A21,
6	A3, A11, E15, E22
4	E23
3	E9

The verbal processes of the participants were examined to identify the ways that participants framed each question.

SRMT question six

On question six, *Like everyone else, I say whatever I need to say to get what I want*, only nine participants (E1, A4, E6, A8, E10, E15, E18, E19, A21) accurately interpreted the meaning of the statement. Five participants (E1, E6, A8, E18, E19) who understood the meaning framed their answers in primarily moral terms. Three participants (A4, E15, A21) who understood the meaning framed their answers with a mixture of moral and pragmatic terms. One participant (E10) who understood the meaning framed his response in purely pragmatic terms.

Eleven participants (E2, A3, E9, E12, E13, A14, A17, A20, E22, E23, A25) misinterpreted the meaning of the statement. Five participants (A3, E12, E13, A17, A20) who misunderstood the meaning framed their response in pragmatic terms. Five participants (E2, E9, A14, E22, E23) who misunderstood the meaning framed their answers in the terms of social

implications. One participant (A25) who misunderstood the meaning framed her response in general terms. Four participants (A5, A7, A11, A16) did not provide meaningful verbal data.

Table 60

Framing of SRMT Statement: Like everyone else, I say whatever I need to say to get what I want

Ways Answers were Framed	Participants
Understood meaning: Moral terms	E1, E6, A8, E18, E19
Understood meaning: Moral/Pragmatic terms	A4, E15, A21
Understood meaning: Pragmatic terms	E10
Misunderstood meaning: Pragmatic terms	A3, E12, E13, A17, A20
Misunderstood meaning: Social implications	E2, E9, A14, E22, E23
Misunderstood meaning: General terms	A25
Did not provide meaningful verbal data	A5, A7, A11, A16

Item-scale responses to SRMT question six

After the first TAP Arabic session, I changed the wording of question six. A3's response made it clear that the question did not communicate the same meaning as its English equivalent. After updating the translation, a few English-language and Arabic-language participants still misunderstood the meaning of the statement. Six participants (A3, E12, E13, A17, A20, A25) understood the meaning of the statement as "Like everyone else, I speak up or speak out to get what I want." Five participants (E2, E9, A14, E22, E23) understood the meaning of the statement as "Like everyone else, I should say what I really think to get what I want."

Two of the 24 participants (E1, E2) *strongly disagreed* with the statement *Like everyone else, I say whatever I need to say to get what I want*. E1 framed her answer in primarily moral terms. She stated, "Sometimes what a person wants is not what he actually needs...and I can't just say whatever I want because I can't be selfish like that...I might find different ways to get what I want and have to think a lot... about what I want to see if it's actually important or it's just like getting what I want for the sake of getting it." E2 understood the meaning of the

statement as “I should say what I think.” He framed his response by discussing the social implications of expressing what you think. He stated, “You cannot just go and say what you think, they may think of you as a person that hates others, people don’t want to employ people that hate them... That’s why sometimes if you want something, you can’t be yourself, which is quite sad, so yeah, you can’t say whatever you want (to) get what you need.”

Six of the 24 participants (E6, A8, E12, E13, E18, E19) *disagreed* with the statement *Like everyone else, I say whatever I need to say to get what I want*. Four out of the 6 participants (E6, A8, E18, E19) framed their answers in moral terms. E6 and E18 equated saying whatever they need to say with lying. E6 stated, “I will never say something just because it will get me what I want if it contradicts what I believe...that’s out of my character...I say whatever I believe in whatever I’m convinced in and I’d eventually get what I want because I believe that’s the right way.” E18 stated, “it (to not lie) is the key of success in every stage of our lives...if I am like this, I lie in one word in everything, my children will be like me, so I’ll not be happy of course.” A8 expressed, “A person should say what is necessary, I mean something as it actually is, not what he wants in order to flatter a person. Ok now, there are times when you have to not tell a story the way it actually is, but you shouldn’t change anything in the story. But, no, you should say things as they are.” E19 said, “If I want something and to get it I have to say something inappropriate, then, no, not that kind of person.” Two of the 6 participants (E12, E13) misunderstood the statement as “I should speak up” and responded in pragmatic terms. E12 expressed, “There’s certain things that you should get without saying.” E13 said, “Sometimes speaking is the wrong choice, sometimes I should just be silent. Silence may be the answer of the solution to what I want.”

Eight of the 24 participants (A4, A7, E10, E15, A16, A17, A21, A25) *disagreed a little* with the statement *Like everyone else, I say whatever I need to say to get what I want*. Two of the 8 participants (A7, A16) did not provide meaningful verbal data. Three of the 8 participants (A4, E15, A21) framed their answers with a mixture of moral and pragmatic terms. A4 answered the question through a self-dialogue. She said, “In life you sometimes need to say things that you don’t mean 100% in order to get things done but at the same time what does this do to your character? You’re not considering your emotions or your opinion but are only thinking about getting things done or not having people upset with you...I disagree, no disagree a little.” E15 said, “I do not say what people want...because I like to respect what I believe...but I disagree a little because sometimes I don’t really care about what’s going on so I just say what people want me to say.” A21 expressed, “Not everything you say is to get what you want...unless I was really in need of something, maybe I’d do that or if something is really dangerous or if I need to get something maybe I’d do this, but I don’t always say what I don’t believe in to get things that aren’t that necessary in life.” One of the 8 participants (E10) framed his response in purely pragmatic terms. He said, “You could twist things around, you can put a little white lie in it, you don’t always have to be straightforward because I don’t think that would get you anywhere especially if it’s something big.” Two of the 8 participants (A17, A25) understood the meaning of the statement as “I speak up to get what I want.” A17 responded in pragmatic terms and said, “I say what I need to say to get my point across.” A25 answered in general terms and expressed, “I don’t usually not speak just because I want something.”

Three of the 24 participants (A14, E22, E23) *agreed a little* with the statement *Like everyone else, I say whatever I need to say to get what I want*. All three participants understood the meaning of the statement as “I say what I want to say.” All three participants (A14, E22,

E23) framed their answers in the terms of the social consequences of speaking one's mind. For example, A14 stated, "Of course, I do this with my family, I say what I want to get what I want...but it's not like this with everyone...I can't say whatever with anyone to get what I want. There are morals, appropriate ways of speaking, there are taboos, issues like this." E22 expressed, "I'm an honest person, I don't know how to play on words to get what I want, I state it directly, but throughout life experiences I've notice that there are different people...that understand differently what I'm saying so I need to be more in control of what I'm saying...I'm not gonna say it in the way I'm thinking it out loud because that's gonna affect the relationship with the person outside that I'm arguing with." E23 stated, "As long as I'm not disrespecting anyone or hurting anyone then yes I'll say what I need to say to get what I want."

Two of the 24 participants (A5, A11) *agreed* with the statement *Like everyone else, I say whatever I need to say to get what I want*. Both participants provided unclear verbal data. A5 said, "That's right, if someone wants something he needs to say what's required in order to take it. Someone can't say the opposite of what is required...For someone to get what he wants, he needs to say what is necessary." A11 did not clarify the reasons for his choice or how he understood the statement. He simply stated, "Everyone has their own way to get to a place...so everything has a way to get it, to talk about it."

Three of the 24 participants (A3, E9, A20) *strongly agreed* with the statement *Like everyone else, I say whatever I need to say to get what I want*. Two participants (A3, A20) understood the meaning of the statement as "I speak out to get what I want." A3 read a different translation than the other 23 participants. She responded to the original translation in pragmatic terms saying, "Everything I want or want to get I say and I don't hide it because there is no other way to get it." Similarly, A20 expressed, "I strongly agree because...for example I ask a

question...to get the answer I need also to ask in order to get what I want.” One participant (E9) interpreted the statement as “I should say what I really think to get what I want.” She framed her answer in the terms of social consequences of speaking one’s mind. E9 stated, “I used to think a lot about the thing, I used to make sure what the person in front of me will think about the thing I want to say...but now no, yea, I say whatever I want to say and I don’t care.”

Table 61

Verbal Data on SRMT Statement: Like everyone else, I say whatever I need to say to get what I want

Description of Response	Participants
Strongly disagree: Moral terms, can’t be selfish	E1
Strongly disagree: Social implications, can’t say what you actually think	E2
Disagree: Moral terms, lying or inappropriate speech	E6, A8, E18, E19
Disagree: I speak out, pragmatic	E12, E13
Disagree a little: No meaningful data	A7, A16
Disagree a little: Mix of moral/pragmatic terms	A4, E15, A21
Disagree a little: Pragmatic	E10
Disagree a little: Pragmatic, I should speak out	A17
Disagree a little: Pragmatic, general terms	A25
Agree a little: Social implications, depends on audience	A14, E22, E23
Agree: Unclear verbal processes	A5, A11
Strongly Agree: Pragmatic	A3, A20
Strongly Agree: Social implication, don’t care	E9

SRMT question ten

On question 10, *Every belief should be evaluated*, five participants (A11, E12, A16, A17, E19) provided no meaningful verbal data. Eight of the 19 participants (A4, A8, E9, E13, E15, A21, E22, E23) who provided verbal data framed their answers in terms of evaluating or judging other peoples’ beliefs. Six of the 19 participants (A3, E6, A7, E18, A20, A25) who provided meaningful verbal data responded to the statement in the pragmatic terms of general

improvement, progress, or avoiding error. Three participants (E1, E2, A5) framed their responses in general ideological terms. One of the 19 participants (E10) framed his response contextually saying that it depends on your location. One of the 19 participants (A14) who provided verbal data misunderstood the statement and expressed that she enjoys debate.

Table 62

Framing of SRMT Statement: Every belief should be evaluated

Ways Answers were Framed	Participants
General terms: Pragmatic	A3, E6, A7, E18, A20, A25
General terms: Ideological	E1, E2, A5
General terms: Contextual	E10
Terms of evaluating others: Ideological, freedom of belief	A4, A8, E9, E13, E15, A21, E22, E23
Misunderstood: Likes to debate	A14
No meaningful verbal data	A11, E12, A16, A17, E19

Item-scale responses to SRMT question ten

Four of the 24 participants (E1, A14, A20, A25) *strongly agreed* with the statement *Every belief should be evaluated*. Two of the four participants (A20, A25) framed their answers in pragmatic terms. A20 stated that evaluation is a way to avoid error. She said, “I strongly agree because it is necessary to evaluate on an ongoing basis especially if a belief is based on a religious authority or from society, if it is a mix between the two. Sometimes we fall into an idea, a societal belief, and we are focused on it and there is something wrong in it, but, tradition and beliefs don’t change, so no, you need to continue evaluating things.” A25 expressed, “Evaluating is the way to improve, so of course I’m interested in evaluating all beliefs.” One of the four participants (E1) responded in general ideological terms. E1 stated that everyone should evaluate beliefs, “You can’t just acknowledge only one perspective, you have to acknowledge...a lot. You might not agree with it but at least you have to evaluate it and take it into consideration.” One of

the four participants (A14) framed her answer in personal terms . She understood the meaning of the question as “I like to evaluate every belief” and said, “I really love to evaluate everything from beliefs to issues that I believe in and do not believe in. I love to evaluate and argue...discuss an issue, why or why not. I really love debates.”

Seven of the 24 participants (A3, A5, E6, E12, A16, A17, E19) *agree* with the statement *Every belief should be evaluated*. Four of the seven participants (E12, A16, A17, E19) did not provide meaningful verbal data. One of the seven participants (A3) framed her answer in the terms determining if something is correct or incorrect. She stated, “I agree because we need to evaluate everything in order to see if it is right or wrong or the negative things about it and the positive things about it.” One of the seven participants (E6) framed her response in the pragmatic terms that evaluating beliefs is what has led to progress. She stated, “Our lifestyle has changed, the context we're living in has changed, beliefs are really affected by many variables and if we don't evaluate our beliefs we would have stayed on, I don't know, how many centuries back, and if beliefs weren't evaluated then they won't be updated and we wouldn't have reached whatever stage we are at now. I believe that we would have been way behind hadn't we evaluated and updated our beliefs every once in a while.” One of the seven participants (A5) answered in general ideological terms stating that evaluation is necessary in a multicultural society. She said, “Especially when we have a number of different groups of people (in a society). So evaluating is positive and it should not be biased. We should evaluate all beliefs and all points of view.”

Five of the 24 participants (A4, A7, E10, A11, E18) *agreed a little* with the statement *Every belief should be evaluated*. One of the five participants (A11) did not provide meaningful verbal data. Two of the five participants (A7, E18) framed their answers in pragmatic terms. A7 expressed that we evaluate beliefs to avoid error. E18 said that it depends on how much time it

takes. She stated, “Sometimes to doubt everything...it will take my time, so I agree a little because sometimes we should evaluate every belief...but sometimes not.” One of the seven participants (E10) framed his answer in contextual terms. He said, “Religious beliefs I guess should be evaluated especially in Lebanon...outside not that much...this depends on where you are. If you’re in Lebanon, yes, they should be strongly evaluated but if you’re outside, if you’re in the North American countries, I don’t think that beliefs should be evaluated...I don’t think they care about that that much in my opinion so I’m gonna go with agree a little, mostly depends on where you are.” One of the seven participants (A4) framed the question in terms of evaluating others. She stated that you shouldn’t evaluate others except in things that are important like their behavior. She said, “Sometimes a belief has nothing to do with anything. If we are evaluating a person we don’t need to consider all his beliefs. Maybe the belief has nothing to do with anything...someone likes something and someone else likes something else, or believes in something and someone else believes in something else. At the same time we need to evaluate the things that have important meaning. For example, how he acts in the world, if he is honest or likes to help others...important things.”

Three of the 24 participants (E13, A21, E22) *disagreed a little* with the statement *Every belief should be evaluated*. All three participants framed their answers in terms of evaluating others and framed their responses in the ideological terms of freedom of belief. For example, E13 stated, “People have the freedom to do or choose whatever or to believe whatever they want, but not every belief should be evaluated, some beliefs are based on things, or factors that cannot be accepted by most of the people...this doesn’t allow us to evaluate it.” A21 expressed, “People in the world need to be free to believe what they want. We don’t need to always evaluate what they say but there are some situations where this belief impacts others, in this case maybe we

have to evaluate beliefs and have an opinion on them.” E22 stated, “When it comes to belief that's out of my business, I don't interfere on the belief of others, but maybe in my inner mind I do think about why (does) that person believe that way but I don't over exaggerate about it or think about it or even maybe judge that person. So it's not about judging or evaluating because it's out of my business... whatsoever the person thinks about.”

Four of the 24 participants (E2, A8, E9, E15) *disagreed* with the statement *Every belief should be evaluated*. Two of the four participants (A8, E15) framed their responses in terms of evaluating others and answered using the ideological terms of freedom of belief. A8 said, “Everyone is free to believe whatever they want. There needs to be guidelines that protect human rights, this is right, you evaluate that, but not how they think.” E15 expressed, “Not every single belief should be evaluated because again belief is something personal and I do not consider anybody's belief to be wrong, it is something up to the person.” One of the four participants (E2) answered in general ideological terms and stated that evaluating beliefs leads to fanaticism. One of the four participants (E9) framed her response in the terms of others not evaluating her beliefs. She expressed, “I might believe in something which you don't believe in so why should you evaluate my belief then.”

One of the 24 participants (E23) *strongly disagreed* with the statement *Every belief should be evaluated*. She stated, “No, everyone is free to believe in whatever they want, they shouldn't be evaluated.”

Table 63

Verbal Data on SRMT Statement: Every belief should be evaluated

Description of Response	Participants
Strongly agree: Pragmatic, to avoid error, improve	A20, A25
Strongly agree: Ideological, necessary	E1
Strongly agree: Misunderstood, likes debate	A14
Agree: No meaningful verbal data	E12, A16, A17, E19
Agree: Pragmatic, positives/negative, progress	A3, E6
Agree: Necessary in a multicultural society	A5
Agree a little: Pragmatic, avoid error, depends on time	A7, E18
Agree a little: Contextual	E10
Agree a little: Evaluating others, important behavior	A4
Agree a little: No meaningful verbal data	A11
Disagree a little: Evaluating others, freedom of belief	E13, A21, E22
Disagree: Evaluating others, freedom of belief	A8, E9, E15
Disagree: General terms, leads to fanaticism	E2
Strongly disagree: Evaluating others, freedom of belief	E23

Research Question 3

Patterns were identified in the verbal processes produced by participants on the Cornell Critical Thinking Test and the Sample Reasoning Mindset Test. These patterns were analyzed to address the following research question.

3. Do undergraduate Lebanese students employ culturally-specific reasoning processes in responding to questions on the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test?

Whether the following patterns should be characterized as “culturally-specific” will be discussed in chapter 5.

Patterns of reasoning on the CCTT

A number of patterns were identified in the verbal reasoning processes of participants on the CCTT. In section 1, participants were asked to identify, trace, and neutrally evaluate the

relationships between statements. The majority of participants demonstrated a pattern of selecting answers based on personal opinion/perception of the conclusion and/or overall argument. Twenty-two participants provided verbal data in section 1. Twelve participants (E2, A3, A5, E6, A8, E9, A11, E13, A14, A17, E23, A25) selected answers based on personal opinion. Six participants (E1, A4, A7, E12, E19, A21) neutrally analyzed and evaluate the relationship between statements. Three participants (E10, A16, E22) produced a mixture of evaluative reasoning based on opinion and the ability to evaluate the relationship between statements. One participant's responses (A20) did not fit into a specific pattern.

In section 3, question 23, participants generally disregarded the information provided in parentheses and failed to identify the credibility of a source as an important factor in establishing believability. Fourteen of the 19 participants (E2, A5, A7, A8, E10, E12, E13, A14, E15, E18, E19, A20, A21, E23) who provided verbal data paid no attention to the information in the parentheses and attempted to answer the question with reference to the italicized statements alone.

Another pattern that emerged was the propensity to answer inductive questions designed to identify best-explanation criteria in the terms of right and wrong. For example, on question 22, sixteen of the 18 participants (E1, E2, A3, A5, E6, A7, E10, E13, A14, A16, E18, E19, A20, A21, E22, E23) who provided verbal data attempted to determine which statement was correct or incorrect instead of evaluating which of the two accurate statements was more believable. On question 39, participants were presented three viable experiments and asked to find the "best prediction." Eleven of the 12 participants (E1, E2, A3, A4, E6, A7, E10, E13, A14, A20, A21) who provided verbal data selected answers by trying to determine which option was right and which options were wrong. Twelve of the 24 participants did not provide meaningful verbal data

on question 39. The fact that 50% of participants did not verbalize their thinking processes may indicate that participants found this section difficult (Leighton, 2004, 2017).

The tendency to frame question in terms of right and wrong as well as participant disregard for the additional information provided in parenthesis was consistent with another pattern that emerged in the verbal data. Participants consistently attempted to simplify tasks. They performed well in comparing simple, straightforward experiments, but on more complicated tasks, participants generally either only evaluated one option or used the process of elimination to arrive at their conclusion without weighing choices against each other. In addition, participants had difficulty navigating questions involving nuance, multiple variables, or the consideration of a broader picture.

An example of the pattern of evaluating one option and/or the failure to compare answers was evident in section 2. The verbal processes in question 11 are representative of the way that participants generally approached TAP questions in the section. Two participants (A8, A17) did not provide any meaningful verbal data. Eleven of the 22 participants (E1, E2, A3, A4, A5, A8, E9, A11, E15, A17, E23) who provided verbal data did not verbally consider more than one choice. Only three of these participants (A4, E9, E15) selected the correct answer. Eleven of the 22 participants (E6, A7, E10, E12, E13, A14, E19, A20, A21, E22, A25) who provided verbal data arrived at their conclusion through the process of elimination. Only four of these participants (E6, E13, A14, A21) produced verbal data that demonstrated the process of weighing possible answer against each other. The remaining seven participants eliminated options individually without comparing answers. In total, 18 of 22 participants did not compare the possible choices in the process of determining their answer.

In addition, the combination of results from selection responses and verbal data on section 2 indicated that 22 out of 24 participants did not understand the nuanced concept of equivocation. Verbal data from 14 participants (E1, A4, E6, E9, E10, A11, E12, E13, A14, E15, A16, E19, A20, E22) demonstrated a misunderstanding of the concept of equivocation. Three participants (E2, A3, A5) never verbally assessed or considered choices related to using a word in two ways. Three participants (A8, A17, A25) provided limited or no verbal processing although their patterns of answers indicated a misunderstanding or lack of consideration of type 1 choices. Two participants (A7, A21) produced selection patterns that indicated a general misunderstanding of equivocation, although they identified the correct type 1 answer on question 15. Two participants (E18, A21) asked the moderator to explain the meaning of using a word in two ways and then correctly chose multiple type 1 answers.

Another example of the pattern of simplifying choices and the failure to compare options was evident in section 5, question 40. Similar to question 39, participants were instructed to choose the “best predictions.” Seven of the 24 participants (A8, E9, A11, E12, A16, A17, E18) did not provide meaningful verbal data. Nine of the 17 participants (E2, A3, A4, E6, E10, E19, A20, E22, E23) who provided verbal data selected what they believed was the simplest, most specific, and most controlled option. Four participants (A7, E13, A14, A25) eliminated options, but did not verbally compare answers. Three of these four (A7, E13, A14) questioned the validity of the initial statement as the criteria for determining which options were wrong. One participant (A21) selected her answer because it was, “Most true.” One participant (E15) guessed. Only two participants (E1, A5) selected the correct answer using the criteria stated in the CCTT manual. Only one of these two (E1) produced verbal processes that demonstrated the process of comparing multiple options in order to determine the *best* prediction.

In sections 4, the majority of participants performed well in simple comparative analysis, but found it difficult to navigate questions with variables whose effects were unknown. On question 26, thirteen of the 19 participants (E2, A4, A5, A7, E10, A11, E12, E13, E18, E19, A20, E22, E23) who provided verbal data accurately analyzed and compared similar experiments with different results. On questions 28 and 30, fourteen of the 20 participants (E1, E2, A4, A5, E6, A7, E10, A11, A14, A16, E18, E19, A20, E23) who provided verbal data demonstrated the ability to identify that information from similar types of reports/experiments supported the conclusion of the original experiment. In contrast, on questions 27 and 29 participants demonstrated a consistent inability to trace the impact and implications of additional variables. On question 27, eighteen of the 19 participants (E1, E2, A3, A4, A5, E6, A7, A8, E9, E10, E12, A14, E18, E19, A20, A21, E22, E23) who provided verbal data were not able to identify the impact of an additional variable on part of an experimental group. On questions 27 and 29, none of the participants who produced meaningful verbal data selected the correct answers for the right reasons on both questions.

Similarly, in section 6, question 43, participants displayed the ability to perform a simple analysis but the inability to construct a broader definition. Twenty-one participants provided meaningful verbal data on question 43. Twelve of the 21 participants (E1, E2, A3, A4, E6, A8, E9, E10, E13, A21, E22, E23) provided verbal data that demonstrated the skill of simple analysis. Eight of these 12 participants (E1, A4, A8, E9, E10, A21, E22, E23) accurately deduced the details of a specific stock car but were unable to identify the broad, general definition. Two of these 12 participants (A3, E6) immediately eliminated the correct answer, deduced the details of a stock car, but missed that what was described was *not* a stock car. Only

two of the 21 participants (E2, E13) who provided meaningful verbal data were able to construct a general definition of a stock car using the information provided in the question.

Another pattern that emerged was that participants did not demonstrate the ability to understand or analyze statements framed in the deductive terms of propositional logic. As stated above, in section 1 only six participants demonstrated a consistent ability to neutrally analyze the relationship between statements and identify whether or not a conclusion followed necessarily. In section 7, none of the participants produced verbal processes that demonstrated the ability to identify a gap in syllogistic reasoning or the ability to construct, deconstruct, or analyze statements presented in the form of syllogistic, propositional logic.

Patterns of reasoning on the SRMT

A number of patterns were identified in participant verbal responses on the SRMT. Three SRMT statements lent themselves to meta-reflection on the nature of reality, *I need to know the reasons why things happen; every belief should be evaluated; and facts are facts, no interpretation needed.*

In response to question one, *I need to know the reason why things happen*, the majority of participants who provided meaningful verbal data framed their answers in pragmatic terms and did not articulate an interest in a broad understanding of the way the world works. For example, seventeen participants (E1, A3, A4, A5, E6, A7, E10, A11, E12, E13, A14, E15, A17, A20, E22, E23, A25) provided verbal data that clearly justified why they did or did not want to know why things happen. Twelve of these 17 participants (E1, A3, A4, A5, E6, A7, E10, E15, A20, E22, E23, A25) framed their responses in pragmatic terms such as only wanting to know about things that impacted them personally, they could benefit from, would help them manage their lives, or would not negatively affect their psychological well-being. Two of the 15 participants (A11,

A14) expressed an interest in knowing who is culpable for different events; God, fate, or themselves? Only two participants (A17, A20) expressed any sentiment related to a general interest or disposition of inquisitiveness about the nature of reality.

In response to question ten, *Every belief should be evaluated*, participants did not engage in self-reflection. None of the 19 participants who provided meaningful verbal data applied the statement, *Every belief should be evaluated*, to an evaluation of their own personal beliefs. Eight of the 19 participants (A4, A8, E9, E13, E15, A21, E22, E23) framed their answers in terms of evaluating or judging other peoples' beliefs. All eight participants expressed that people should be free to believe whatever they want. Six of the 19 participants (A3, E6, A7, E18, A20, A25) who provided meaningful verbal data responded to the statement in the pragmatic terms of general improvement, progress, or avoiding error. Only two participants (E1, A5) provided more nuanced responses about the value of considering multiple points of view. The verbal responses of the remaining four participants (E2, E10, A14) did not fit into one of the categories stated above.

In response to question seven, given the choice between interpreting the statement as *Facts are facts, no interpretation necessary*, or *Facts are facts, no explanation necessary*, seven Arabic-language participants (A3, A5, A7, A17, A20, A21, A25) understood the meaning of the statement as the more straightforward *Facts are facts, no explanation necessary*. In the verbal processes of four Arabic-language participants (A4, A8, A11, A16) it was unclear whether they understood the meaning as explanation or interpretation. Only one Arabic-language participant (A14) clearly responded to the statement using the more nuanced concept of interpretation. In addition, one English-language participant (E12) used the English word interpretation with the meaning of explanation. Two English-language participants (E2, E18) equated

interpretation/explanation with deception and lies. In total, seven of the 20 participants (E1, E6, E10, E13, A14, E19, E22) who provided meaningful verbal data clearly understood the intended meaning of the statement and responded to the concept of interpretation.

Three SRMT statements produced patterns related to the specific understanding of weak-mindedness, exaggeration, and confusion. Question five, *Only weak-minded people change their minds*, produced the strongest responses from participants. Nineteen of the 23 participants who provided meaningful verbal data either *strongly disagree* (E6, A7, E9, E10, E12, E13, A16, A21, E23) or *disagreed* (E1, A4, A5, A8, E10, A14, E15, E19, E22, A25) with associating weak-mindedness with changing one's mind. Thirteen participants (A3, A4, A5, E6, A7, A8, E12, E13, A14, E19, E22, E23 A25) responded in general ideological terms as to why it is appropriate and/or necessary to change one's mind. Five participants (E1, E9, E10, E15, E18) responded based on the experience of having changed their own mind. Four participants (E2, A16, A17, A21) expressed in pragmatic terms that change is for the better.

In response to question eight, *I exaggerate how sure I am of my decisions*, none of the participants who provided meaningful verbal data framed their answers in the moral terms of exaggeration as right or wrong. Four of the participants (A7, A16, A17, A20) provided no meaningful verbal data. Four participants (A8, A11, E18, A25) seemed to understand the statement as *I inform others how sure I am of my decisions*. Nine of the 16 participants (A5, E6, E9, E10, E12, A14, E15, E19, A21) who provided meaningful verbal data discussed in morally neutral terms the use of exaggeration as a tool to convince others or convince themselves of their choices. Four of these nine (A5, E6, E12, A21) stated that they have no need to use exaggeration as a tool because they are confident in their decisions. Five of these nine (E9, E10, A14, E15, E19) stated that they regularly use exaggeration as a tool to convince themselves or others. Five

participants of the 16 participants (E2, A3, A4, E13, E23) who provided meaningful verbal data framed the responses in the terms of self-protection from the social consequences of being wrong. Two of the 16 participants (E1, E22) who provided meaningful verbal data expressed that they are not the type of person who shares or discusses their decisions.

In response to question three, *Most of the time I feel confused*, the majority of participants expressed self-confidence and many of the participants framed confusion as something negative. Thirteen of the 24 participants (E1, E6, A8, E10, A11, E12, E13, A14, A17, E19, A20, E22, A25) verbally stated that they are generally not confused. Ten participants (E1, A5, E6, A7, A8, A14, A17, A21, E22, A25) specifically framed confusion in negative terms such as being anxious, mentally unhealthy, or uptight. Four participants (A3, A16, E23) responded neutrally stating that sometimes they are confused and other times they are not. Four participants (A4, E9, E15, E18) said that they are often confused. One participant (A7) was indifferent to the statement.

Question six, *Like everyone else, I say whatever I need to say to get what I want*, produced particular patterns of responses based on how the participants understood the meaning of the question statement. Four participants (A5, A7, A11, A16) did not provide meaningful or clear verbal data. The remaining 20 participants framed their responses similarly based on how they interpreted the meaning of the statement.

Six participants (A3, E12, E13, A17, A20, A25) understood the statement to mean *Like everyone else, I speak up or speak out to get what I want*. Five of these 6 participants (A3, E12, E13, A17, A20) responded in primarily pragmatic terms. Two participants (E12, E13) *disagreed* with this meaning of the statement because it is sometimes better to be silent in order to get what you want or because you should get what you want without having to ask. Two participants

(A17, A25) *disagreed a little* with this meaning of the statement. One of these two participants (A17) stated that you should speak out in order to get your point across. One of the participants (A25) said that you should sometimes speak out whether or not it will get you something in particular. Two participants (A3, A20) *strongly agreed* because you need to ask in order to get what you want.

Five participants (E2, E9, A14, E22, E23) understood the statement to mean *Like everyone else, I say what I really think to get what I want*. These five participants all framed their answers in terms of the social implications of speaking your mind. One participant (E2) *strongly disagreed* and stated that you can never say what you really think because of the social consequences. Three participants (A14, E22, E23) *agreed a little* and expressed that you can say what you really think as long as you are in a safe environment without social repercussions. One participant (E9) *strongly agreed* and said that she used to care about the social implications of what she said, but no longer cares about the social consequences of speaking her mind.

Nine participants (E1, A4, E6, A8, E10, E15, E18, E19, A21) understood the intended meaning of the statement *Like everyone else, I say whatever I need to say to get what I want*. Five participants (E1, E6, A8, E18, E19) *disagreed* or *strongly disagreed* (E1) and framed their answers in moral terms. Three participants (A4, E15, A21) *disagreed a little* and answered with a mixture of moral and pragmatic terms. One participant (E10) *disagreed a little* and answered in purely pragmatic terms.

Finally, on question nine, *I prefer assignments where I am told exactly what to do and how to do it*, three approximately equal selection patterns emerged. Eight participants either *disagreed* (E6, A17, A20, E23, A25) or *disagree a little* (E2, E10, E22) based on the values of creativity, independence, and self-reliance. Six participants either *agreed* (A3, A5, A8, A11,

E18) or *strongly agreed* (E19) for the pragmatic reasons that being told makes things easier, produces good results, and makes everyone happy. One participant (A16) *agreed* and simply stated, “Definitely, the whole world would prefer that.” Seven participants either *disagreed a little* (E13, A14, A21) or *agreed a little* (E1, A4, E9, E15) and stated that it depends on the assignment or circumstances. Two participants (A7, E12) did not provide meaningful verbal data.

Research Question 4

Participants were split into two comparable procedural groups. Twelve participants in group A completed the TAP protocol in Arabic. Twelve participants in group B completed the TAP protocol in English. Six to nine weeks after completing the first TAP sessions, four participants (A4, A11, E12, E13) completed a second TAP session in the alternate language. A quantitative analysis of participant choices was utilized to identify differences in scores based on language at the item-levels and section-levels. A comparative analysis of the participant TAP verbal responses between the two procedural groups and the four repeat sessions was completed to answer the following research question.

4. Do bilingual students use comparable reasoning processes in answering equivalent questions in Arabic and English from the Cornell Critical Thinking Test Level Z and the Sample Reasoning Mindset Test?

Linguistic comparison of CCTT reasoning processes

Frequency tables were used to identify CCTT TAP questions with at least a 15% discrepancy between Arabic and English scores.

Table 64

Percentage of Correct CCTT Item-level Scores

TAP Questions	% Correct (English)	% Correct (Arabic)	Total % Correct
Section 1			
Question 1	75	75	75
Question 2*	50	67	58
Question 3	92	83	83
Question 6	75	67	71
Question 7	67	67	67
Section 2			
Question 11	42	42	42
Question 12*	8	25	17
Question 13*	25	8	17
Question 14*	17	33	25
Question 15	50	42	42
Section 3			
Question 22	8	8	8
Question 23*	75	42	58
Section 4			
Question 26	67	58	63
Question 27*	8	25	17
Question 28	83	75	79
Question 29*	100	67	83
Question 30*	75	58	67
Section 5			
Question 39*	17	33	25
Question 40	33	42	38
Section 6			
Question 43	25	25	25
Question 44*	83	33	58
Section 7			
Question 47*	50	25	38
Question 48*	58	25	42
Question 49*	8	33	21

* At least a 15% difference between scores from Arabic and English TAP sessions

A series of independent t-tests were run to determine differences in CCTT section level scores based on test language. The results showed no statistical differences between section 1 scores in Arabic (5.25 ± 1.36) and English (4.91 ± 1.38); $t(21) = 0.59$, $p = 0.556$; section 2 scores in Arabic (3.25 ± 1.06) and English (2.67 ± 1.56); $t(22) = 1.07$, $p = 0.294$; section 3 scores in Arabic (1.42 ± 1.16) and English (1.08 ± 0.67); $t(17.5) = 0.86$, $p = 0.401$; section 4 scores in

Arabic (7.17 ± 1.64) and English (7.33 ± 1.37); $t(22) = -.027$, $p = 0.790$; section 5 scores in

Arabic (1.67 ± 0.89) and English (1.08 ± 0.51); $t(17.6) = 1.96$, $p = 0.065$.

section 7 scores in Arabic (2.33 ± 1.56) and English (2.58 ± 1.51); $t(22) = -.040$, $p = 0.693$. The

results showed a significant difference between section 6 scores in Arabic (0.92 ± 0.67) and

English (2.08 ± 1.08); $t(22) = -3.17$, $p = 0.004$.

Table 65

T-Test for Equality of Means Results for CCTT Section Scores by Language

Variables		F	Sig.	t	df	Sig 2	MD	Std. ED	95% CI	
									Lower	Upper
Section 1	EVA	0.03	0.86	0.598	21.00	0.556	0.341	0.570	-0.844	1.526
	EVNA			0.598	20.77	0.556	0.341	0.570	-0.846	1.528
Section 2	EVA	0.66	0.43	1.074	22.00	0.294	0.583	0.543	-0.543	1.709
	EVNA			1.074	19.35	0.296	0.583	0.543	-0.552	1.718
Section 3	EVA	8.19	0.01	0.860	22.00	0.399	0.333	0.388	-0.471	1.137
	EVNA			0.860	17.54	0.401	0.333	0.388	-0.483	1.149
Section 4	EVA	0.42	0.52	-0.270	22.00	0.790	-0.167	0.618	-1.447	1.114
	EVNA			-0.270	21.32	0.790	-0.167	0.618	-1.450	1.116
Section 5	EVA	5.45	0.03	1.969	22.00	0.062	0.583	0.296	-0.031	1.198
	EVNA			1.969	17.65	0.065	0.583	0.296	-0.040	1.207
Section 6	EVA	1.88	0.18	-3.174	22.00	0.004	-1.167	0.368	-1.929	-0.404
	EVNA			-3.174	18.31	0.005	-1.167	0.368	-1.938	-0.395
Section 7	EVA	0.08	0.78	-0.400	22.00	0.693	-0.250	0.625	-1.546	1.046
	EVNA			-0.400	21.98	0.693	-0.250	0.625	-1.547	1.047

Note: EVA = Equal variance assumed; EVNA = Equal variance not assumed;

Sig 2 = Sig (2-tailed); MD = Mean Difference; Std. ED = Std. Error Diff;

CI = Confidence Interval

A comparative analysis of collected data was performed to identity different patterns in participant responses based on language.

Section 1: Deduction

No differences based on language were evident in the verbal processes of participants on section 1. For example, three English-language participants (E1, E12, E19) and three Arabic-language participants (A4, A7, A21) demonstrated the use of good analytic reasoning. Seven English-language participants (E2, E6, E9, E10, E13, E22, E23) and eight Arabic-language participants (A3, A5, A8, A11, A14, A16, A17, A25) produced an evaluative response based on personal opinion or a mixture of analytic reasoning and evaluative response based on personal opinion. Three English-language participants (E1, E9, E23) and four Arabic-language participants (A3, A5, A11, A14) evaluated and responded to only one answer on at least 4 out of 5 TAP questions. Three English-language participants (E6, E10, E19) and three Arabic-language participants (A16, A20, A21) considered more than one option and arrived at their answer through the process of elimination on at least 4 out of 5 TAP questions.

On question two, 67% of Arabic-language participants selected the correct answer versus 50% of English-language participants. The verbal processes showed that an equal number of Arabic-language (A4, A7, A21) and English-language (E1, E12, E15) participants used analytic reasoning to arrive at the correct answer. The difference in selection choices was the result of more Arabic-language than English-language participants personally agreeing with the statement.

Section 2: Meaning & Fallacies

Overall, no differences based on language were evident in the verbal processes of participants on section 2. For example, all twelve Arabic-language participants and ten English-language participants (E1, E2, E6, E9, E10, E12, E13, E15, E19, E22) did not understand the concept of equivocation.

There was at least a 15% difference in scores on question twelve. After accounting for the mismarked answer sheet from E23, this difference was eliminated. As a result, three Arabic-language participants (A16, A21, A25) and two English-language (E18, E23) participants selected the type 1 answer. Eight Arabic-language participants (A3, A4, A5, A7, A8, A14, A17, A20) and seven English-language participants (E6, E9, E10, E12, E13, E15, E22) selected the type 2 answer. One Arabic-language participants (A11) and three English-language participants (E1, E2, E19) selected the type 3 answer. The verbal data did not indicate any differences based on language on question 12.

Although the selection pattern indicated a potential difference in verbal processes on question 13, the verbal data did not reveal consistent differences. Four of the five participants (A3, E12, E13, E18, E23) who selected the correct option A were English-language participants. Three participants (A3, E13, E18) used different, inaccurate thinking processes to arrive at the correct answer. Six of the eight participants (E1, E6, A5, A8, A11, A14, A17, A25) who selected the incorrect option C were Arabic-language participants. There was no consistent patterns or differences in the verbal responses of the Arabic and English participants.

Two potential differences were evident in the verbal responses on question 14. Seven of the ten participants (E6, E10, E13, E15, E19, E22, E23, A4, A16, A21) who understood the statement “hasn’t shown that there are only two alternatives” to mean “hasn’t presented two alternative” were English-language participants. Four of the six participants (A5, A11, A14, A20, E1, E2) who used the criteria that there are other possible ways to clean water were Arabic-language participants.

Section 3: Observation & Credibility of Sources

No differences based on language were evident in the verbal processes of participants on section 3. For example, on question 22, four Arabic-language (A3, A7, A20, A21) and four English-language (E1, E10, E13, E18) participants misread the data chart and concluded that option B was inaccurate. Two Arabic-language (A5, A14) and three English-language (E2, E22, E23) participants did not check the data chart. One Arabic-language (A4) and one English-language (E12) participant used the correct criteria of precision. One Arabic-language (16A) and one English-language (19E) participant concluded that both statements were believable. On question 23, eight Arabic-language (A5, A7, A8, A14, A17, A20, A21, A25) and eight English-language (E2, E10, E12, E13, E15, E18, E19, E23) participants attempted to answer the question with reference to the italicized statements alone. Two Arabic-language (A3, A4) and three English-language (E1, E6, E22) participants accurately evaluated the credibility of the source as the criteria for selecting the correct answer.

There was a 33% difference between correct answers from Arabic and English-language participants on question 23. Five of the seven participants (E2, E10, E15, E19, E23, A14, A20) who used the conclusion that cabbage worms are poisonous to ducklings as criteria for selecting the correct answer B were English-language participants. Other differences in the verbal processes were unclear since four Arabic-language participants (A11, A16, A17, A25) did not provide meaningful verbal data.

Section 4: Induction (Hypothesis Testing)

No differences based on language were evident in the verbal processes of participants on section 4. For example, on question 26, five Arabic-language (A4, A5, A7, A11, A20) and eight English-language (E2, E10, E12, E13, E18, E19, E22, E23) participants used analytic reasoning

to select the correct answer. On questions 27 and 29, four Arabic-language (A7, A14, A20, A21) and five English-language (E2, E18, E19, E22, E23) participants concluded that the additional variable had nothing to do with the experiment. On questions 28 and 30, seven Arabic-language (A4, A5, A7, A11, A14, A16, A20) and seven English-language (E1, E2, E6, E10, E18, E19, E23) participants accurately analyzed the relationship between the reports and the original experiment.

There was a 17% difference between correct Arabic and English-language participant answers on question 27. Although the selection pattern indicated a potential difference in verbal processes based on language, the verbal data did not reveal consistent differences. For example, 18 of the 24 participants selected the incorrect option C, that the additional variable had nothing to do with the experiment. Nine of the 18 were Arabic-language participants (A3, A4, A5, A7, A8, A14, A16, A20, A21) and nine of the 18 were English-language (E1, E2, E6, E12, E13, E18, E19, E22, E23) participants. Of these 18 participants, nine provided verbal data. Four Arabic-language (A7, A14, A20, A21) and five English-language (E2, E18, E19, E22, E23) participants used similar processes to arrive at their answers.

Section 5: Induction (Planning Experiments)

No differences based on language were evident in the verbal processes of participants on section 5. On question 39, there was a 15% difference between correct Arabic and English-language participant answers. Unfortunately, thirteen participants (A5, A8, E9, A11, E12, E15, A16, A17, E18, E19, A21, E23, A25) did not provide verbal meaningful verbal data making it difficult to compare a significant number of reasoning processes. There were no significant differences in verbal processes based on language on question 40.

Section 6: Definition & Assumption Identification

Although the quantitative analysis indicated a significance difference in section 6 scores by language, the verbal data did not demonstrate a significant difference in reasoning processes. On question 43, there was no difference in selection patterns and no clear differences in verbalized reasoning processes. On question 44, there was a 50% difference between correct Arabic and English language answers. Unfortunately, nine participants (A4, A5, E6, A7, A8, A14, E15, A16, E23) did not provide meaningful data and seven participants (E1, E9, A11, E12, A17, E18, E19) did not provide clear criteria for their selections. Of the remaining eight participants, one Arabic-language (A21) and four English-language (E2, E10, E13, E22) participants created criteria that was not included in the question. Three Arabic-language participants (A3, A20, A25) inaccurately used statements from the question as criteria for their selections.

Section 7: Assumption Identification

No differences based on language were evident in the verbal processes of participants on section 7. There was at least a 15% difference on correct choices in all three section 7 questions. On question 47, there was a 25% difference in Arabic and English language correct answers, but there were no significant differences in the verbal reasoning processes. One Arabic-language (A4) and one English-language (E15) used analytic processes to arrive at the correct conclusion A. One Arabic-language (A7) and one English-language (E22) selected the correct choice by eliminating option C because C was not explicitly mentioned in the question. Two English-language participants (E2, E9) selected the correct answer because they agreed with the statements and two English-language participants (E6, E10) created criteria unrelated to the instructions in order to select the correct answer. On question 48, there was a 33% difference in

Arabic and English language correct answers, but the verbal data did not reveal any significant differences in the verbal processes. On question 49, there was a 25% difference in in Arabic and English language correct answers, but eleven participants (A3, A5, A7, A8, A11, E12, A14, E15, A16, A17, E18) did not provide meaningful verbal data. As a result, it was not possible to identify whether there were meaningful differences in the verbal processes based on language.

Linguistic comparison of SRMT reasoning processes

English-language participants scored slightly higher on overall positive scores related to a disposition of inquisitiveness (10 English-language vs 8 Arabic-language), open-mindedness (11 English-language vs 7 Arabic-language), self-confidence (8 English-language vs 7 Arabic-language) and truth-seeking (8 English-language vs 5 Arabic-language). Arabic-language participants scored slightly higher on overall positive scores related to the disposition of maturity (8 Arabic-language vs 6 English-language).

A comparison of the selection-response choices and verbal data demonstrated no significant differences in reasoning processes on the SRMT based on language. For example, on item-level responses to question one, *I need to know the reasons why things happen*, five Arabic-language (A3, A4, A5, A7, A25) and five English-language (E1, E6, E10, E22, E23) participants framed their answers in primarily pragmatic terms. Four Arabic-language (A3, A14, A16, A20) and four English-language (E1, E9, E12, E18) participants strongly agreed, four Arabic-language (A8, A11, A17, A25) and two English-language (E15, E23) participants agreed, and four Arabic-language (A4, A5, A7, A21) and four English-language (E2, E10, E19, E22) participants agreed a little. Two English-language participants (E6, E13) disagreed a little. Similar patterns of selection and verbal processes were replicated in responses to the remaining nine questions. No consistent differences based on language were evident.

Linguistic comparison of repeat participant processes

Four participants (A4, A11, E12, E13) participated in repeat sessions in the alternate language. Three out of four participants (P4R, P11R, P13R) scored slightly higher on the English-language version of the CCTT. One participant (P12R) received the same score in both languages. Two participants (P11R, P13R) had a slightly more positive disposition of *inquisitiveness* score in English compared to Arabic. One participant (P12R) had a slightly more positive disposition of *inquisitiveness* score in Arabic compared to English. One participant (P4R) received the same score in both languages. Three out of four participants (P11R, P12R, P13R) had a slightly more positive disposition of *open-mindedness* score in English compared to Arabic. One participant (P4R) received the same score in both languages. Two participants (P11R, P13R) had a slightly more positive disposition of *self-confidence* score in English compared to Arabic. One participant (P4R) had a slightly more positive disposition of *self-confidence* score in Arabic compared to English. One participant (P12R) received the same score in both languages. Two participants (P4R, P13R) had a slightly more positive disposition of *maturity* score in English compared to Arabic. Two participants (P11R, P12R) had a slightly more positive disposition of *maturity* score in Arabic compared to English. Three out of four participants (P4R, P11R, P13R) had a slightly more positive disposition of *truth-seeking* score in English compared to Arabic. One participant (P12R) had a slightly more positive disposition of *truth-seeking* score in Arabic compared to English.

Table 66

Comparison of Repeat Participants Scores on the CCTT and SRMT

Participants	CCTT Score	Inq.	OM	SC	Mat.	TS
A4	25	6	9	6	7	7
P4R-E	28	6	9	5	8	8
A11	20	7	5	6	6	6
P11R-E	23	6	6	7	5	9
E12	27	6	12	8	7	10
P12R-A	27	5	9	8	10	11
E13	22	7	12	12	11	8
P13R-A	19	8	11	10	9	7

Inq. = Inquisitiveness; OM = Open-mindedness; SC = Self-confidence; Mat. = Maturity;
 TS = Truth-seeking

Item-level comparison of verbal processes of repeat participants

Repeat participant answers were compared to identify item-level differences in selection choices on TAP questions. The verbal data from questions where participants selected different answers in English and Arabic were compared to explore whether the participants used different reasoning processes depending on language.

P4 expressed that she is generally more comfortable in English than Arabic. She selected different answers on eight out of 24 TAP CCTT questions. On six out of the eight questions, there was no difference in the reasoning processes based on language. For example, on question 15, P4 disagreed with Dobert's reasoning in the statement. On the English version of the CCTT, she selected B, Dobert's conclusion doesn't necessarily follow from the reasons he gives. On the Arabic version she selected A, there is a serious mistake in the thinking in this part. Although the answer choices were different, the participant used similar reasoning processes in both languages to conclude that Dobert's reasoning was wrong.

P4 used different reasoning processes on the two TAP questions in section 5. On question 39 on the English-language CCTT, P4 selected the incorrect answer B because, “K is the easiest one...best one to prove.” On the Arabic-language CCTT, she eliminated answer B because, “They (the ducklings) can die from something else not related to worms.” On question 40 on the English-language CCTT, P4 selected the correct answer C because, “It approaches it as a test to prove the prediction.” On the Arabic-language CCTT, she considered all three options “complicated.” She selected the incorrect option A because, “If the statement (being tested) is saying that all the ducklings that ate will die in 6 hours...then the first one is correct.” In English, the participant focused on the best way to prove the prediction. In Arabic, she looked for right and wrong answers.

P4 selected either the same answer or one degree of difference on nine out of 10 SRMT questions. She answered with two degrees of difference on question eight, but did not frame her answer in different terms. On question seven, *Fact are facts, no interpretation necessary*, she framed her response differently based on language. In English, she focused on not blindly following a fact. In Arabic she discussed the importance of emotions in supporting facts.

P11 was clearly more comfortable in Arabic than English. He selected different answers on 13 out of 24 TAP CCTT questions. On seven questions (1, 2, 6, 23, 27, 43, 48), P11 selected the opposite answers in Arabic and English. In section 1, P11 answered questions based on his personal opinion, but on questions 1, 2, and 6 his opinion in Arabic was different than his opinion in English. For example, on question 1, in English P11 stated, “He has the good idea that most of the people hasn’t faced these problems should not be able to vote.” In Arabic he said, “Yes, it is necessary for an 18-year-old to face these problems and vote.” On question 6, P11 made reference to the positive contributions made by foreigners in the Arab world.

Unfortunately, P11 produced limited verbal processes in Arabic and English making it difficult to understand the reasons behind the different choices he made in Arabic and English.

P11 selected either the same answer or one degree of difference on seven out of 10 SRMT questions. In general, the verbal data revealed no differences in the reasoning processes except that P11 read questions five and six differently in Arabic and English. On question five, *Only weak-minded people change their minds*, in Arabic he stated that those with weak minds should change their minds. In English he said that many things can cause a person to change his mind. On question six, *Like everyone else, I say whatever I need to say to get what I want*, in Arabic he understood the statement to mean that there are different ways to accomplish different goals whereas in English he stated, “No, not important to say whatever to take what you want, so I’m not like everyone else.”

P12 selected different answers on nine out of 24 TAP CCTT questions. The verbal data revealed no significant differences in the reasoning processes used to answer the seven of the nine questions. On question 39, in English P12 attempted to find the correct choice, not best prediction, whereas in Arabic, he selected the best prediction based on the use of clean cages. On question 43, in English P12 used a general definition to evaluate the statements, whereas in Arabic he immediately eliminated the correct general definition and selected the specific description of Bill’s stock car.

P12 selected either the same answer or one degree of difference on six out of 10 SRMT questions. Question eight was the only statement where P12 clearly used different reasoning processes according to language. In English he framed exaggeration as a way to get attention, whereas in Arabic he stated that he uses exaggeration as a tool to convince others of his decision when he is uncertain.

Although P13 scored better in English, he expressed his expectation that he would perform better in Arabic. He selected different answers on thirteen out of 24 TAP CCTT questions. On two of the 13 questions, the verbal data indicated that he mismarked one of the answer sheets and arrived at the same conclusion in both languages. On six of the 13 questions where he selected different answers, he used different reasoning processes. Three of these six occurred in section two on meaning and fallacies. On question 11, in English he stated, “There are only two alternatives,” whereas in Arabic he said, “The correct answer is A, this is wrong because he limited himself to two alternatives where there are many alternatives.” On question 13, in English he arrived at the correct answer using the process of elimination, whereas in Arabic, P12 did not compare answers and selected the incorrect option C because “Algan can’t know that there was an error made in the investigation.” On question 15, in English he arrived at the correct answer using the process of elimination, whereas in Arabic, P12, again, focused on one answer, option B, and explained why it was the correct choice.

On question 22, P13 misread the chart in Arabic and accepted the option A conclusion, whereas in English he did not find the experiment’s conclusion believable. On question 30, in English he reasoned from the specific to the general, whereas in Arabic he concluded that the information did not support the conclusion because the experiments were not identical. Similarly, on question 43, in English he created a general definition of a stock car and selected the correct answer, whereas in Arabic he focused on the details of Bill’s stock car.

P13 selected either the same answer or one degree of difference on six out of 10 SRMT questions. He framed his responses differently based on language on two questions. On question four, *Too much education can really mess a person up*, in English P13 stated, “Too much education enhances the person’s mind...studying more and more will make the person more

knowledge and thus he will be more good in several fields or aspects of life.” In Arabic he expressed, “Maybe someone studies a lot and has a lot of knowledge and this will lead him to dangerous things or he’ll develop weapons or anything dangerous or viruses and he’ll have the curiosity to try it and will try it on humanity for example. He will be doing something wrong.” On question nine, *I prefer assignments where I am told exactly what to do and how to do it*, in Arabic P13 strongly agreed and focused on his need for a place even if there is room for creativity. In English he answer situationally and stated, “There are assignments it is better to know how exactly to do it and...there are some assignments that need critical thinking and analysis and it would be fun to just think about it and analyze things...and try to find the right solution by yourself.”

CHAPTER FIVE

Discussion and Conclusions

This study explored the thinking processes of bilingual Lebanese undergraduate students with the aim of identifying the role of culture and contextual factors in critical thinking. Verbal data produced through a Think-aloud protocol (TAP) on selected items from the Cornell Critical Thinking Test (CCTT) Level Z were analyzed to examine the way that Lebanese students framed, interpreted, and answered critical thinking questions designed to measure *deduction, induction, observation and credibility of sources, assumptions identification, and meaning*. In addition, verbal data produced through a TAP on selected items from Insight Assessment's Sample Reasoning Mindset Test (SRMT) were analyzed to explore how Lebanese students framed and self-reported on questions designed to assess the critical thinking dispositions of *truth-seeking, open-mindedness, inquisitiveness, critical thinking self-confidence, and maturity*.

A secondary purpose of the study was to examine whether bilingual students used comparable processes to answer equivalent critical thinking questions in Arabic and English. Participants were divided into two similar procedural groups. One group was administered the English-language CCTT and SRMT and produced TAP verbal data in English. A second group was administered an Arabic-language translation of the CCTT and SRMT and produced TAP verbal data in Arabic (Lebanese dialect). A comparative analysis of the Arabic and English verbal data was completed with the goal of identifying linguistic differences in critical thinking processes.

This chapter will discuss the findings of this study in light of conceptual approaches to critical thinking, culture and thinking, critical thinking assessment, empirical reviews, and the

aspects of Lebanese culture presented in chapter 2. It will then address the limitations of the study and possible challenges to the interpretations of the results. It will conclude with suggestions for future research and a personal reflection on the overall project.

A number of patterns were identified in the thinking processes of participants. This project specifically investigated the role of culture in critical thinking. As such, this section will begin with a discussion of why participant verbal processes should be labeled culturally-specific in light of the aspects of Lebanese culture presented in chapter 2. It will then move to a discussion of how the results of this study contribute to the contemporary debate over the conceptualization and assessment of critical thinking.

Discussion of Findings

Culture and critical thinking skills: The impact of sectarianism

The verbal data produced in this study support the claim that sectarianism impacts the critical thinking processes of Lebanese undergraduate students. Sectarianism is the sociopolitical system in Lebanon where power is divided among ethnoreligious communities according to established quotas and where ethnoreligious groups are empowered by the state to create and manage their own religious courts and personal status and family laws (Nassar, 1995; Salloukh, Barakat, Al-Habbal, Khattab, & Mikaelian, 2015). As such, sectarianism has created an educational environment in Lebanon characterized by protectionism (Hage, 1996), fear of engagement with diverse worldviews (Shuayb, 2012), and a failure to promote mutual understanding and social cohesion (Al-Habbal, 2011). Ethnoreligious leaders who run private schools have resisted national initiatives in education aimed at promoting pluralism (Abou Assali, 2012; Abouchedid & Nasser, 2002; Frayha, 2010). Conflict avoidance is one of the prevailing values in the classroom setting (Abouchedid & Nasser, 2002; Al-Habbal, 2011;

Karami Akkary, 2014; Shuayb, 2012). Evidence of the impact of sectarianism was present in the verbal data in sections 2, 3, 4, 5, and 6. In CCTT sections 2 and 6, participants generally evaluated only one choice or used a simple process of elimination to select their answers. Although the process of elimination may be understood as a means of comparing answers, the verbal data did not provide evidence of careful deliberation, weighing choices, or considering possible alternatives. For example, on question 11 in section 2, 11 of the 22 participants who provided verbal data did not verbally consider more than one choice. The remaining 11 participants arrived at their conclusions through the process of elimination. Seven of these participants eliminated options individually without comparing answers. Only four participants produced verbal data that demonstrated the process of weighing possible answers against each other. In total, 18 of 22 participants did not compare the possible choices in the process of determining their answers. In section 3, participants attempted to determine which statements were correct or incorrect instead of comparing degrees of believability. In section 5, participants attempted to identify the right experiment instead of comparing and weighing the elements of possible predictions to determine the best type of experiment. The failure to compare and consider multiple points of view is consistent with a sectarian system that reinforces siloed thinking and does not encourage constructive dialogue among ethnoreligious groups.

In addition, in CCTT sections 4 and 6, participants did not engage in global reasoning or consider a broad perspective. Global reasoning is a central aspect of critical thinking in both objectivist and subjectivist schools of thought (Bailin, 1998; Blatz, 1989; R. H. Ennis, 2015; Facione, 1990a; McPeck, 1981; Papastephanou & Angeli, 2007; Paul & Binker Ed., 1990; Siegel, 1991; Thayer-Bacon, 1998). In section 4, the majority of participants performed well in simple comparative analysis, but found it difficult to navigate questions with variables whose

effects were unknown. In section 6, participants were able to perform a simple analysis but unable to construct a broad definition. For example, only two of the 21 participants who provided meaningful verbal data were able to construct a general definition of a stock car using the information provided. The lack of global reasoning or consideration of the impact of additional variables was consistent with the sectarianism's failure to promote pluralism and multicultural understanding.

The evidence from sections 2, 3, 4, 5, and 6 supports the contention that Lebanon's sectarian educational environment promotes narrow thinking and does not develop critical thinking skills such as withholding judgment and gathering multiple points of view. The verbal data also align with the expectation outlined in chapter 2, that students in a sectarian environment would be more concerned with choosing what is perceived as the right answer than providing a well-reasoned and reflective response.

Culture and critical thinking dispositions: The impact of sectarianism

The verbal data produced in this study support the claim that sectarianism impacts the critical thinking dispositions of Lebanese undergraduate students. On SRMT questions two and five, participants expressed a general willingness to change their minds. On question two, the majority of participants expressed that they would change an uninformed decision or that circumstances may require a change of mind. On SRMT question five, the majority of participants disagreed with the statement *Only weak-minded people change their minds* and framed a willingness to change their minds as a positive attribute. Even so, only two participants expressed that they would change their minds if they were convinced of a different perspective. On question five, only one participant stated that a logical argument from a different perspective would require a change of mind. None of the participants mentioned the possibility of personal

bias or the importance of being tolerant of divergent points of view associated with the description of the critical thinking disposition of open-mindedness (Facione et al., 1995).

Although participants expressed a general willingness to revise and reconsider their decisions, they did not indicate a general interest in engaging with multiple perspectives or considering more than one viable option.

In addition, the verbal data from questions one and ten indicated that participants do not actively pursue multifaceted understanding. For example, on question one, *I need to know the reason why things happen*, the majority of participants did not articulate an interest in a broad understanding of the way the world works. Instead, in more than half of the responses, knowledge was framed in the pragmatic terms of personal benefit. In line with the sectarian emphasis on conflict-avoidance, 8 of the 19 participants who provided meaningful data on question ten, *Every belief should be evaluated*, expressed that you should not evaluate others' beliefs. None of the 19 participants who provided meaningful verbal data applied the statement *Every belief should be evaluated* to an evaluation of their own personal beliefs. In total, the verbal data from questions one, two, five, and ten indicated a general lack of inquisitiveness, a disinterest in the beliefs of others, information framed in terms of self-interest, an avoidance of evaluating other points of view, and a failure to engage in self-examination; all characteristics consistent with the impact of sectarianism.

The juxtaposition of participant self-reported willingness to change their minds along with a general lack of interest in exploring alternate points of view supports the claim that Lebanese schools fail to promote mutual understanding (Abouchedid & Nasser, 2002) and do not nurture student dispositions of inquisitiveness and open-mindedness. This dynamic also supports Ommering's (2011) claim that Lebanese students are willing to discuss topics and consider other

options, but educators in Lebanon's sectarian environment do not encourage a spirit of exploration, open-discussion, and exposure to multiple points of view. In total, the impact of sectarianism on the development of student critical thinking dispositions appears to be a result of a lack of training and exposure as opposed to a general disposition of close-mindedness.

Culture and critical thinking skills: The impact of authoritarianism

The verbal data support the claim that authoritarianism impacts the critical thinking processes of Lebanese undergraduates. In an authoritarian educational environment, information is communicated directly and accepted by students in a top-down manner (Jurdak & El-Amine, 2005). An authoritarian system does not create space for nuance, exploration of multiple points of view, or general questioning (Joseph, 1993). Assessment of student performance is generally based on the mastery of subject-matter material. The Lebanese educational system is built on a high-stakes test model that requires students to pass a nationally administered test after primary school (the Brevet) and secondary school (either the Lebanese Baccalaureate or the French Baccalaureate). These official exams emphasize the ability to reproduce information. For example, students prepare for the Lebanese official exams by memorizing sets of questions and answers in civics, history, and geography. In math and sciences, students are required to memorize a set number of equations that they need to be able to reproduce on official exams (School-Net Lebanon, www.schoolnet.edu.lb/indeng.htm).

Evidence of the impact of authoritarianism was primarily present in the processes of participants in sections 2, 3, and 5. In CCTT section 2, participants did not understand the nuanced concept of equivocation, a word being used in two ways. Although this misunderstanding may indicate a cultural bias in the test, it may also reveal the impact of an authoritarian system with no place for nuance in the interpretation and use of language. In CCTT

section 3, participants failed to identify the credibility of a source as an important factor in establishing believability. Instead, participants framed believability in terms of right and wrong and disregarded the information provided in parenthesis. In section 5, participants attempted to find the correct prediction instead of evaluating the best prediction. The acceptance of the credibility of statements may indicate the impact of an authoritarian system where information is taken at face value and then evaluated as either correct or incorrect. Similarly, deficiencies in inductive reasoning may be the result of an authoritarian educational environment that emphasizes knowledge reproduction and does not promote student-centered exploration and analysis.

Self-confidence and self-regulation

Self-confidence was evident in participant responses on the CCTT and SRMT. For example, 13 of 24 participants indicated that they are rarely confused. A number of participants verbally expressed confidence in their decision-making and reasoning processes. Researcher field notes taken during the TAP sessions indicated that 16 of the 24 participants exhibited strong self-confidence.

In addition, the coding of the verbal responses on the CCTT and SRMT indicated that participants did not engage in the critical thinking skill of self-regulation. Self-regulation is the skill to “self-consciously monitor one's cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis and evaluation to one's own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results” (Facione, 1990, p. 19). As outlined above, verbal data from the CCTT showed that participants did not generally review, reflect on, or second-guess their choices. There were limited examples of self-correction where a participant examined a selection

and revised his or her choice after acknowledging an error in reasoning. Participant responses on the CCTT and SRMT did not demonstrate a pattern of the self-examination of personal views with a sensitivity to the possible influences of personal biases or self-interest (Facione, 2015). Participants did not provide evidence of meta-cognitive self-assessment of opinions or the willingness to evaluate their own inferential judgements with a view toward questioning or correcting their selections.

Participant self-confidence and a lack of self-regulation may be traced to the impact of authoritarianism, where one correct answer is assumed and communicated, as well as the impact of sectarianism, where students are not asked to engage with multiple points of view. These results may also be the result of an educational system that emphasizes the mastery of clearly defined content and does not require students to consistently reflect on their own assumptions.

Culture and critical thinking skills: Other cultural-specific observations

Only 6 of 22 participants demonstrated the ability to consistently reason neutrally in CCTT section 1. The general inability to evaluate statements neutrally may be evidence of the impact of a social belonging where contradicting the opinion of the “in-group” is perceived as threatening. Sectarianism, authoritarianism, and the cultural use of rhetoric may also reinforce a sense of confidence in one’s opinion (Wedeen, 1999).

The concept of *follows necessarily from the statements* was generally disregarded and did not carry normative force in the reasoning processes of the majority of participants. For example, the verbal data indicated that participant opinions on whether or not 18 year-olds are mature was considered the most important criteria for determining whether or not 18 year-olds should be allowed to vote. The majority of participants were not concerned with whether or not conclusions follow necessarily from the statements. These results indicate that participants have

not generally been trained to approach argument by neutrally evaluating the relationship between statements and conclusions and/or do not consider this approach to evaluating arguments valuable or necessary. These results support McPeck's (1981) claim that critical thinking assessments are tests that measure a learned accomplishment; in this case, the ability to trace the formal logical relationships between statements and conclusions. The verbal data also highlight the importance of Paul's (1985) concept of productive logic. Paul argues that productive logic is the reasoning humans use consciously or unconsciously to shape a goal or issue before actually thinking about the issue. In section 1, participants generally framed their responses and answered questions in terms of whether they agree or disagreed with the conclusion in spite of instructions which specified a different set of requirements.

Participants did not produce verbal processes that indicated the use of interdependent, dialectical reasoning (Nisbett et al., 2001). There was no evidence that participants attempted to find a compromise between opposing options. The majority of participants did not verbally consider the social consequences of their choices or take the broad context into account. Participants did not engage in the global, contextual reasoning associated with dialectical thinking. The verbal data indicated that on items where participants did not have an opinion, they engaged in simple, analytic reasoning, but on items where participants had a particular point of view, their opinion of the conclusion was more important than the ability to trace the relationships between the statements and conclusion. The verbal data did not clarify the sources of participant opinions. These results may indicate a need to develop additional paradigms situated between dialectic and analytic thinking. It may also be that the approach used in the CCTT and SRMT primed a particular way of thinking that did not allow for an accurate assessment of dialectical, interdependent thinking (Varnum et al., 2010).

The lack of verbal data in section 5 and 7 indicate that participants found these sections difficult (Leighton, 2017). The difficulty of comparative tasks in section 5 may support Chan and Yan's claim (2009) that adaptive rationalities lead to simplifying tasks to make them more manageable and may not be an indication of a lack of critical thinking ability.

The linguistic relativity hypothesis states that the languages humans speak are intricately related to the way that people think about and interpret reality (Dirven & Niemeier, 2000; Dragos, 2012; Goddard, 2003; Hussein, 2012; Tohidian, 2009). The results of this study did not reveal that test language had an impact on participant reasoning processes. The verbal data produced no evidence of differences in Arabic and English reasoning patterns on the CCTT and the SRMT. Instead, it produced a relatively even distribution of Arabic and English responses on different types of answers throughout both assessments. Similarly, the verbal data from repeat participants showed the use of similar reasoning processes on the majority of questions where they selected different answers in Arabic and English. The even distribution of participant choices across languages and the evidence of similar reasoning processes across languages indicates that the form of the questions and structured requirements utilized in the CCTT and SRMT had a more significant impact on participant thinking processes than the test language. This result supports the contention that test language does not impact the assessment of the specific skills and dispositions targeted in the CCTT and SRMT.

Culture and critical thinking dispositions: Other cultural-specific observations

The verbal data did not support the hypothesis that the majority of participants would frame their responses to the SRMT in collectivist and religious terms. For example, only 9 of 20 participants responded to the statement *I exaggerate how sure I am of my decisions* using social/relational terms. Only 5 of 16 participants responded to the statement *Like everyone else, I*

say whatever I need to say to get what I want using social/relational terms. Only 3 of 20 participants responded to the statement *I need to know the reasons why things happen* in religious terms and only one participant made any reference to religion in response to the statement *Every belief should be evaluated*. In addition, the impact of Lebanon's shame/honor culture was not clearly evident in the verbal data from the SRMT. A small number of participants stated that they avoid exaggeration based on the fear of being found wrong. Although not clearly stated, it may be that the negative responses to the characterization of being confused or weak-minded were associated with shame. In total, there was no evidence that religious belief, collectivism, or the concept of shame were prominent in the way that participants understood and self-reported on what motivates their beliefs and actions. These results indicate that either these aspects of Lebanese culture have limited impact on critical thinking dispositions; participants are not generally aware of how shame, collectivism, and religion impact their beliefs and choices; or that the SRMT is not a useful tool for examining the impact of shame, religious belief, and collectivism on critical thinking dispositions.

The verbal data raise questions about the disposition descriptors used in the SRMT. For example, none of the participants produced verbal responses that indicated "intellectual curiosity" and a "desire for learning even when the application of the knowledge is not readily apparent" (Facione, Sanchez, Facione, & Gainen, 1995, p. 6). Even so, SRMT scores indicated a position disposition of inquisitiveness in 18 of 24 participants. Similarly, participants did not indicate a "tolerance of divergent views" or a "sensitivity to the possibility of one's own bias" (p. 6) associated with open-mindedness. Even so, 18 of 24 participants received scores indicating a positive disposition of open-mindedness primarily based on a willingness to change their minds if they discovered that their decision was wrong.

In addition, the verbal data demonstrated a significant difference between the intention of the statement and the interpretation of the statement on a number of test items. For example, on SRMT question eight, the use of exaggeration was meant to indicate a lack of self-confidence, but participants did not generally associate exaggeration with confidence. Only 7 of the 22 participants who provided verbal data on question seven discussed the nuanced concept of interpretation in response to the statement *Facts are facts, no interpretation needed*. Although positive responses to the statement *Every belief should be evaluated* were meant to measure a disposition of truth-seeking, participants framed their answers in terms of evaluating others' beliefs or pragmatic interests. Only 9 of the 20 participants who provided verbal data on question six understood the intended meaning of the statement *Like everyone else, I say whatever I need to say to get what I want*.

These results indicate that the items used in the SRMT were not effective for assessing the intended critical thinking dispositions among participants. The verbal data also highlight the importance of cultural meaning and understanding in the development of statements that target the assessment of defined critical thinking dispositions. In addition, the results call into question the use of trans-cultural instruments as a means to effectively assess critical thinking dispositions in cross-cultural contexts.

Culture and critical thinking assessment

The CCTT is built on the objectivist conceptualization of critical thinking developed by Ennis (1962, 2011, 2015). Forty of the 52 CCTT questions assess knowledge of the scientific method, propositional forms of deductive logic, and the concept of equivocation. The remaining twelve questions are divided as follows: five questions assess the ability to evaluate credibility;

three questions assess the ability to identify an error in reasoning; and four questions assess the ability to reason from specific information to a general definition.

The verbal data demonstrated that participants did not answer questions designed to assess deductive logic, equivocation, and the linguistic relationship between genus and differentia based on the criteria outlined in the CCTT manual. In addition, a number of participants were not able to effectively evaluate scientific experiments. In section 1, verbal data showed that participant selection choices were not an accurate measure of deductive reasoning. Even though participants received their second highest aggregate score in section 1, only 6 of 22 participants were able to accurately trace the relationship between statements and their conclusions. In section 7, none of the 24 participants selected answers based on the description of an assumption as a syllogistic gap in reasoning. In section 2, 22 of 24 participants did not understand the concept of equivocation. Although 14 of the 24 participants selected the correct answer on question 44, none of the 15 participants who provided verbal data used the genus-differentia criteria for selecting their answers (R, Ennis, personal communication, February 2018). In addition, sections 4 and 5 of the CCTT primarily assess a test-taker's knowledge of the steps used to plan and evaluate a scientific experiment. The verbal data in the study indicated that participants who scored poorly on sections 4 and 5 generally did not know how to plan or assess the validity of a scientific experiment. Although participant selection responses may be an indication of weak critical thinking skills, a test-taker who has memorized the steps of the scientific method could perform well on sections 4 and 5 without using Ennis' definition of critical thinking as "reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 2011b, p. 5).

The lack of knowledge about deductive formal logic expressed in the verbal data is consistent with Davies (2007) claim that it is the basic principles of western critical reasoning that are not understood, not necessarily a lack of critical thinking skills. The participants general failure to identify all of the elements necessary for a reliable scientific experiment support Halpern's contention that multiple-choice critical thinking tests "are basically tests of verbal and quantitative knowledge" (Ku, 2009, p. 73). Participant ignorance of the concept of equivocation support Lun, Fischer, and Ward's (2010) contention that critical thinking scores are less about critical thinking and more about language acquisition and background knowledge.

Critics of the objectivist school of critical thinking claim that objectivist conceptualizations represent Western (Papastephanou & Angeli, 2007), scientific (Battersby & Bailin, 2011), linear (Bailin, 1995), effective thinking (Smith, 2001); not critical thinking. Papastephanou (2011) argues that the skills paradigm primarily assesses the type of skills the test-maker determines that people should be able to do well. Norris' (1989) claims that critical thinking assessments actually test whether a test-taker is aligned with the extra-critical-thinking assumptions of the test makers. McPeck's (1981) contends that critical thinking assessments are tests that measure a learned accomplishment.

The verbal data from this study show that participants either did not use or did not understand the criteria utilized to assess their critical thinking skills on the CCTT. In many cases, the correct selection was not an indication that students used the targeted critical thinking skill. For example, as mentioned above, 14 of 24 participants selected the correct answer on question 44, but the verbal data revealed that none of the participants used the intended criteria as the basis for their selection and none of the participants made their selections in section 7 based on the CCTT understanding of a gap in reasoning. Participants also received their second highest

aggregate score in section 1 even though the majority of participants answered based on their personal opinion of the conclusion. As such, this study supports the claim that either Lebanese undergraduate students are not skilled critical thinkers or that the CCTT, and by extension possibly all objectivist critical thinking assessments, is not an effective instrument for measuring critical thinking in the Lebanese context. The way these results are interpreted will be impacted by whether one adheres to the objectivist or subjectivist schools of critical thinking outlined in chapter 2.

Culture and critical thinking: Final observations

In total, the verbal data revealed a number of examples where similar justifications and assumptions employed by participants led to incorrect answers. For example, in section 1, participants consistently prioritized their opinion of a conclusion as the primary criteria used to justify their answers. In sections 3 and 4, the data revealed shared assumptions such as the irrelevancy of parenthetical information and the perceived unimportance of additional variables. The verbal data also revealed a pragmatic, instrumentalist view of knowledge, a disposition of self-confidence, and a lack of reflective practice. In addition to these patterns, the verbal data demonstrated an unfamiliarity with forms of propositional logic, the concept of equivocation, and the elements used to evaluate and plan a scientific experiment. Based on the information presented in this study, the reader will need to determine the extent to which these patterns constitute a deficiency in critical thinking skills and/or dispositions.

Finally, these results highlight the limitations of normative critical thinking frameworks and critical thinking assessments in non-Western settings. The data also call into question the construct relevance of trans-cultural critical thinking tests and indicate that the evaluation or

comparison of critical thinking abilities across cultural contexts based on selection response assessments should be avoided.

Limitations of the Research

There are a number of limitations associated with this study. TAP protocols are limited, general, methodologies. In this project, a number of participants provided incomplete or incoherent cognitive data at different times during the sessions. There were also occasional verbal gaps in the reasoning processes where it was evident that a non-verbalized, intermediate thought had occurred (Somerén et al., 1994). The difficulty of certain items appeared to limit the verbal processes of select participants. In addition, it was evident that it was easier for some participants to verbalize their thoughts than others (Ericsson & Simon, 1998). As such, it may be argued that the verbal data presented in this study are not an adequate representation of the critical thinking processes used by the participants. It is accurate that the verbal data in this study do not represent a picture of the entire cognitive processes utilized by participants. It is also possible that participants employed unidentified critical thinking skills during verbal gaps in reasoning. Even so, the amount of data produced and the emergence of clearly identifiable patterns in the verbal reasoning process of participants support the claims presented in the project.

A second limitation is that the study interprets and labels the verbal data of participants using the aspects of Lebanese cultural outlined in the literature review without verbal data from a comparative group from a different culture. It is possible that similar patterns of reasoning could be discovered among different cultural groups. As such, it can not be clearly demonstrated that the verbal data represent what the researcher labels culturally-specific patterns of reasoning. This is a valid critique of the project that requires further research if it is to be addressed.

A third limitation in the study was the use of translated, highly structured critical thinking assessments as a means for examining linguistic relativity. This project utilized a domain-centered approach to explore linguistic relativity. In a domain-centered approach, a researcher begins with a certain domain and then asks how various languages encode or construe it. In this case, the domain was critical thinking and the project examined how participants constructed their answers on the CCTT and SRMT based on their use of English or Arabic. Lucy (1997) outlines a number of weaknesses in domain-centered approaches. She highlights the “strong pressure to focus on domains that can be easily defined rather than on what languages typically encode.” She also states that the focus on a particular domain “tends to give a very narrow and distorted view of a language's semantic approach to a situation” and that “analysts typically concentrate only on those aspects of meaning that seem relevant to the domain.” She argues that “the key question for any domain-centered approach is how the domain has been delineated in the first place and what the warrant is for including or excluding particular forms and meanings” (p. 299). In the case of this project, it could be argued that the clearly defined forms and structure of the CCTT primed participants to think in a particular way irrespective of language. Although the SRMT provided a more flexible format for participant responses, the translation problems and misunderstandings of statements recorded in the results raise concerns about the effectiveness of the tool for assessing linguistic relativity. Again, these are valid concerns. There may be more effective, less structured, domain-centered approaches to examine the relationship between critical thinking and linguistic relativity. As such, any interpretation of the results in this study should be cognizant of these limitations.

Similarly, the questions used in the CCTT and SRMT were not designed to assess dialectical thinking. As such, the argument that the participants did not engage in dialectical

thinking must be tempered by the acknowledgement that the assessments used in the project were not primarily designed for this purpose. Even so, the questions in the CCTT sections 1 and 7, as well as a number of the statements in the SRMT, did present statements situated in social contexts. These questions provide situations that can be used to identify differences in dialectical and analytical patterns of reasoning. In addition, CCTT section 2 requires participants to assess arguments. There was no evidence in the verbal data of participant attempts to find a compromise between opposing options. Similarly, CCTT section 3 required participants to engage in the broader, contextual reasoning associated with dialectical thinking.

As with many qualitative studies, this project used a relatively small number of participants from one location. As such, any attempt to generalize to the larger population should be avoided. Knight and Nisbett (2007) have shown that it is possible that individuals from geographically similar regions may think in different ways. Similarly, Varnum, Grossman, Kitayama, and Nisbett (2010) argue that although research may support correlations between culture and thought, these correlations may break down on the individual level such that modes of thought are expressed in different ways for different individuals within each group. In addition, the think-aloud protocol used in this project resulted in limited or incomplete verbal data on a number of questions. The small sample size and, at times, limited verbal data makes it possible that the analyses of participant verbal processes do not represent the critical thinking processes of other Lebanese undergraduate students. Further research must be done to substantiate these results.

Finally, the CCTT claims to assess particular critical thinking skills using specific criteria based on an objectivist conceptualization of critical thinking. This study analyzed and interpreted verbal data to address questions that extended beyond the intentions of the test. As such, the

conclusions articulated in this study represent starting points for further research, not definitive results. Further research is needed to support or revise the project's conclusions.

Suggestions for Future Research

As stated above, this project represents a starting point for further research. To substantiate or challenge the results of this study, replication studies should be performed in different cultural contexts. For example, using the same methodology, the analysis of verbal data from participants at a similarly situated US university would provide comparative data to help clarify whether the thinking processes used in this study are appropriately labeled as culturally-specific. Since the conclusions did not produce evidence of linguistic relativity, a replication study could be conducted in a monolingual environment. A similar discussion of the historical/cultural background of each research context would need to be included in any replication study in order to accurately situated and analyze the verbal data.

Another type of replication study that would substantiate or challenge the results presented here would be a similar project conducted at another Lebanese university. A replication study could be improved by developing a better translation of the SRMT or attaining permission from Insight Assessment to use the California Critical Thinking Dispositions Inventory. Considering that the TAP protocol resulted in limited data on particular questions, it would be advantageous to recruit at least 30 participants in any replication study. In addition, considering only 24 of the 52 CCTT questions were used in the TAP protocol, a replication study could flip the think-aloud and non-think-aloud questions to produce verbal data for all 52 CCTT questions. The data collected from both studies could be useful in interpreting non-think-aloud selection responses.

A third type of replication study that would inform the results presented here would be a study where participants receive training in the principles of propositional logic, equivocation, and the scientific method before engaging in a TAP session. It would be informative to examine whether a simple knowledge of these concepts would produce higher scores and/or different reasoning patterns on the CCTT.

A fourth type of replication study that would expand the scope of this project could target participants in Lebanon from different developmental ages. The CCTT Level X is aimed at fourth through fourteenth grade students. The CCTT Level Z is used with advanced and gifted high-school students, college students, graduate students, and other adults (Millman et al., 2005). A replication study with high-school students using the CCTT Level X and a replication study with professionals using the CCTT Level Z would provide data on the role of developmental age in the interpretation and use of these research findings.

It would also be advantageous to develop new methodological approaches to explore the results presented in this project. For example, this study demonstrated weaknesses among Lebanese undergraduate students in global reasoning and comparing options. By either identifying a currently existing instrument that targets these skills, or developing an appropriate instrument, it would be useful to more fully assess these specific skills in the Lebanese undergraduate population to see if similar patterns emerge. If similar patterns are identified using other approaches, this information could help inform curricular choices and methodological strategies that can be used to develop critical thinking in Lebanon. In addition, although this study did not provide evidence of linguistic relativity in critical thinking, it would be informative to approach the question of linguistic relativity using other methods in order to provide further support or to challenge the conclusions presented here.

This project can help inform the practice of cross-cultural critical thinking instruction and the assessment of critical thinking skills and dispositions in cross-cultural and multicultural contexts. From the lens of a test-maker, the results suggest the need to include non-Western voices in the development of critical thinking instruments. From the lens of an administrator, the data can be utilized to outline the practical implications and inherent dangers of adopting specific approaches in teaching and assessing critical thinking. From the lens of a theoretician, the study emphasizes the importance of including culture and context in the ongoing debate over how to conceptualize critical thinking. Regardless of whether one adopts an objectivist or subjectivist approach, think-aloud protocols can be employed to help identify culturally-specific challenges to the development of critical thinking.

Conclusion

In conclusion, as long as the human capacity to think critically continues to be one of the goals of education, it is important to situate educational approaches to the development and assessment of critical thinking in appropriate social/cultural/political/linguist contexts. This study has attempted to trace the boundaries of the critical thinking discussion and introduce the complexities of cultural location into the debate. It has also explored the specific educational context of Lebanon with the aim of providing data that can assist in the development of contextually relevant approaches to promoting critical thinking among Lebanese students.

Through the project, I have learned about the values that undergird different conceptualization of critical thinking. I have touched on epistemology, cultural psychology, sociology, and education. I have developed questions about certain goals in the critical thinking movement such as how to balance the educational pursuit of autonomy with social connectivity. The study has also raised concerns about prevailing, objectivist approaches to critical thinking,

specifically whether critical thinking as a linear, scientific way of knowing is inherently good as well as whether objectivist critical thinking skills are transferable to daily life. Through the project, I have clarified the challenges I face if I want to promote critical thinking in Lebanon. The study has laid the groundwork for a research agenda that I am passionate about and can pursue in the next stage of my academic career. Most importantly, I have reconfirmed my belief in the importance of critical thinking as a means to navigate the information and challenges in our multicultural world.

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APPENDICES

Appendix A: IRB Proposal Approval



GEORGE FOX
UNIVERSITY

College of Education

414 N. Meridian St., V 124, Newberg, OR 97132

503.538.8383 | Fax 503.554.2868 | soe.georgefox.edu

June 15, 2017

Mr. William Merrifield
Ed.D. Candidate
George Fox University

Dear Mr. Merrifield,

This letter is to inform you that as a representative of the GFU Institutional Review Board I have reviewed your proposal for research investigation entitled "Culture and Critical Thinking: Exploring Culturally Informed Reasoning Processes in a Lebanese University." The proposed study meets all ethical requirements for research with human participants. The proposal is approved.

Best wishes as you complete your research investigation.

Sincerely,

A handwritten signature in black ink, appearing to read "Terry Huffman".

Terry Huffman, Ph.D.
Professor of Education

Appendix B: Stipulated Agreements for the use of Critical Thinking Instruments

Cornell Critical Thinking Test

The Critical Thinking Co.

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thereof by the parties.

5. General Provisions.

5.1 Agreement Binding on Legal Representatives, Successors and Assigns. This Agreement is binding on the Parties hereto and their respective legal representatives, successors and assigns.

5.2 Amendment or Alteration. No amendment, modification or other alteration of the terms and conditions of the Agreement shall be valid unless made in writing and duly executed by both parties hereto.

5.3 Dispute Resolution. In order to facilitate an efficient and economical resolution of any disputed matter arising under this Agreement, the parties agree to first, personally negotiate with each other in good faith, in an effort to resolve any dispute related to this Agreement that may arise between the parties.

In the event a dispute arises, the complaining party shall give the other party written notice of such dispute. Within 10 days after receipt of said notice, the parties shall meet at a mutually acceptable time and place, and, thereafter, as often as reasonably deemed necessary, shall exchange relevant information and attempt to resolve the dispute. If the dispute cannot be resolved by negotiation within 30 days after notice, or if the parties fail to meet within 10 days, the dispute shall be submitted to mediation before resorting to litigation or any other dispute resolution mechanism. Submission to mediation may be made by either party by written notification to the other party.

A mediator shall be selected by agreement of the parties within five days of notification of the need for mediation. Together with the mediator, the parties shall agree on a mutually convenient time for the mediation. If the parties are not able to agree on a mediator, an Oregon District Judge who coordinates mediation shall pick a mediator from his or her Approved List of Mediators. Together with the mediator selected, the parties shall promptly designate a mutually convenient time and place for the mediation, which shall take place within 45 days after selection of the mediator. If the parties do not agree promptly, then the mediator shall determine the time and place.

The Critical Thinking Co.

Confidential Agreement

The parties will use their best efforts to resolve such dispute by first mediating the dispute in good faith, and second, by using such other alternative dispute resolution procedures as may be selected by the parties.

5.4 Assignment. Neither of the Parties may assign this Agreement, in whole or in part, or any of their respective rights, interests or obligations hereunder, without the prior written consent of the other Party.

5.5 Counterparts/ Execution. This Agreement may be executed in two (2) counterparts, each of which shall be deemed to be an original, and all such counterparts shall constitute but one instrument. Article headings are inserted for the sake of convenience only and shall have no legal effect.

5.6 Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Oregon. Any dispute arising hereunder shall be resolved in Oregon.

5.7 Language. This agreement has been executed in the English language, and the English version of the Agreement shall prevail over any translation thereof.

5.8 Severability. The holding of any part of the Agreement to be invalid or unenforceable by a court of competent jurisdiction shall not affect any other part of the Agreement, which shall remain in full force and effect.

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|


The Critical Thinking Co.

Confidential Agreement

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed on the date first set forth above.

Michael Baker

Signature: 

Title: President

The Critical Thinking Co.

1991 Sherman Ave., Suite 200

North Bend, Oregon 97459, U.S.A.

Email: michaelb@criticalthinking.com

Phone: 800-458-4849 x 106

Fax: 800-458-4195

Bill Merrifield

Signature: 

Title: Researcher at George Fox University

Email: wmerrifield13@georgefox.edu

Phone Number: (563) 514-4546

Mailing Address: 2451 Countryside Lane, Bettendorf, IA 52722

Insight Assessment: Sample Reasoning Mindset Test*Measuring Thinking Worldwide*

Memo to Bill Merrifield:
Re: Permissions

Date: May 15, 2017

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A handwritten signature in black ink, appearing to read "Dee August".

Dee August, PhD
Research and Assessment Support

A handwritten signature in blue ink, appearing to read "William Merrifield".
WILLIAM MERRIFIELD

Debono Center for Teaching Thinking**Translation of the Cornell Critical Thinking Test****2017 / 5 / 11**إلى من يهمه الأمر

نود إعلامكم بأنه لا مانع لدينا من استخدام الأستاذ/ ويليام ميرفيلد **William Merrifield** للنسخة المترجمة من اختبار كورنيل للتفكير الناقد، حيث يعد الاختبار من ترجمة مركز ديونو لتعليم التفكير، وذلك ضمن الشروط والأحكام المتعارف عليها في البحث العلمي.

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مع فائق الاحترام والتقدير

**Faisal Gh. Hussein**

Administrative Assistant

Mob: +962-79-8306894

Tel: +962-6-5337003 / +962-6-5337029

Fax: +962-6-5337007

www.debono.edu.jo

Appendix C: Cornell Critical Thinking Test Level Z

**CORNELL CRITICAL THINKING TEST
LEVEL Z**

FIFTH EDITION

ROBERT H. ENNIS

JASON MILLMAN

© 2005, 1985 THE CRITICAL THINKING CO.™ www.CriticalThinking.com

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INSTRUCTIONS

This is a test to see how clearly and carefully you think.

There are 52 items. Avoid wild guessing, although it is all right to make shrewd guesses when you have good clues. There is one best answer to each item.

Mark your answers with a soft pencil on the answer sheet.

The test will be divided into Sections I-VII (1-7). In each section, there will be questions that are designated as “**Think-aloud Questions.**” For these questions, you need to talk out loud while you solve the critical thinking test problems. The remainder of the questions will be designated as “**Non Think-aloud Questions.**” You **do not** need to talk out loud while you solve these problems.

SECTION IA

In the first five items, two men are debating about voting by eighteen-year-olds. Mr. Pinder is the speaker in items 1, 2, and 4. Mr. Wilstings is the speaker in items 3 and 5. Each item presents a set of statements and a conclusion. In each item, the conclusion is underlined. Do not be concerned with whether or not the conclusions or statements are true.

Mark items 1 through 5 according to the following system:

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

If the conclusion **contradicts** the statements given, mark **B**.

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

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

CONSIDER EACH ITEM INDEPENDENTLY OF THE OTHERS.

Think-aloud Questions

1. “Mr. Wilstings says that eighteen-year-olds haven’t faced the problems of the world, and that anyone who hasn’t faced these problems should not be able to vote. What he says is correct, but eighteen-year-olds still should be able to vote. They’re mature human beings, aren’t they?”
2. “Furthermore, eighteen-year-olds should be allowed to vote because anyone who will suffer or gain from a decision made by the voters ought to be permitted to vote. It is clear that eighteen-year-olds will suffer or gain from the decisions of the voters.”
3. “Most eighteen-year-olds don’t know the difference between right and wrong. The right to vote should not be possessed by the members of a group if most of them don’t know this difference. It is obvious then that eighteen-year-olds shouldn’t have the right to vote.”

Non Think-aloud Questions

4. “Many eighteen-year-olds are serving their country. Now there can be no doubt that many people serving their country ought to be allowed the vote. From this you can see that many eighteen-year-olds ought to be allowed to vote.”
5. “I agree with Mr. Pinder that anyone who will suffer or gain from a decision made by the voters ought to be permitted to vote. And it is true that eighteen-year-olds will suffer or gain from these decisions. But so will ten-year-olds. Therefore, eighteen-year-olds shouldn’t be allowed to vote.”

SECTION IB

In the next five items, the two men are debating about immigration. Mr. Pinder is speaking in items 6, 8, and 9. Mr. Wilstings is speaking in items 7 and 10.

Use the same system to mark items 6 through 10:

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

CONSIDER EACH ITEM INDEPENDENTLY OF THE OTHERS.

Think-aloud Questions

6. “Mr. Wilstings has said that most foreigners have made positive contributions to our country. This is true. I will also admit that a group is not bad if most of its members do make positive contributions. But don’t be deceived by Mr. Wilstings’ fine-sounding language. Foreigners are a bad group and shouldn’t be admitted.”
7. “All of you think it was all right to open our doors to all people from distant lands in the nineteenth century. Any person who thinks it was all right to do so at that time ought also to be in favor of doing so now. Thus, you ought to be in favor of opening our doors now to those from distant lands who are seeking admission to our country.”

Non Think-aloud Questions

8. “Mr. Wilstings has proposed that we open our doors to all the foreigners who want to enter our beloved country. But foreigners always have made trouble and they always will. Most of them can’t even speak English. Since anybody who makes trouble is bad, it follows that foreigners are bad.”
9. “You may not know it, but for the past ten years the Communists in our country have been supporting a policy of unrestricted immigration. It is obvious why they support this policy of opening our doors to foreigners. Now I hate to say this, but Mr. Wilstings’ support of this policy leaves us but one conclusion: Mr. Wilstings is a Communist.”
10. “I’m sorry that Mr. Pinder feels that way about it. Sure, foreigners make trouble and most of them can’t speak English. But even though it’s true that people who make trouble ought not to be admitted, we still ought to admit foreigners to our country. You don’t want to be selfish, do you?”

SECTION II

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

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

Think-aloud Questions

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

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

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

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

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

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

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

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

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

Think-aloud Questions

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

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

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

- A. Algan is not using "know" in its ordinary sense, yet he is expecting the effect that follows from its being used in the ordinary sense.
 - B. Dobert, in using secret evidence, is not being fair, since this evidence is not available to everyone for inspection.
 - C. Algan can't know that an error was made in the investigation.
- 14. ALGAN:** The question boils down to two alternatives. Either we want clean, chlorinated water or we want bad-smelling, disease-ridden water. The citizens of Gallton certainly don't want bad-smelling, disease-ridden water. What is left but to chlorinate?

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

- A. Algan hasn't shown that there are only two alternatives.
 - B. Algan is using emotional language that doesn't help to make the argument reasonable.
 - C. Algan is using the same word in two ways.
- 15. DOBERT:** Laying aside the question of whether medication is bad or good, wouldn't you say that you are proposing a plan for medication?

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

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

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

- A. There is a serious mistake in the thinking in this part.
- B. Dobert's conclusion doesn't necessarily follow from the reasons he gives.
- C. Dobert and Algan are using the same word differently.

Non Think-aloud Questions

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

ALGAN: This is a demonstration. Nobody ought to object to a demonstration, since the purpose of a demonstration is not to find out something, but rather to show us something that is already known. An additional value of this demonstration of chlorination is that its purpose is also to test for the long-range effects of chlorination on the human body. This objective of the demonstration is a worthy one.

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

- A. Algan has not shown that knowing the long-range effects of chlorination is a worthy objective.
 - B. Algan is using a word in two ways.
 - C. There is an error in thinking in this part.
- 17. DOBERT:** Can you prove that chlorination is useful in making water safe?

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

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

- A. Algan is using the same word in two ways.
 - B. That's not a big enough reduction. If there were no typhoid at all the second year, then Algan would have proven his statement.
 - C. One such comparison is not enough to prove such a statement.
- 18. DOBERT:** In reality, you are proposing to poison our water supply when you propose to put chlorine gas in the water. Chlorine gas has been used in war to kill human beings. It is a deadly poison. Nobody wants to be poisoned.

ALGAN: But when chlorine is mixed 3 1/2 parts per million, nobody will be hurt at all.

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

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

- A. Algan is missing the point.
- B. Dobert is using the same word in two ways.
- C. Dobert's thinking is in error.

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

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

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

- A. Algan has made the word "safe" useless for communicating information.
- B. Algan hasn't said what he means by "safe."
- C. There is a flaw in Algan's thinking.

20. DOBERT: The citizens of Gallton will have to make a choice. Either we want absolutely pure water or we should keep our present setup. Now any chemist can tell you that from a practical point of view it is impossible to remove all the impurities from a water supply. So we should leave things the way they are.

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

- A. Dobert hasn't shown that there are only two alternatives.
- B. Dobert is using the same word in two ways.
- C. The conclusion doesn't necessarily follow from the reasons given.

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

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

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

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

- A. Dobert's thinking is in error.
- B. Algan should realize that a person has a right to use a word in a special way. The important thing is that there be understanding of what is said.
- C. Dobert is using a word in two different ways.

SECTIONS III, IV, AND V

REFER TO THE FOLLOWING EXPERIMENT:

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

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

TYPE OF DUCKLING	ORIGINAL NUMBER IN BROOD	REGULAR DIET			REGULAR DIET PLUS WORMS		
		Healthy	Ill	Dead	Healthy	Ill	Dead
MALLARD	8	3	1			2	2
	6	3					3
PINTAIL	6	2		1			3
	8	3	1		1		3
CANVASBACK	8	4				1	3
	8	3	1			1	3
TOTALS	44	18	3	1	1	4	17

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

SECTION III

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

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

Mark items 22 through 25 according to the following system:

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

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

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

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

Think-aloud Questions

22. A. Cabbage worms are poisonous to ducklings (said by Dr. Kolter).
B. Six Canvasbacks died during the week of the experiment (said by Dr. Kolter).
C. Neither statement is more believable.
23. A. During the week following the experiment, all of the ill ducklings died. (From an article in a magazine that can be found on almost every newsstand. The author, a popular international writer, stated that he obtained his information from Drs. Brown and Kolter.)
B. During the week following the experiment, the rest of the worm-fed ducklings died (from the report written by Drs. Brown and Kolter).
C. Neither statement is more believable.

Non Think-aloud Questions

24. A. Six Pintails were healthy at the end of the experiment (said by Dr. Brown).
B. Four worm-fed ducklings were ill at the end of the experiment (said by Dr. Brown).
C. Neither statement is more believable.
25. A. Independent laboratory studies have shown conclusively that ducklings sprayed with Wrodane will not be harmed by eating cabbage worms (from an article in a magazine published by a chemical company that makes Wrodane).
B. No satisfactory way has yet been found to counteract the poisonous effects of cabbage worms on ducklings (from the magazine article mentioned in Item No. 23, which appeared two months after the Wrodane article).
C. Neither statement is more believable.

SECTION IV

From the original experiment, the doctors drew this conclusion:
CABBAGE WORMS ARE POISONOUS TO DUCKLINGS.

Mark items 26 through 38 according to the following system:

- A. If true, this information **supports** the conclusion.
- B. If true, this information **goes against** the conclusion.
- C. This information does **neither**.

CONSIDER EACH ITEM INDEPENDENTLY OF THE OTHERS.

Think-aloud Questions

- 26. The experiment is repeated in Canada with twice as many ducklings. None of the ducklings die. At the end of the week, two of the regular-diet ducklings are ill, and three of the worm-diet ducklings are ill.
- 27. It is discovered that during the original experiment the regular-fed ducklings had less sunlight than the worm-fed ducklings. It is not known whether or not the difference in amount of sunshine would have an effect on the health of ducklings.
- 28. A group of well-known Canadian duck breeders report that they discovered long ago that it was dangerous to ducklings to let them run in a cabbage patch.
- 29. It is discovered that both sets of ducklings reached through their cages and drank water from a little ditch that ran past both cages. They drank practically no water out of the pans that were in the cages. The water in the ditch was ordinary water.
- 30. A similar experiment is performed with young dogs. Another is performed with young turtles. In both cases the results are similar to those of the original duckling experiment.

Non Think-aloud Questions

- 31. The experiment is repeated. The results are similar.
- 32. The experiment is repeated with three different varieties of ducklings, which are younger than the ones used in the original experiment. At the end of the week, two of the regular-diet ducklings are dead, and twenty of the worm-diet ducklings are dead.
- 33. At the time of the original experiment, there was an apple tree shedding apples into the cages of both sets of ducklings. The experimenters did not expect this to happen. About the same number of apples fell into each cage. This kind of apple does not affect the health of ducklings.

Non Think-aloud Questions

Reminder: Mark these items as follows:

- A. If true, this information **supports** the conclusion.
- B. If true, this information **goes against** the conclusion.
- C. This information does **neither**.

CONSIDER EACH ITEM INDEPENDENTLY OF THE OTHERS.

- 34. The experiment is repeated in Scotland. At the end of the week, all of the worm-fed ducklings are dead, and all of the regular fed ducklings are alive and healthy. But it is discovered that the man who handled the worms had been spraying fruit trees with arsenic and had carelessly transferred some arsenic to the feeding pan of the worm-fed ducklings. Arsenic is a deadly poison.
- 35. A team of expert biologists examines the body structure and processes of ten common varieties of ducklings, including the three used in the experiment. The biologists can find no significant differences among the varieties examined except for coloring.
- 36. The experiment is repeated in Canada with three different varieties of ducklings. All of the ducklings die, whether worm-fed or not.
- 37. The experiment is repeated in the United States with twice as many ducklings. At the end of the week, 40 of the 44 regular diet ducklings are alive and healthy, and 39 of the 44 worm-fed ducklings are alive and healthy.
- 38. It turns out that at the time of the original experiment, a large oak tree was dropping acorns into the cages of the worm-fed ducklings only. The effect of this kind of acorn on the health of ducklings is not known.

SECTION V

A research worker sets out to test the truth of the statement:

IF ANY DUCKLING EATS A CABBAGE WORM,
THE DUCKLING WILL DIE WITHIN SIX HOURS.

The research worker has developed an accurate, painless, and non-injurious stomach-testing method for telling whether a duckling has eaten a cabbage worm during the previous twelve hours. The method can be used both with dead ducks and live ducks.

In planning his experiments, he needs to make some *predictions* from the above statement.

- a. PREDICTIONS TELL WHAT WOULD BE TRUE, IF THE STATEMENT WERE TRUE.
- b. PREDICTIONS SHOULD BE USEFUL IN GUIDING AN ACTUAL EXPERIMENT.

Remembering these two rules about predictions, answer items 39 through 42. The items refer to the seven possible predictions listed after item 42.

Think-aloud Questions

39. Of j, k, and l, which is the best prediction? Mark A for **j**; mark B for **k**; mark C for **l**.

40. Of n, o, and p, which is the best prediction? Mark A for **n**; mark B for **o**; mark C for **p**.

Non Think-aloud Questions

41. Of k, l, and m, which is the best prediction? Mark A for **k**; mark B for **l**; mark C for **m**.

42. Of m, n, and o, which is the best prediction? Mark A for **m**; mark B for **n**; mark C for **o**.

Possible predictions:

- j.** If any duckling eats a cabbage worm, the duckling will be dead within six hours, and if a stomach test is performed within twelve hours after eating the worm, the results of the stomach test will show that the duckling has eaten at least one cabbage worm.
- k.** If any duckling does not die within six hours after a given period, then it did not eat any cabbage worms during that period.
- l.** Suppose six hungry Pintail ducklings are put for one hour in a cabbage patch containing cabbage worms and then put in a clean cage for six hours. If any do not die during that period, the results of the stomach test will show that these ducklings did not eat any cabbage worms.
- m.** If one Mallard duckling is selected at random from each of ten different broods, and all ten ducklings are kept away from cabbage worms for a twelve-hour period, then none will die during the last six hours of the twelve-hour period.
- n.** If one Mallard duckling is selected at random from each of six different broods, and each selected duckling is fed a cabbage worm, all six ducklings will be dead within six hours.
- o.** Suppose twelve hungry, randomly selected Canvasback ducklings are turned loose for one hour in a cabbage patch containing cabbage worms and then put in a clean cage for six hours. If each dies during that period, the results of the stomach tests will show that each has eaten a cabbage worm.
- p.** If a group of ten healthy Canvasback ducklings that would probably live if not fed cabbage worms is randomly split in half, and each half is treated the same except that one group of five eats cabbage worms, then the worm-fed ducklings will die within six hours and the other ducklings probably will not.

SECTION VI

Items 43 through 46 provide situations in which a definition is called for. From the three definitions that follow each description, pick the one (**A**, **B**, or **C**) that best gives the meaning.

Think-aloud Questions

- 43.** “That’s a nice stock car you have there, Bill,” his mother remarked.

“Stock car!” exclaimed Bill. “That’s no stock car. Did you ever see a car in a dealer’s showroom with bumpers made out of heavy pipe? Do the automobile manufacturers turn out cars with no fenders? Of course not.”

Bill’s mother then asked, “Just what do *you* mean by ‘stock car’?”

Of the following, which is the best way to state Bill’s notion of a stock car?

- A. A stock car is an automobile that is, for the most part, made of standard parts put out by automobile manufacturers, but which might have missing fenders and special bumpers.
 - B. A stock car is an automobile that has fenders and does not have bumpers made out of pipe.
 - C. A stock car is a standard automobile, as turned out by the factory and sold to the public.
- 44.** “It certainly is a stock car,” said Joan. “It has an ordinary engine that hasn’t been changed since it came off the assembly line. That alone makes it a stock car and that’s all that matters.”

Of the following, what is the best way to state Joan’s notion of a stock car?

- A. A stock car is an automobile that is, for the most part, made of standard parts put out by automobile manufacturers, but which might have the fenders missing and special bumpers.
- B. A stock car is an automobile with a standard engine.
- C. A stock car is where the engine is standard.

Non Think-aloud Questions

45. “What are you making with that dough?” asked Mary’s father.

“Dough!” exclaimed Mary. “Did you ever see anything made with yeast that was baked immediately after it was mixed? Naturally not,” she said as she put the mixture into the oven immediately after mixing it. “Therefore, it’s not dough.” “What do *you* mean by ‘dough’?” her father asked.

Of the following, which is the best way to state Mary’s notion of dough?

- A. Dough is a mixture of flour and other ingredients, including yeast.
- B. Dough is a mixture of flour and other ingredients, not baked immediately.
- C. Dough is a mixture of flour and other ingredients, often baked in an oven.

46. “Why, of course that’s dough,” said Jim. “You’re making cookies, aren’t you? It’s not even called dough unless it’s used for cookies.”

Of the following, which is the best way to state Jim’s notion of dough?

- A. Dough is a mixture of flour and other ingredients not baked immediately unless used for cookies.
- B. Dough is a mixture of flour and other ingredients which is used for cookies.
- C. Dough is a mixture of flour and other ingredients, which is used for cookies unless it’s baked immediately.

SECTION VII

In items 47 through 52, someone is speaking, but in each case there is an unstated assumption. An assumption is a statement that is taken for granted. From the choices that follow each item, select the one (A, B, or C) that is most probably the unstated assumption. Consider each item by itself.

Think-aloud Questions

47. MR. ALGAN: The explanation of the misbehavior of Gallton's present-day crop of youngsters is a simple one. These children have been severely punished at some time or other. That's the trouble.
- A. Children who have been severely punished misbehave.
 - B. Children who misbehave have been severely punished at some time.
 - C. Children who haven't been severely punished behave properly.
48. MRS. DOBERT: Their behavior can be explained by realizing that most of these youngsters have never been punished.
- A. Children who are punished behave properly.
 - B. Children who behave improperly have never been punished.
 - C. Children who have never been punished behave improperly.
49. MR. DOBERT: What we should do is never punish them. That would take care of things.
- A. Children who behave badly have been punished at some time.
 - B. Children who are punished will misbehave.
 - C. Children who behave properly have never been punished.

Non Think-aloud Questions

50. MR. DOBERT: The fact that Gallton's children have been forced to work explains their misbehavior.
- A. Children who have never been forced to work behave properly.
 - B. Children who behave improperly have been forced to work.
 - C. Children who have been forced to work behave improperly.
51. MRS. DOBERT: What we should do is not make them work. Then they would be all right. I know it.
- A. Children who are forced to work will misbehave.
 - B. Children who are not forced to work will behave properly.
 - C. Children who behave properly have not been forced to work.

Reminder: Select the one (A, B, or C) that is most probably the unstated assumption.

52. MRS. ALGAN: We ought to make them work. That will cure them.

- A. Children who aren't forced to work will misbehave.
- B. Children who are forced to work will behave properly.
- C. Children who behave properly have been forced to work.

Appendix D: Cornell Critical Thinking Test Level Z – Arabic Translation**Instructions****تعليمات**

هذا اختبار لمعرفة مدى الوضوح و الحرص الذي تفكر به.

هنالك 52 فقرة. تجنب التخمين السريع, لكن لا بأس من التخمينات اللاذعة حين تكون لديك المفاتيح الجيدة. هنالك إجابة واحدة هي الأفضل لكل فقرة.

ظلل إجاباتك باستخدام قلم رصاص (رقم 2) على ورقة الإجابة.

سيُقسَّم الاختبار إلى مقاطع من 1 إلى 7. سيتواجد ضمن كل مقطع أسئلة بعنوان "أسئلة للتفكير بصوت مرتفع". ضمن هذه الأسئلة، عليك أن تتكلم بصوت مسموع أثناء إكمال مسائل التفكير الناقد. وما تبقى من الأسئلة ستكون بعنوان "أسئلة للتفكير بصوت غير مرتفع". ليس عليك أن تتكلم بصوت مسموع أثناء إكمالك لهذا النوع من الأسئلة.

Section 1A

➤ القسم 1 (أ)

في الفقرات الخمس الأولى، يتناقش رجلان حول حق التصويت لمن بلغوا الثامنة عشر. المتحدث في الفقرات 1، 2، و 4 هو السيد خوري، أما المتحدث في الفقرتين 3 و 5 فهو السيد كنعان. تطرح كل فقرة مجموعة من التصريحات و استنتاجا. و في كل فقرة، تم وضع خط تحت الاستنتاج. لا تقلق قيما إذا كانت الاستنتاجات أو التصريحات صحيحة أم لا.

ظلل الفقرات من 1 إلى 5 وفق النظام التالي:

إذا كان الاستنتاج يتبع بالضرورة التصريحات المطروحة، ظلل أ.

إذا كان الاستنتاج يناقض التصريحات المطروحة، ظلل ب.

إذا كان الاستنتاج لا يتبع بالضرورة التصريحات المطروحة و لا يناقضها، ظلل ج.

إذا كان الاستنتاج يتبع بالضرورة التصريحات، يلتزم الشخص الذي يوافق على التصريحات بالموافقة على الاستنتاج. و إذا كان هنالك أمران متناقضان، فلا يمكن أن يكون الاثنان صحيحين.

تأمل كل فقرة بشكل مستقل عن الفقرات الأخرى.

أسئلة للتفكير بصوت مرتفع

1. "يقول السيد كنعان أن من بلغوا الثامنة عشرة لم يواجهوا مشكلات العالم، و ان أي شخص لم يواجه هذه المشكلات لا ينبغي أن يصوت. ما يقوله صحيح، غير أنه ينبغي تمكين من بلغوا الثامنة عشر من التصويت. فهم بشر ناضجون، أليس كذلك؟"

2. "بالإضافة إلى ذلك، ينبغي السماح لمن بلغوا الثامنة عشر بالتصويت لأن أي شخص سيعاني من قرار يصنعه الناخبون أو سيستفيد منه ينبغي أن يسمح له بالتصويت. من الواضح أن من بلغوا الثامنة عشر سيعانون أو سيستفيدون من قرارات الناخبين."

Section 1A

3. "إن معظم من بلغوا الثامنة عشر لا يعرفون الفرق بين الصواب و الخطأ. و حق التصويت لا ينبغي أن يمتلكه أفراد مجموعة ما إذا كانت غالبيتهم لا تعرف هذا الفرق. من الواضح إذا أنه لا ينبغي منح من بلغوا الثامنة عشر حق التصويت."

أسئلة للتفكير بصوت غير مرتفع

4. "إن العديد ممن بلغوا الثامنة عشر يخدمون بلدهم. و الآن ما من شك أن العديد ممن يخدمون بلدهم ينبغي أن يسمح لهم بالتصويت. من هنا تستطيع أن تستنتج أن العديد ممن بلغوا الثامنة عشر ينبغي أن يسمح لهم بالتصويت."

5. "اتفق مع السيد خوري أن أي شخص سيعاني من قرار يصنعه الناخبون أو سيستفيد منه ينبغي أن يسمح له بالتصويت. و صحيح أن من بلغوا الثامنة عشر سيعانون من هذه القرارات أو سيستفيدون منها. لكن ذلك ينطبق أيضا على من بلغوا العاشرة من عمرهم. لذا، لا ينبغي السماح لمن بلغوا الثامنة عشر بالتصويت."

Section 1B

➤ القسم 1 (ب)

في الفقرات الخمس التالية، يتناقش الرجال حول موضوع الهجرة. يتحدث السيد خوري في الفقرات 6, 8, و 9, ويتحدث السيد كنعان في الفقرتين 7 و 10.

استخدم نفس النظام لتظليل الفقرات من 6 إلى 10:

أ - الاستنتاج يتبع بالضرورة التصريحات المطروحة.

ب - الاستنتاج يناقض التصريحات المطروحة.

ج - لا هذا و لا ذاك.

تأمل كل فقرة بشكل مستقل عن الفقرات الأخرى.

أسئلة للتفكير بصوت مرتفع

6. "قال السيد كنعان أن معظم الأجانب كانت لهم إسهامات إيجابية في بلدنا. هذا صحيح. و أقر كذلك أن مجموعة ما لا تعد سيئة إذا كان معظم أفرادها ذوي إسهامات إيجابية. لكن عليكم ألا تتخذوا بمعسول الكلام الذي يقوله السيد كنعان. الأجانب عبارة عن مجموعة سيئة و لا ينبغي السماح لهم بالدخول."

7. "جميعكم يعتقد أنه كان لا بأس من فتح أبوابنا لجميع الناس القادمين من مناطق بعيدة في القرن التاسع عشر. و أي شخص يعتقد أنه لا بأس بذلك في ذلك الوقت ينبغي عليه أيضا أن يؤيد ذلك الآن. لذا، ينبغي عليكم تأييد فتح أبوابنا الآن للقادمين من بلدان بعيدة ممن يسعون بدخول بلدنا."

Section 1B

أسئلة للتفكير بصوت غير مرتفع

8. "اقترح السيد كنعان أن نفتح أبوابنا لجميع الأجانب الذين يرغبون بدخول وطننا الحبيب. غير أن الأجانب قد تسببوا دائما بالمتاعب و سيتسببون بذلك دائما. فمعظمهم لا يستطيعون حتى التحدث بالإنجليزية. و لما كانت أية فئة تتسبب بالمتاعب تعتبر فئة سيئة, فإن ذلك يعني أن الأجانب عبارة عن مجموعة سيئة."

9. "قد لا تعرفون ذلك, غير أنه في السنوات العشرة الماضية كان الشيوعيون في بلدنا يؤيدون سياسة الهجرة بلا قيود. إن أسباب تأييدهم لهذه السياسة في فتح الأبواب أمام الأجانب واضحة. أكره الآن أن أقول ذلك, غير أن تأييد السيد كنعان لهذه السياسة لا يترك لنا سوى استنتاجا واحدا, و هو أن السيد كنعان شيوعي."

10. آسف لشعور السيد خوري بهذه الطريقة تجاه ذلك الموضوع. بالتأكيد أن الأجانب يتسببون بالمتاعب و معظمهم لا يتحدثون الإنجليزية. و رغم أنه من الصواب عدم السماح لمن يخلقون المتاعب بالدخول, إلا انه لا يزال لزاما علينا السماح للأجانب بدخول بلدنا. " لا اعتقد أنكم أنانيين, أليس كذلك؟

Section 2

➤ القسم 2

تنقسم المناقشة التالية إلى أجزاء ترتبط بالفقرات 11 إلى 21. و هنالك تفكير خاطئ يجري في كل جزء. وظيفتك بالنسبة لكل فقرة هي اختيار افضل سبب جعل التفكير خاطئاً.

لأخذ هذا الجزء من الاختبار, لا حاجة لك لمعرفة أي شيء حول عملية إضافة الكلور للمياه.

أسئلة للتفكير بصوت مرتفع

11. رياض: سمعت انك و بعض المعتوهين الآخرين تحاولون دفع ولاية جيان لإضافة الكلور لمياهها. ويبدو أنكم تعتقدون أن ذلك سيكون مجدياً. ما من شك انه ينبغي علينا اما أن نعمل على إضافة الكلور أو ألا نعمل على ذلك. الأحق فقط هو من يؤيد إضافة الكلور للمياه, لذا لا ينبغي علينا فعل ذلك.

آدم: أنت مصيب على الأقل في قولك أننا نحاول إضافة الكلور للمياه.

اختر افضل سبب يجعل بعض هذا التفكير خاطئاً.

أ - يفترض رياض خاطئاً أن ثمة خيارين فقط.

ب - يستخدم رياض كلمة بطريقتين.

ج - يستخدم رياض لغة عاطفية لا تساعد في جعل نقاشه منطقياً.

Section 2

12. رياض: اعتقد أنكم تعلمون أن وضع الكلور في المياه سيهدد صحة كل واحد من مواطني جيان، و هذا أمر سيئ و تقرون بأنه سيئ.

آدم: ما الذي يمنحك الحق بالقول أن صحتنا ستكون مهددة؟

رياض: يمكن تعريف "الحياة الصحية" بأنها العيش وفق الطبيعة. و نحن لا نرى الكلور مضافا إلى المياه في الطبيعة. لذا، فإن صحة كل فرد ستكون مهددة إذا جرت إضافة الكلور.

اختر افضل سبب يجعل بعض هذا التفكير خاطئا.

أ - يستخدم رياض لغة عاطفية لا تساعد في جعل نقاشه معقولا.

ب - تفكير رياض يأخذ مسارا خاطئا.

ج - يستخدم رياض كلمة بطريقتين مختلفتين.

13. رياض: إضافة إلى ذلك، فإن مياه جيان نقية. و أنا أعرف ذلك من التقرير الذي لم تتطلع عليه بعد و الذي سيتم نشره قريبا من قبل دائرة مسح المياه الخاصة بالولاية.

آدم: لا يمكنك أن تعرف أن مياه جيان نقية. فدائرة مسح المياه لم تختبر جميع المياه المتوفرة لدينا، فهم لم يأخذوا سوى عينات. إضافة إلى ذلك، أنت لا تستطيع معرفة أنهم لم يرتكبوا خطأ ما في فحصهم لأن هنالك دائما فرصة للخطأ في كل فحص. لذا، لا تستطيع معرفة فيما إذا كانت مياه جيان نقية.

اختر افضل سبب يجعل بعض هذا التفكير خاطئا.

أ - لا يستخدم آدم كلمة "تعرف" بمعناها المعتاد. و مع ذلك فإنه يتوقع أن يكون السبب الناجم عن استخدامها في سياقه الصحيح.

ب - لم يكن رياض منصفا باستخدامه دليلا سريا ذلك الآن الدليل ليس في متناول كل فرد للتحقق منه.

ج - لا يستطيع آدم أن يعرف فيما إذا كان قد تم ارتكاب خطأ في الفحص.

Section 2

14. آدم: المسألة ينطوي عليها خياران. اما أننا نريد مياه نظيفة و مزودة بالكلور , أو أننا نريد مياه كريهة الرائحة و ناقلة للأمراض. و بالتأكيد أن مواطنو جيان لا يريدون مياه كريهة الرائحة و ناقلة للأمراض. فما الذي تبقى لنا سوى أن نقوم بعملية إضافة الكلور؟

اختر افضل سبب يجعل بعض هذا التفكير خاطئاً.

- أ - لم يوضح آدم أن هنالك خيارين فقط.
- ب - يستخدم آدم لغة عاطفية لا تساعد في جعل النقاش معقولاً.
- ج - يستخدم آدم نفس الكلمة بطريقتين.

15. رياض: لو وضعنا جانباً مسألة إن كانت المعالجة الطبيّة أمراً سيئاً أم جيداً, ألا نقول أنك تطرح خطة للمعالجة الطبيّة؟

آدم: على الاطلاق, هل يعد قتل الجرائم الموجودة في المياه مشابهاً لمعالجة مرض في الجسم البشري؟ بالتأكيد لا. لذا, لا يمكن أن نسمي خطتي خطة للمعالجة الطبيّة.

رياض: لا بل هي معالجة الطبيّة. اليس احد اهدافك التي ذكرتها هو الوقاية من المرض؟ و المعالجة الطبيّة هي عملية محاولة استعادة الصحة أو حمايتها بأية وسيلة مهما كانت. لا يعنينا فيما إذا كانت خطتك بالفعل ستعمل على حماية الصحة. ما يعنينا هو أنك ستحاول فعل ذلك و بالتالي فإنك ستعمل على معالجة الناس.

اختر افضل سبب يجعل بعض هذا التفكير خاطئاً.

- أ - هنالك خطأ خطير في التفكير في الجزء.
- ب - أن استنتاج رياض لا يتبع بالضرورة الأسباب التي يطرحها.
- ج - يستخدم رياض و آدم نفس الكلمة بشكل مختلف.

Section 2

أسئلة للتفكير بصوت غير مرتفع

16. رياض: ما أفهمه أنك تنتظر لهذه المسألة باعتبارها تجربة. و أنا واثق أن مواطني جيان لا يرغبون في أن يكونوا حقل تجارب في ذلك.

آدم: هذا توضيح للموضوع. و ما أحد ملزم بالاعتراض على توضيح ما, بما أن الهدف منه ليس التوصل إلى شيء ما, بل توضيح شيء نعرفه مسبقا. و القيمة التي يضيفها هذا التوضيح الخاص بإضافة الكلور تتمثل في أنه يهدف أيضا إلى اختبار الآثار طويلة الأمد لعملية إضافة الكلور على جسم الإنسان. و هذه الغاية من التوضيح تعد ذات أهمية.

اختر افضل سبب يجعل بعض هذا التفكير خاطئا.

- أ - لم يوضح آدم أن معرفة الآثار طويلة الأمد لعملية إضافة الكلور هي غاية ذات قيمة.
- ب - يستخدم آدم كلمة ما بطريقتين.
- ج - هنالك خطأ ما في التفكير في هذا الجزء.

17. رياض: هل تستطيع اثبات أن عملية إضافة الكلور مفيدة في جعل المياه آمنة؟

آدم: نعم, استطيع ذلك. تأخذ ولاية دانيّة مياهها من نفس المكان الذي نأخذ منه. قبل ثلاث سنوات, سجلت دانيّة 9 حالات مصابة بحمى التيفوئيد. قبل سنتين, بدأوا بإضافة الكلور و سجلت لديهم حالتان في تلك السنة. و هذا دليل كافي.

اختر افضل سبب يجعل بعض هذا التفكير خاطئا.

- أ - يستخدم آدم نفس الكلمة بطريقتين.
- ب - هذا ليس دليلا كافيا. إذا لم تسجل و لا حالة تيفوئيد في السنة الثانية, لقدّم آدم إثباتا على ما قاله.
- ج - مقارنة واحدة مثل تلك لا تعد كافية لإثبات ما يقوله.

Section 2

18. رياض: في الواقع أنت تقترح تسميم مياهنا حين تقترح إضافة الكلور إلى المياه. لقد جرى استخدام غاز الكلور في الحرب لقتل البشر. انه سم قاتل, و لا أحد يرغب بأن يتم تسميمه.

آدم: لكن حين يجري مزج الكلور بنسبة 3 و نصف لكل مليون, لن يتضرر أحد.

رياض: هذا ليس بيت القصيد, فالواقع انك تضع سما قاتلا في المياه. و هذا ما تقصده من تسميم المياه. لذا فإن أي شخص يشرب الماء سيتسم بالضرورة.

اختر افضل سبب يجعل بعض هذا التفكير خاطئا.

أ - أن آدم يخرج عن بيت القصيد.

ب - يستخدم رياض نفس الكلمة بطريقتين.

ج - تفكير رياض يأخذ اتجاهًا خاطئًا.

19. رياض: اضافة إلى ذلك, فان مياه جيان تعتبر آمنة الآن.

آدم: هذا ليس صحيحا. لا شيء آمن طالما أن هنالك فرصة سانحة لوقوع خطأ ما. من هنا نستنتج أن مياه جيان ليست آمنة.

اختر افضل سبب يجعل بعض هذا التفكير خاطئا.

أ - جعل آدم من كلمة "آمنة" كلمة غير مفيدة لنقل المعلومة.

ب - لم يقل آدم ما يعنيه من كلمة "آمنة".

ج - هنالك عيب في تفكير آدم.

Section 2

20. رياض: سيتوجب على مواطني جيان الاختيار. إما أننا نريد مياهها نقية تماماً أو أنه ينبغي علينا أن نحتفظ بوضعنا الحالي. يمكن لأي كيميائي أن يخبرك أنه من المستحيل – من وجهة نظر عملية – إزالة جميع الشوائب من المياه. لذا ينبغي علينا أن نترك الأمور كما هي.

اختر أفضل سبب يجعل بعض هذا التفكير خاطئاً.

- أ – لم يوضح رياض أن هنالك خيارين فقط.
 ب – يستخدم رياض نفس الكلمة بطريقتين.
 ج – أن الاستنتاج لا يتبع بالضرورة الأسباب المطروحة.
21. رياض: أن إضافة الكلور تعني إضافة دواء لمياه جيان. من الواضح أننا لا نرغب بمداواة مواطنينا كلما أرادوا شرب المياه.

آدم: ما الذي يمنحك حق القول بأن الكلور عبارة عن دواء؟

رياض: إن اصطلاح "دواء" تم تعريفه في القسم 201 (ز) من القانون الفيدرالي للغذاء و الدواء و مواد التجميل كمادة يقصد بها الاستخدام في التشخيص أو العلاج أو الوقاية من المرض في الإنسان أو غيره من الحيوانات. و الآن, لما كان الغرض من الكلور هو استخدامه للوقاية من المرض, فهو يعد دواء.

اختر أفضل سبب يجعل بعض هذا التفكير خاطئاً.

- أ – تفكير رياض يأخذ اتجاهها خاطئاً.
 ب – على آدم أن يدرك أن للمرء الحق باستخدام كلمة ما بطريقة خاصة. فالمهم ما يقال.
 ج – يستخدم رياض كلمة بطريقتين مختلفتين.

Section 3,4,5: Description

الأقسام 5,4,3

ارجع للتجربة التالية:

قام كل من الدكتور براون و الدكتور كولتر بتجربة في مختبر البيطرة التابع لوزارة الزراعة و الثروة السمكية البريطانية. و قد كان الاثنان مهتمين بما يحدث لفراخ البط التي تأكل ديدان الملفوف. و قد نقلت لهما تقارير عن العديد من الحالات التي ماتت فيها فراخ البط "بشكل غامض" بعد أن وضعت في مزرعة ملفوف تحتوي على ديدان الملفوف.

تم الحصول على 3 أنواع من فراخ البط (البري، و البلبول، و الامريكي) مجموعتان من كل نوع. و تم تقسيم كل مجموعة إلى مجموعتين متساويتين و متشابهتين إلى اقصى حد ممكن. كما تم تزودها لمدة اسبوع بغذاء متفق عليه خاص بالبط. و تم تقديم هذا الغذاء للجميع عدا أن نصف كل مجموعة جرى تزويدها بشيء إضافي: دودتي ملفوف يوميا لكل فرخ بط. و تمت ملاحظة حالة فراخ البط في نهاية الاسبوع و جرى تسجيلها في الجدول التالي:

نوع البط	العدد الأصلي في المجموع	خذاء معتاد			خذاء معتاد + الديدان		
		بصحة جيدة	مريض	ميت	بصحة جيدة	مريض	ميت
بري	8	3	1			2	2
	6	3					3
بلبول	6	2		1			3
	8	3	1		1		3
امريكي	8	4				1	3
	8	3	1			1	3
المجموع	44	18	3	1	1	4	17

توصل الاثنان إلى الاستنتاج التالي: تعد ديدان الملفوف غذاء ساما لفراخ البط.

Section 3

➤ القسم 3

لقد لفتت التجربة الكثير من الإهتمام، وسادت العديد من التصريحات حولها وحول سبل حماية فراخ البط. تشتمل كل من الفقرات من 22 إلى 25 على زوج من التصريحات (أ و ب)، والتي جرى وضع خط تحتها. إقرأهما و حدد بعد ذلك أيهما أصدق.

ضع إشارة على الفقرات من 22 إلى 25 وفق النظام التالي:

- إذا كنت تعتقد أنَّ التصريح الأول أصدق، ظلل أ.
- إذا كنت تعتقد أنَّ التصريح الثاني أصدق، ظلل ب.
- إذا لم يكن أيّ منهما أصدق من الآخر، ظلل ج.

لدى اتخاذك لقراراتك، استخدم المعلومات الموجودة والمعلومات الواردة بين قوسين بعد كل تصريح.

أسئلة للتفكير بصوت مرتفع

22. أ - تعد ديدان الملفوف سامة لفراخ البط (قالها الدكتور كولتر)
 ب - ماتت 6 بطات أمريكية خلال الأسبوع الأول من التجربة (قالها الدكتور كولتر).
 ج - ليس أيّ من التصريحين أصدق من الآخر.
23. أ - خلال الأسبوع الذي أعقب التجربة، ماتت جميع فراخ البط المريضة، (من مقالة في مجلة يمكن العثور عليها على جميع رفوف بيع المجلات تقريباً. وقد صرّح كاتب المقالة وهو كاتب دولي أنه قد حصل على المعلومات من الدكتورين براون وكولتر).
 ب - خلال الأسبوع الذي أعقب التجربة، ماتت باقي فراخ البط التي تغذت على الديدان.
 (من تقرير كتبه الدكتورين براون و كولتر).
 ج - ليس أيّ من التصريحين أصدق من الآخر.

Section 3

أسئلة للتفكير بصوت غير مرتفع

24. أ - كانت 6 بطات من نوع البلبول بصحة جيدة لدى نهاية التجربة (قالها الدكتور براون)
 ب - كانت 4 فراخ من البط التي تغذت على الديدان مريضة في نهاية التجربة
 (قالها الدكتور براون)
 ج - ليس أي من الصريحين أصدق من الآخر.
25. أ - أظهرت دراسات مخبرية منفصلة بشكل حاسم أن فراخ البط التي جرى رشها بمادة الوردان لن تتأذى من أكل ديدان الملفوف. (من مقالة في مجلة نشرتها شركة للمواد الكيماوية تصنع مادة الوردان).
- ب - لم يتم بعد العثور على طريقة مرضية لمواجهة الآثار السامة لديدان الملفوف على فراخ البط. (من مقالة المجلة المذكورة في الفقرة 23، و التي ظهرت بعد شهرين من مقالة مادة الوردان).
- ج - ليس أي من التصريحين أصدق من الآخر.

Section 4

➤ القسم 4

توصل الدكتوران من التجربة الأولى إلى الإستنتاج التالي:
تعد ديدان الملفوف مادة سامة لفراخ البط.

ظلل الفقرات من 26 إلى 38 وفق النظام التالي:

- أ - إذا كانت صحيحة, فإن هذه المعلومة تؤيد الإستنتاج.
- ب - إذا كانت صحيحة, فإن هذه المعلومة تخالف الإستنتاج.
- ج - هذه المعلومة لا تؤيد الإستنتاج ولا تخالفه.

تأمل كل فقرة بشكل مستقل عن الفقرات الأخرى.

أسئلة للتفكير بصوت مرتفع

26. جرت إعادة التجربة في كندا باستخدام ضعف عدد فراخ البط, ولم يمت أي منها. في نهاية الأسبوع, مرض فرخين ممن تناولوا الطعام المعتاد. ومرضت 3 فراخ ممن تغذوا على الديدان.

27. اكتشف أنه خلال التجربة الأولى كانت الفراخ التي تناولت الطعام المعتاد قد تعرضت لضوء الشمس فترة أقل مما تعرضت له الفراخ التي تغذت على الديدان, ولا يعرف فيما إذا كان الاختلاف في كمية الإشعاع الشمسي له أثر على صحة الفراخ أم لا.

28. تقول مجموعة كندية ذائعة الصيت من مربّي طيور البط أنهم اكتشفوا قبل ذلك بفترة طويلة خطورة ترك فراخ البط في مزارع الملفوف.

29. اكتشف أن مجموعتي الفراخ قد مدت رؤوسها عبر قضبان الأقفاص وشربت المياه من حفرة صغيرة كانت تمر بالقرب من القفصين. وعملياً فإن تلك الفراخ لم تشرب من الأواني الموجودة في الأقفاص, والمياه التي كانت في الحفرة كانت مياهها عادية.

Section 4

30. تم إجراء تجربة مشابهة على كلبين صغيرين. وأجريت تجربة أخرى على سلاحف صغيرة. في الحالتين كانت النتائج مشابهة لتلك التي تمخضت عن التجربة الأولى التي أجريت على فراخ البط.

أسئلة للتفكير بصوت غير مرتفع

تأمل كل فقرة بشكل مستقل عن الفقرات الأخرى.

31. تم إعادة التجربة، وكانت النتائج مشابهة.

32. تم إعادة التجربة باستخدام ثلاثة أنواع مختلفة من فراخ البط أصغر سناً من تلك الأنواع التي استخدمت في التجربة الأولى، في نهاية الأسبوع، مات فرخان من فراخ البط التي تناولت الطعام المعتاد، ومات عشرون فرخاً ممن تغذوا على الديدان.

33. في فترة إجراء التجربة الأولى، كان ثمة شجرة تفاح ترمي بثمارها إلى الأقفاص التي تحتوي على مجموعتي البط. لم يتوقع القائمون على التجربة حدوث ذلك. وقد سقط نفس عدد التفاحات تقريباً في كل قفص. هذا النوع من التفاح لا يؤثر على صحة فراخ البط.

34. جرت إعادة التجربة في سكتلنده. وفي نهاية الأسبوع الأول، ماتت جميع فراخ البط التي تغذت على الديدان، وظلت الفرخ التي تغذت بالطعام المعتاد حية و بصحة جيدة. لكن اكتشف أن الشخص الذي كان يقوم بتغذيتها بالديدان كان يرش الأشجار الفاكهة بمادة الزرنيخ وقد نقل بعض تلك المادة إلى الإناء المخصص لإطعام الفراخ التي تتغذى على الديدان. ويعتبر الزرنيخ مادة سامة قاتلة.

35. قام فريق من الخبراء البيولوجيين بفحص البنية الجسدية والعمليات التي تتم في عشر أنواع معروفة من فراخ البط بما فيها الأنواع الثلاثة التي استخدمت في التجربة. ولم يتمكن الخبراء من العثور على اختلافات واضحة بين الأنواع التي أجريت عليها التجربة عدا عن اختلافات في اللون.

Section 4

تذكير: ظلل هذه الفقرات كما يلي:

- أ - إذا كانت صحيحة, فإن هذه المعلومة تؤيد الاستنتاج.
- ب - إذا كانت صحيحة, فإن هذه المعلومة تخالف الاستنتاج.
- ج - هذه المعلومة لا تؤيد الاستنتاج ولا تخالفه.

36. جرت إعادة التجربة في كندا باستخدام ثلاثة أنواع مختلفة من فراخ البط. و قد ماتت جميعها سواء تلك التي تغذت على الديدان أو التي لم تتغذى عليها.
37. جرت إعادة التجربة في الولايات المتحدة باستخدام ضعف عدد فراخ البط. في نهاية الأسبوع, بقي 40 فرخاً من بين 44 فرخاً تغذوا على الطعام المعتاد على قيد الحياة وبصحة جيدة, بينما بقي 39 فرخاً من بين 44 فرخاً تغذوا على الديدان على قيد الحياة وبصحة جيدة .
38. تبين أنه في فترة إجراء التجربة الأولى كانت ثمة شجرة بلوط كبيرة تلقي بثمارها إلى أقفاص فراخ البط التي تتغذى على الديدان فقط. ولم يعرف أثر هذا النوع من الثمار على صحة فراخ البط.

Section 5

➤ القسم 5

يشرّع باحث بفحص صحة التصريح التالي:
إذا قام أي فرخ بط أكل دودة ملفوف, فإن الفرخ سيموت خلال ست ساعات.

قام الباحث بتطوير أسلوب دقيق وغير مؤلم ولا ضار لفحص المعدة في سبيل معرفة فيما إذا كان فرخ بط قد أكل دودة ملفوف خلال الساعات الأثنتي عشرة الماضية. يمكن استخدام هذا الأسلوب مع كل من فراخ البط الميتة والحية.

في تخطيطه لتجاربه, يحتاج لعمل بعض التنبؤات من التصريح الوارد أعلاه.

أ - تقول التنبؤات بما سيكون صحيحاً, إذا كان التصريح صحيحاً.

ب - ينبغي أن تكون التنبؤات مفيدة في توجيه إجراء تجربة حقيقية.

متذكراً هاتين القاعدتين الخاصتين بالتنبؤات, أجب على الفقرات من 39 إلى 42, تشير هذه الفقرات إلى التنبؤات السبعة المحتملة التي أدرجت بعد الفقرة 42.

أسئلة للتفكير بصوت مرتفع

39. من الفقرات ي و ك و ل, أيهم يعد أفضل التنبؤات؟ سجل أ للفقرة ي و ب للفقرة ك و ج للفقرة ل.

40. من الفقرات ن و س و ع, أيهم يعد أفضل التنبؤات؟ سجل أ للفقرة ن و ب للفقرة س و ج للفقرة ع.

أسئلة للتفكير بصوت غير مرتفع

41. من الفقرات ك و ل و م, أيهم يعد أفضل التنبؤات؟ سجل أ للفقرة ك و ب للفقرة ل و ج للفقرة م.

42. من الفقرات م و ن و س, أيهم يعد أفضل التنبؤات؟ سجل أ للفقرة م و ب للفقرة ن و ج للفقرة س.

Section 5: Possible predictions

النتبؤات المحتملة:

- ي. إذا قام أي فرخ بط يأكل دودة ملفوف, فإنه سيموت خلال 6 ساعات, وإذا جرى فحص المعدة خلال 12 ساعة بعد أكل الدودة, ستظهر نتائج فحص المعدة أن الفرخ قد أكل دودة ملفوف واحدة على الأقل.
- ك. إذا لم يموت أي فرخ خلال 6 ساعات بعد فترة محددة فإنه لم يأكل أي دودة ملفوف خلال تلك الفترة.
- ل. افترض أنه قد جرى وضع 6 فراخ من بط البلبول لمدة ساعة في مزرعة ملفوف تحتوي على ديدان ملفوف, وجرى بعدها وضعه في قفص نظيف لمدة 6 ساعات. إذا لم يموت أي من الفراخ خلال تلك الفترة, ستظهر نتائج فحص المعدة أن هذه الفراخ لم تأكل أي من ديدان الملفوف.
- م. إذا جرى انتقاء فرخ بط بري بشكل عشوائي من 10 مجموعات مختلفة, و تم إبعاد كافة الفراخ العشر عن ديدان الملفوف لمدة 12 ساعة, فإن أيا منها لن تموت خلال آخر 6 ساعات من فترة الأثنيتي عشرة ساعة.
- ن. إذا جرى انتقاء فرخ بط بري بشكل عشوائي من 6 مجموعات مختلفة, و تم تغذية كل فرخ منها بدودة ملفوف, فإن جميع الفراخ الستة ستموت خلال 6 ساعات.
- س. افترض أنه قد جرى اطلاق 12 فرخاً جائعاً من فراخ البط أمريكي جرى انتقاؤها بشكل عشوائي لمدة ساعة في مزرعة للملفوف تحتوي على ديدان ملفوف, وجرى بعدها وضعها في قفص نظيف لمدة 6 ساعات. إذا مات كل فرخ خلال تلك الفترة, فإن نتائج فحص المعدة ستظهر أن كل فرخ قد أكل دودة ملفوف.
- ع. إذا جرى تقسيم عشوائي لمجموعة تتكون من 10 فراخ بط أمريكي بصحة جيدة إلى النصف والتي ربما كانت ستعيش إذا لم تتم تغذيتها بديدان الملفوف, و تمت معاملة كل نصف بنفس الطريقة عدا عن أن مجموعة من 5 فراخ قد جرى تغذيتها بديدان الملفوف, فإن الفراخ التي أكلت الديدان ستموت خلال 6 ساعات ومن المحتمل ألا تموت الفراخ الأخرى.

Section 6

➤ القسم 6

تطرح الفقرات من 43 إلى 46 مواقف تستدعي تعريفاً ما، من بين التعريفات الثلاثة التي تعقب كل وصف، اختر تعريفاً واحداً (أ أو ب أو ج) والذي يعطي أفضل المعنى.

أسئلة للتفكير بصوت مرتفع

43. "إنها سيارة جميلة تلك التي مطورة لديك هناك يا طارق"، قالت أمه.
 "سيارة مطورة! قال طارق متعجباً. تلك ليست سيارة مطورة. هل سبق لك رؤية سيارة في معرض لبيع السيارات تتمتع بدعامات مصنوعة من الأنابيب الثقيلة؟ هل تنتج مصانع السيارات سيارات بدون رفار؟ بالطبع لا."

تسأل أم طارق بعد ذلك: "ما الذي تعنيه بالسيارة المطورة؟"

من بين التصريحات التالية، أي الطرق تعد الأفضل لتوضيح فكرة طارق عن السيارة المطورة ؟

- أ - السيارة المطورة هي مركبة صنعت أكثر أجزائها من قطع متعارف عليها تنتجها مصانع السيارات، لكنها قد تفتقد للرفارف و الدعامات الخاصة.
- ب - السيارة المطورة هي مركبة تحتوي على رفارف ولا تحتوي على دعامات مصنوعة من أنبوب.
- ج - السيارة المطورة هي سيارة اعتيادية تبقى كما خرجت من المصنع وتباع للعامة.

Section 6

44. "إنها بالتأكيد سيارة مطورة." تقول مايا. "فهي تشتمل على محرك اعتيادي لم يطرأ عليه تغيير منذ أن خرج من خط للتجميع. و هذا وحده يجعلها سيارة مطورة وهذا كل ما يعيننا."

من بين التصريحات التالية، أي الطرق تعد الأفضل لتوضيح فكرة مايا حول السيارة المطورة؟

- أ - السيارة المطورة هي مركبة صنعت أكثر أجزائها من قطع متعارف عليها أنتجتها مصانع السيارات، لكنها قد تفتقد للرفرف والدعامات الخاصة.
- ب - السيارة المطورة هي مركبة ذات محرك اعتيادي .
- ج - السيارة المطورة هي حيثما وجدَّ محركٍ اعتيادي.

أسئلة للتفكير بصوت غير مرتفع

45. "ما الذي تعنيه بتلك العجينة؟"، سأل والد ماري.

"عجينة! قالت ماري متعجبة. "هل سبق لك أن رأيت شيئاً مصنوعاً من القمح جرى خبزه فوراً بعد أن تم مزجه؟ بالطبع لا." قالت ذلك وهي تضع المزيج في الفرن فوراً بعد مزجه. "لذا، فهذه ليست عجينة؟"

"ما الذي تعنيه بالعجينة؟" سأل والدها.

من بين التصريحات التالية أي الطرق تعد الأفضل لتوضيح فكرة ماري حول العجينة؟

- أ - العجينة هي مزيج من الطحين و المكونات الأخرى بما فيها القمح.
- ب - العجينة هي مزيج من الطحين و المكونات الأخرى لا يتم خبزها فوراً.
- ج - العجينة هي مزيج من الطحين و المكونات الأخرى و التي غالباً يتم خبزها في الفرن.

Section 6

46. "بالطبع تلك ليست عجينة" قال زين. "أنت تصنعين الكعك، أليس كذلك؟ إنها لا تسمى عجينة ما لم تستخدم في صنع الكعك."

من بين التصريحات التالية، أي الطرق تعد الأفضل لتوضيح فكرة زين حول العجينة؟

أ - العجينة هي مزيج من الطحين والمكونات الأخرى التي لا يتم خبزها فوراً، إلا إذا استخدمت في صنع الكعك.

ب - العجينة هي مزيج من الطحين و المكونات الأخرى التي تستخدم في صنع الكعك.

ج - العجينة هي مزيج من الطحين والمكونات الأخرى التي يتم استخدامها في صنع الكعك، إلا اذا جرى خبزها فوراً.

Section 7

➤ القسم 7

في الفقرات من 47 إلى 52 يتحدث أحدهم، لكن في كل حالة هنالك افتراضة هو غير مذكور. و الافتراض عبارة عن تصريح يؤخذ كأمر مسلم به. من الخيارات التالية اختر واحداً (أ أو ب أو ج) والذي يعتبر على الأغلب هو الافتراض غير مذكور.
تأمل كل فقرة بحد ذاتها.

أسئلة للتفكير بصوت مرتفع

47. السيد شلهوب: إن تفسير سوء سلوك أطفال هذا اليوم في جيان هو تفسير بسيط، لقد تعرض هؤلاء الأطفال للعقاب الشديد في وقت ما، تلك هي المشكلة.

- أ – الأطفال الذين تعرضوا للعقاب الشديد يسيئون التصرف.
- ب – الأطفال الذين يسيئون التصرف تعرضوا للعقاب الشديد في وقت ما.
- ج – الأطفال الذين لم يتعرضوا للعقاب الشديد يتصرفون بشكل لائق.

48. السيدة نصر الله: يمكن تفسير سلوكهم بإدراك أن معظم هؤلاء الصغار لم يسبق لهم أن عوقبوا.

- أ – الأطفال الذين يعاقبون يتصرفون بشكل لائق.
- ب – الأطفال الذين يتصرفون بشكل غير لائق لم يسبق لهم أن عوقبوا.
- ج – الأطفال الذين لم يسبق لهم أن عوقبوا يتصرفون بشكل غير لائق.

49. السيد نصر الله: ما ينبغي علينا فعله هو عدم معاقبتهم بتاتا. وهذا سيحل كل الأمور.

- أ – الأطفال الذين يتصرفون بشكل سييء كانوا قد عوقبوا في وقت ما.
- ب – الأطفال الذين تمت معاقبتهم يسيئون التصرف.
- ج – الأطفال الذين يتصرفون بشكل لائق لم يسبق لهم أن عوقبوا.

Section 7

تذكير: اختر من (أ أو ب أو ج) الفقرة التي تعتبر على الأغلب هي الافتراض غير المذكور.

أسئلة للتفكير بصوت غير مرتفع

50. السيد نصر الله: حقيقة أن أطفال جيان قد أجبروا على العمل يفسر سوء سلوكهم.

أ - الأطفال الذين لم يجبروا من قبل على العمل يتصرفون بشكل لائق.

ب - الأطفال الذين لا يتصرفون بشكل لائق أجبروا على العمل.

ج - الأطفال الذين أجبروا على العمل يتصرفون بشكل غير لائق.

51. السيدة نصر الله: ما ينبغي علينا فعله هم عدم تشغيلهم. و سيكونون بعدها بخير, أنا أعرف ذلك.

أ - الأطفال الذين يجبرون على العمل سيسئون التصرف.

ب - الأطفال الذين لا يجبرون على العمل سيتصرفون بشكل لائق.

ج - الأطفال الذين يتصرفون بشكل لائق لم يتم إجبارهم على العمل.

52. السيدة شلهوب: ينبغي علينا تشغيلهم, فهذا سيعالجهم.

أ - الأطفال الذين لا يجبرون على العمل سيسئون التصرف.

ب - الأطفال الذين يجبرون على العمل سيتصرفون بشكل لائق.

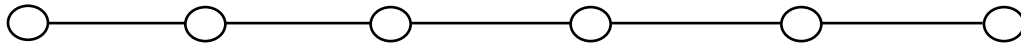
ج - الأطفال الذين يتصرفون بشكل لائق تم إجبارهم على العمل.

النهاية. راجع أجوبتك.

Appendix E: Think-Aloud Protocol Sample Reasoning Mindset Test items

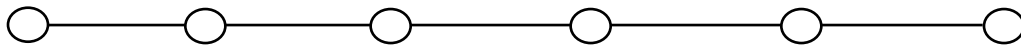
1. I need to know the reasons why things happen.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



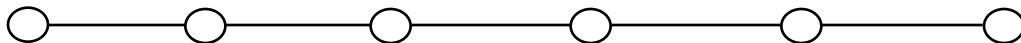
2. Once I have made my decision, I do not change my mind.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



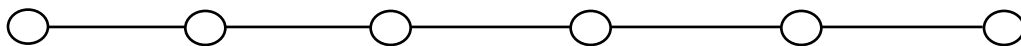
3. Most of the time I feel confused.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



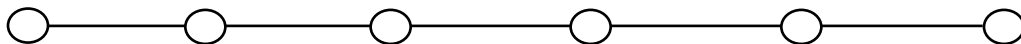
4. Too much education can really mess a person up.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



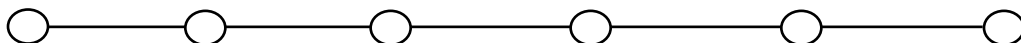
5. Only weak-minded people change their minds.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



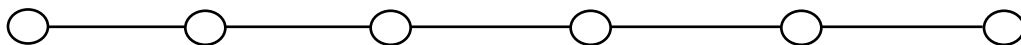
6. Like everyone else, I say whatever I need to say to get what I want.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



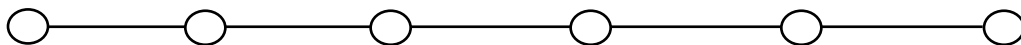
7. Facts are facts, no interpretation needed.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



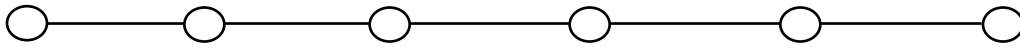
8. I exaggerate how sure I am of my decisions.

Agree strongly *Agree* *Agree a little* *Disagree a little* *Disagree* *Disagree strongly*



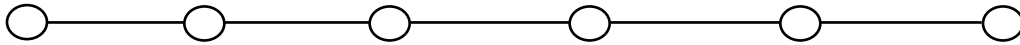
9. I prefer assignments where I am told exactly what to do and how to do it.

Agree strongly Agree Agree a little Disagree a little Disagree Disagree strongly



10. Every belief should be evaluated.

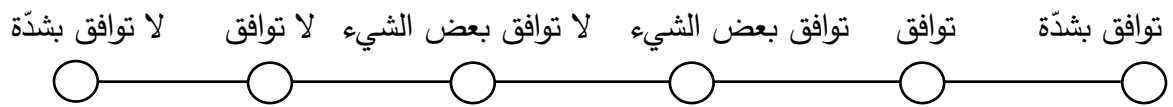
Agree strongly Agree Agree a little Disagree a little Disagree Disagree strongly



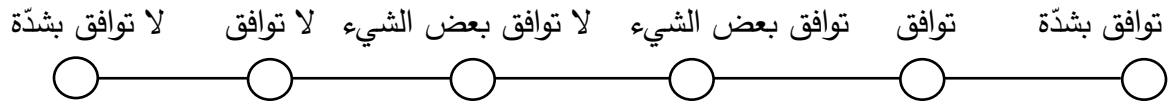
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Appendix F: Think-Aloud Protocol Sample Reasoning Mindset Test items - Arabic

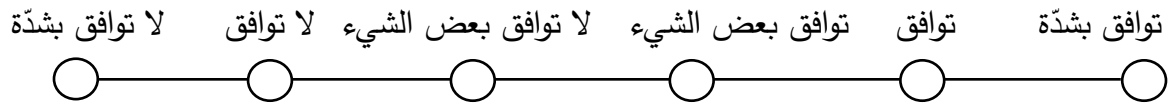
1. أريد أن أعرف لماذا تحدث الأشياء وكيف تحدث.



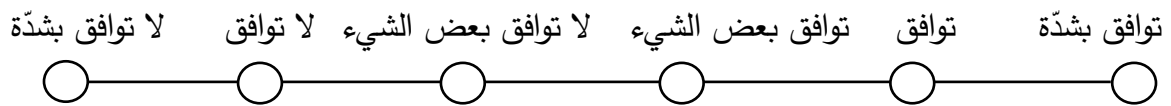
2. لما أأخذ قراراً، لا أغير رأيي.



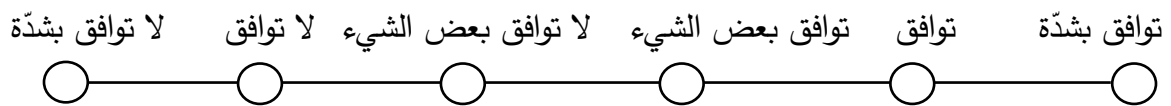
3. معظم الأوقات، أشعر مرتبك.



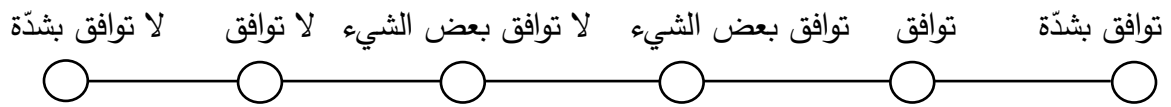
4. كثرت التعليم يُمكن أن يقوّض الشخص (تعبث بالإنسان).



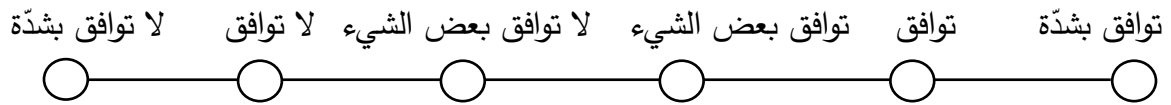
5. ألدیه عقلٌ ضعيف هو الذي يغير عقله.



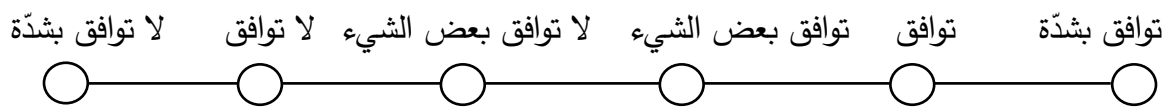
6. مثل الجميع، أقول ما يتوجب علي قوله بغية الحصول على ما أريد.



7. الحقائق هي الحقائق، لا يوجد أي حاجة للتفسير.

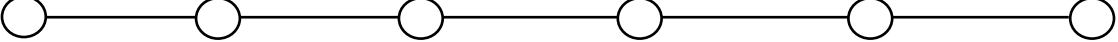


8. أبلغ كيف أنا متأكد من قرارى.



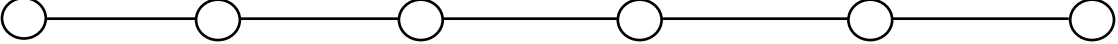
9. أفضل واجبات حيث يُقيل لي بالضبط ماذا أفعل وكيف أفعله.

توافق بشدّة توافق توافق بعض الشيء لا توافق بعض الشيء لا توافق لا توافق بشدّة



10. يجب التقييم على كل المعتقدات.

توافق بشدّة توافق توافق بعض الشيء لا توافق بعض الشيء لا توافق لا توافق بشدّة



Appendix G: Think-Aloud Protocol Script – English and Arabic

In this study, I am interested in learning about the thoughts you have as you solve questions from a critical thinking test.

For this reason, I am going to ask you to think aloud as you work through 34 of the 62 critical thinking problems that I will be giving you.

Let me explain what I mean by “think aloud.” It means that I would like you to tell me everything you think about as you work through the word problems. When I say tell me everything, I really mean every thought you have from the moment you read the problem to the end when you have a solution or even if you do not have a solution. Please do not worry about planning how to say things or clarifying your thoughts—what I really want is to hear your thoughts constantly as you try to solve the problem—uninterrupted and unedited. Again, don't try to plan or explain what you say or worry about being grammatically correct. Just act as if you are alone and speaking to yourself.

You should start by reading the question out loud. Sometimes you may need time to think quietly through something—if so, that's ok but please tell me what you thought through as soon as possible after you are finished. I realize it can feel awkward to think aloud but try to imagine you are alone in the room. If you become silent for too long, I will say “keep talking” or “think aloud,” as a way to remind you to think aloud.

If you start speaking in a language other than the test language, I will remind you to “speak in English.”

It is important that you talk aloud as much as you comfortably can while you are solving the problems and that you remember to project your voice. If you start speaking with a low voice or talking quietly to yourself, I will say “speak louder.”

Also please know that I am not an expert in this area so I cannot and will not be evaluating your thinking—the purpose of the study is to learn about the thoughts you have as you solve the problems.

We will have an opportunity to practice but before we get to that, do you understand what I would like you to do? Do you have any questions?

We are going to practice thinking aloud with some practice problems:

First, we will read the question out loud together, then answer it as soon as you can.

Are you ready?

Practice 1

Question 1: Please name ten foods that you might find in a supermarket.

Did you have any other thoughts as you came up with the answer to this question?

I want you to think those thoughts out loud as they occur to you. Don't explain your thoughts as if you are talking to someone else. Just say what you are thinking—even if it doesn't always seem grammatical or you're afraid that it won't make sense.

Practice 2

This time, you read the question out loud on your own and then try to think of the answer while thinking aloud as soon as you can! Are you ready?

Question 2: What is the sixth letter after the letter C?

Chances are that the letter “I” didn’t immediately occur to you after reading the question. You probably had to go through several steps to find the answer. Had you summarized your thinking during this question rather than reporting the sequence of actual thoughts aloud, you might have said that you found the letter “I” by counting through the alphabet. But this is not what I’d like you to do because this misses the actual sequence of thoughts.

When people actually solve this problem out loud, they usually say a sequence of individual letters, such as C, then D, E, F, G, and H, before the answer “I.”

Again, this is what I’d like you to do because I am interested in knowing the thoughts you had as you answered the question; we wish to have the most accurate, detailed report of thoughts as possible, instead of a summary of those thoughts.

Can you recall any other thoughts? Any questions?

We will now begin critical thinking test.

Section 8

This final section will be a little different. In the previous sections I have asked that you not explain your thinking, but to just talk out loud while you answer the questions.

In this final section you will be asked whether you agree or disagree with certain statements. As you answer these 10 questions, I want you to explain to yourself why you agree or disagree with the statement.

What I mean is that if your first response is simply that you agree or disagree with a statement, I don't want you to stop with that. I want you then to explain to yourself why you agree or disagree.

For example, if the statement were:

“It is important that I show up to appointments on time.”

Don't just say, I agree or I disagree with the statement. Instead I want you to explain your answer.

You might say something like:

“Well, I think it depends on the type of appointment. I think it is important to show up on time to certain events, like a class, but I don't think it is important to arrive to a party at a specific time. I'm guessing that by appointment that this means something formal like a doctor's appointment. So I guess I'd have to say that I somewhat agree. I think it is important to show up to official appointments on time, but if it means that I think it is important to show up everywhere on time, I wouldn't agree with that. I don't think it is important to show up to a party or restaurant at a specific time. So, I'll put somewhat agree because I generally agree but not for everything.”

Do you have any questions?

Let's start.

بيهمني بها الدراسة إتعلم عن الأفكار إلي راودتك لما كنت بتحل إختبار التفكير النقدي.

ولها السبب، بدي أطلب منك أنك تفكر على صوت عالي بينما بتجاوب على الأسئلة الـ34 من الـ62 سؤال النقدي إلي رح أعطيك ياهون.

خلّيني إشرح شوي شو بقصد بـ"التفكير على صوت عالي". بيعني إنو بحب إنك تخبرني كل شي عم بتفكر في بينما عم بتحل أسئلة المكتوبة. ولما قول كل شي فأنا عن جد بقصد كل شي من لحظة ما بتقرأ السؤال لحين ما يصير عندك جواب أو حتّى لو ما وصلت للحل. وبليز ما يهمك كيف بدك ترتّب الأشياء أو توضّح أفكارك-إلي بيهمني حقيقتا هوي إني أقدر إسمع أفكارك بشكل مستمر إننا وعم بتحاول تحل السؤال-بدون إنقطاع أو تعديل. مرة ثانية، ما يهمك كيف ترتّب الأشياء أو تشرح شو بدك تقول أو إذا كان كلامك صحيح قواعدياً. حاول إنك تتصّرف وكأنك لخالك وإنك عم تحكي مع خالك.

أول شي بلش بقراءة السؤال على صوت عالي. ويمكن أحياناً بدك تعوز شوية وقت لحتّى تفكر بقلبك بدون صوت ببعض الأشياء-وإذا ها شي صار، فما في مشكلة، بس أول ما تخلص تفكير خبرني دغري بشو فكرت. بعرف إنو ممكن تكون غريبة أنك تفكر على صوت عالي بس حاول تتخيل إنك لخالك بالغرفة. وإذا إننا بقيت صامت لمدة طويلة، رح إلك "كمل حكي" أو "فكر على صوت عالي". هيدي طريقة لذكرك بأنك تفكر على صوت عالي.

وإذا بلشت تفكر بلغة غير اللغة الموجودة بالإختبار، فأنا رح ذكرك وإلك "إحكي عربي".

من المهم إنك تحكي على صوت عالي على أد ما بترتاح وبتقدر بينما بتكون عم بتحل الأسئلة وأنو تتذكّر تحكي بصوت مسموع. وإذا بلشت تحكي بصوت واطي أو بينك وبين نفسك فأنا رح إلك "إحكي بصوت أعلى".

وكمان بليز تذكّر إني أنا مني خبير بها المجال وبالتالي أنا ما رح كون عم قيم طريقة تفكيرك-فالهدف من ها الدراسة إنو إتعلم عن الأفكار إلي عندك بينما إننا عم بتجاوب على الأسئلة.

رح يكون في فرصة لنتمرّن شوي، بس قبل ما كمّل هل عم تفهم شو عم حاول بقصد أنا أعملو؟ عندك شي سؤال؟

رح من حاول نتمرّن على التّفكير بصوت عالي بشويّة أسئلة:

أول شي، رح نقرأ السؤال سوا على صوت عالي، وبعدين حاول تجاوب على السؤال بأسرع ما بتقدر. جاهز؟

التمرين الأول:

بليز سمّي 10 أنواع أكل ممكن تلاقىها بالسوبرماركت.

هل راودتك أفكار تانية بينما كنت عم بتفكّر بالجواب لها السؤال؟

بدي منك تفكّر بها الأفكار إلى راودتك على صوت عالي. وما تحاول تشرح هالأفكار وكأنتك عم تحكي مع شخص تاني. بس قول بشو عم بتفكّر -حتى ولو ما كانت لغويّاً صح أو لو بتخاف إنو ما تكون مفهومة وبلا معنى.

التمرين الثاني:

هلق، إقرأ السؤال لنفسك على صوت عالي وبعدين حاول تفكّر بالجواب على صوت عالي بأسرع ما فيك! جاهز؟

السؤال الثاني: شو هوي الحرف السادس من بعد الحرف (ت)؟

الأرجح بأنّو الحرف (ذ) ما إجا على بالك دغري من بعد ما سمعت السؤال. والأرجح بأنّك فكّرت ع مراحل لتوصّلت للجواب. هل لخصّصت أفكارك خلال السؤال بدلا من إنك تحاول تقول ترتيب أفكارك إلي فكّرت فيا على صوت عالي، وإذا هيك، يمكن قلت إنك لقيت الحرف (ذ) لما عدّيت الأبجدية. بس مش هيدا إلي بحب إنك تعملو لأنّو هشيّ تحديداً بخليكم ما تنتبه على الترتيب إلى مرقو في أفكارك.

لما الناس يحاولو يحلّوا ها السؤال على صوت عالي، هنيّ عادتاً بعدّو الأحرف حرف حرف، مثلا: ت وبعدين خ ح ج ث د قبل ما يجاوبوا بالحرف ذ.

مرّة ثانية، هيدا إلي بحبكّ تعملو لأنّو أنا بهمني أعرف الأفكار إلي كنت عم بتفكرّ فيا لما كنت عم بتجاوب على السؤال: بتمنا إنّو نتوصل لا أكثر شي دقيق ومفصل عن أفكارك بدلا من مجرد تلخيص لها الأفكار إلي راودتك.

فيك تفكرّ بأفكار ثانية؟ أي سؤال؟

الجزء 8:

هالجزء الأخير حيكون شوي غير. بالأجزاء الأخيرة كنت طلبت منك إنّك ما تشرح أفكارك، ولكن إنّك بس تحكي على صوت عالي بينما عم بتجاوب على الأسئلة.

بها الجزء الأخير بدكّ تنسأل إذا كنت بتوافق أو ما بتوافق على الجمل الموجودة.

إلي بقصدو هوي إنّو إذا كانت إجابتك الأولى بتوافق أو ما بتوافق، فما بدّي منك توقّف عند هالنقطة. ولكن بدّي منك تشرح لنفسك ليش بتوافق أو ما بتوافق.

مثلا، إذا كانت الجملة: "من المهم إنّو كون بالموعد على الوقت" فما إنتا ما تقول بس: إيه بوافق أو ما بوافق على الجملة. ولكن بدّي منك تشرح ليش جاوبت هيك.

يمكن تقول شي مثل: "طيب، أنا بعتمد إنّو هبي بتعتمد على نوع الموعد. بعتمد إنّو من المهم كون عالوقت بأمر معيّنة، مثل الصّف، بس ما بعتمد إنّو لازم أوصل ع ش حفلة مثلا على الوقت تحديداً. أنا عم فكرّ إنّو الموعد ممكن مثلا يكون موعد مهم ورسمي مثلا زيارة الدكتور. فا بعتمد إنّو لازم قول إنّو لحد ما بوافق. بعتمد إنّو من المهم إذا في موعد رسمي بشي للدولة بأنّو كون عالموعد، بس إذا القصّة بأنّو أنا بفكرّ إنّو لازم كون عالموعد بكل شغلة، فأنا ما بوافق. ما بعتمد إنّو لازم كون على الوقت لشي حفلة أو مطعم. فأنا رح قول إنّو نوعا ما بوافق بشكل عام بس مش على كل شي".

فهمت شو بقصد؟ عندك شي سؤال؟

يلا لنبلّش.

Appendix H: Culture and Critical Thinking Project Codebook 2017

Developed by William Merrifield
George Fox University

This codebook is a reference key to understanding the quantitative data collected for the Culture and Critical Thinking dissertation project at George Fox University. The data are taken from a purposive sample of undergraduate junior and senior students at a Lebanese university. The 28 Think-Aloud Protocol (TAP) interviews occurred from July 19, 2017 to September 22, 2017.

PNum	1. The order participants sat for the TAP. R. Participants who repeated the test in a second language.
Location	2. The location where participants sat for the TAP session. 1. Mehagian 303 2. Conte Hall 3. Philibossian 206
Pseudonym	3. Names ascribed to participants.
Sex	4. Sex. 1. Male 2. Female
Sect	5. Ethno-religious background. 1. Greek Orthodox 2. Sunni 3. Armenian Orthodox 4. Shiite 5. Maronite 6. Druze 7. Armenian Catholic
Class	6. Participant grade level during the 2017/2018 academic year. 1. Junior 2. Senior
Major	7. Participant major during the 2017/2018 academic year. 1. Psychology 2. Computer Science 3. Business Administration 4. Education 5. Social Work 6. Biology 7. Nutrition Science 8. English Language

- | | |
|-----------|---|
| Education | 8. Which of the following best describes your nursery to grade 12 educational experience?
1. I completed all of my education (nursery to grade 12) in Lebanon.
2. I completed my high school (grades 9-12) in Lebanon, but did my primary school in a different country.
3. I did some of my nursery to grade 12 education in Lebanon and some in a different country but completed at least grades 9-12 in Lebanon. |
| Date | 9. Date when the TAP session took place.
1. 7/19/2017
2. 7/20/2017
3. 7/21/2017
4. 7/25/2017
5. 7/31/2017
6. 8/2/2017
7. 8/4/2017
8. 8/9/2017
9. 8/22/2017
10. 9/7/2017
11. 9/13/2017
12. 9/15/2017
13. 9/18/2017 |
| DateR | 10. Date when the TAP repeat session took place.
1. 9/18/2017
2. 9/19/2017
3. 9/22/2017 |
| Time | 11. Time of the TAP session.
1. 9:00 AM
2. 11:00 AM
3. 11:30 AM
4. 12:00 PM
5. 12:15 PM
6. 1:00 PM
7. 1:30 PM
8. 2:00 PM
9. 3:00 PM
10. 4:30 PM |
| TimeR | 12. Time of repeat TAP session
1. 9:30 AM
2. 11:00 AM
3. 1:00 PM
4. 2:30 PM |

Language	13. Language of the CCTT/Sample Reasoning Mindset Assessments. 1. Arabic 2. English
LanguageR	14. Language of the repeat CCTT/Sample Reasoning Mindset Assessments. 1. Arabic 2. English
CTClass	15. I have taken a course/class on critical thinking. 1. Yes 2. No
CCTTA 1-3	16-18. Think-aloud (TAP) questions 1-3 from Section 1A of the CCTT. 0. Incorrect 1. Correct
CCTTN 4-5	19-20. Non-TAP questions 4-5 from Section 1A of the CCTT. 0. Incorrect 1. Correct
CCTTA 6-7	21-22. TAP questions 6-7 from Section 1B of the CCTT. 0. Incorrect 1. Correct
CCTTN 8-10	23-25. Non-TAP questions 8-10 from Section 1B of the CCTT. 0. Incorrect 1. Correct
CCTTA 11-15	26-30. TAP questions 11-15 from Section 2 of the CCTT. 0. Incorrect 1. Correct
CCTTN 16-21	31-36. Non-TAP questions 16-21 from Section 2 of the CCTT. 0. Incorrect 1. Correct
CCTTA 22-23	37-38. TAP questions 22-23 from Section 3 of the CCTT. 0. Incorrect 1. Correct
CCTTN 24-25	39-40. Non-TAP questions 24-25 from Section 3 of the CCTT. 0. Incorrect 1. Correct

CCTTA 26-30	41-45. TAP questions 26-30 from Section 4 of the CCTT. 0. Incorrect 1. Correct
CCTTN 31-38	46-53. Non-TAP questions 31-38 from Section 4 of the CCTT. 0. Incorrect 1. Correct
CCTTA 39-40	54-55. TAP questions 39-40 from Section 5 of the CCTT. 0. Incorrect 1. Correct
CCTTN 41-42	56-57. Non-TAP questions 41-42 from Section 5 of the CCTT. 0. Incorrect 1. Correct
CCTTA 43-44	58-59. TAP questions 43-44 from Section 6 of the CCTT. 0. Incorrect 1. Correct
CCTTN 45-46	60-61. Non-TAP questions 45-46 from Section 6 of the CCTT. 0. Incorrect 1. Correct
CCTTA 47-49	62-64. TAP questions 47-49 from Section 7 of the CCTT. 0. Incorrect 1. Correct
CCTTN 50-52	65-67. Non-TAP questions 50-52 from Section 6 of the CCTT. 0. Incorrect 1. Correct
Correct	68. Total number of correct answers for each participant.
PerCorrect	69. Percentage of correct answers on the CCTT for each participant.
TotScore	70. Raw Score on the CCTT assessment.
CorHalfWrong	71. Score of total correct minus half of the incorrect answers (CCTT).
CCTTAR/ 1-52 CCTTNR	72-123. Scores on repeat assessment taken in the alternate language. 0. Incorrect 1. Correct
CorrectR	124. Total number of correct answers for each repeat participant.

PerCorrectR 125. Percentage of correct answers on the CCTT for each repeat participant.

TotScoreR 126. Raw Score on the CCTT repeat assessment.

CorHalfWrongR 127. Score of total correct minus half of the incorrect answers (Repeat CCTT).

SRMT 1 128. I need to know the reasons why things happen.

أريد أن أعرف لماذا تحدث الأشياء وكيف تحدث.

1. Strongly Agree/ توافق بشدة
2. Agree/ توافق
3. Agree a little/ توافق بعض الشيء
4. Disagree a little/ لا توافق بعض الشيء
5. Disagree/ لا توافق
6. Strongly Disagree/ لا توافق بشدة

SRMT 2 129. Once I have made my decision, I do not change my mind.

لما أأخذ قراراً، لا أغير رأياً.

1. Strongly Agree/ توافق بشدة
2. Agree/ توافق
3. Agree a little/ توافق بعض الشيء
4. Disagree a little/ لا توافق بعض الشيء
5. Disagree/ لا توافق
6. Strongly Disagree/ لا توافق بشدة

SRMT 3 130. Most of the time I feel confused.

معظم الأوقات، أشعر مرتبك.

1. Strongly Agree/ توافق بشدة
2. Agree/ توافق
3. Agree a little/ توافق بعض الشيء
4. Disagree a little/ لا توافق بعض الشيء
5. Disagree/ لا توافق
6. Strongly Disagree/ لا توافق بشدة

SRMT 4 131. Too much education can really mess a person up.

كثرت التعليم يمكن أن يقوّض الشخص (تعبث بالإنسان).

1. Strongly Agree/ توافق بشدة
2. Agree/ توافق
3. Agree a little/ توافق بعض الشيء
4. Disagree a little/ لا توافق بعض الشيء
5. Disagree/ لا توافق
6. Strongly Disagree/ لا توافق بشدة

- SRMT 5 132. Only weak-minded people change their minds.
 أَلَدِيهِ عَقْلٌ ضَعِيفٌ هُوَ الَّذِي يَغَيِّرُ عَقْلَهُ.
 1. Strongly Agree/ توافِق بشدّة
 2. Agree/ توافِق
 3. Agree a little/ توافِق بعض الشيء
 4. Disagree a little/ لا توافِق بعض الشيء
 5. Disagree/ لا توافِق
 6. Strongly Disagree/ لا توافِق بشدّة
- SRMT 6 133. Like everyone else, I say whatever I need to say to get what I want.
 مِثْلَ الْجَمِيعِ، أَقُولُ مَا يَتَوَجَّبُ عَلَيَّ قَوْلُهُ بُغْيَةَ الْحَصُولِ عَلَى مَا أُرِيدُ.
 1. Strongly Agree/ توافِق بشدّة
 2. Agree/ توافِق
 3. Agree a little/ توافِق بعض الشيء
 4. Disagree a little/ لا توافِق بعض الشيء
 5. Disagree/ لا توافِق
 6. Strongly Disagree/ لا توافِق بشدّة
- SRMT 7 134. Facts are facts, no interpretation needed.
 الْحَقَائِقُ هِيَ الْحَقَائِقُ، لَا يَوْجَدُ أَيُّ حَاجَةٍ لِلتَفْسِيرِ.
 1. Strongly Agree/ توافِق بشدّة
 2. Agree/ توافِق
 3. Agree a little/ توافِق بعض الشيء
 4. Disagree a little/ لا توافِق بعض الشيء
 5. Disagree/ لا توافِق
 6. Strongly Disagree/ لا توافِق بشدّة
- SRMT 8 135. I exaggerate how sure I am of my decisions.
 أَبَالِغُ كَيْفَ أَنَا مُتَأَكِّدٌ مِنْ قَرَارِي.
 1. Strongly Agree/ توافِق بشدّة
 2. Agree/ توافِق
 3. Agree a little/ توافِق بعض الشيء
 4. Disagree a little/ لا توافِق بعض الشيء
 5. Disagree/ لا توافِق
 6. Strongly Disagree/ لا توافِق بشدّة

- SRMT 9 136. I prefer assignments where I am told exactly what to do and how to do it.
أفضل واجبات حيث يُقيل لي بالضبط ماذا أفعل وكيف أفعله.
1. Strongly Agree/ توافق بشدة
 2. Agree/ توافق
 3. Agree a little/ توافق بعض الشيء
 4. Disagree a little/ لا توافق بعض الشيء
 5. Disagree/ لا توافق
 6. Strongly Disagree/ لا توافق بشدة
- SRMT 10 137. Every belief should be evaluated.
يجب التقييم على كل المعتقدات.
1. Strongly Agree/ توافق بشدة
 2. Agree/ توافق
 3. Agree a little/ توافق بعض الشيء
 4. Disagree a little/ لا توافق بعض الشيء
 5. Disagree/ لا توافق
 6. Strongly Disagree/ لا توافق بشدة
- SRMTR 1-10 138-147. Scores on repeat assessment taken in the alternate language.
1. Strongly Agree/ توافق بشدة
 2. Agree/ توافق
 3. Agree a little/ توافق بعض الشيء
 4. Disagree a little/ لا توافق بعض الشيء
 5. Disagree/ لا توافق
 6. Strongly Disagree/ لا توافق بشدة
- CCTTADET 1 148. Mr. Wilstings says that eighteen-year-olds haven't faced the problems of the world, and that anyone who hasn't faced these problems should not be able to vote. What he says is correct, but eighteen-year-olds still should be able to vote. They're mature human beings, aren't they?
1. A. Conclusion follows necessarily from the statements given.
 2. B. Conclusion contradicts the statements given.
 3. C. Neither follows necessarily nor contradicts the statements given.
- CCTTADET 2 149. Furthermore, eighteen-year-olds should be allowed to vote because anyone who will suffer or gain from a decision made by the voters ought to be permitted to vote. It is clear that eighteen-year-olds will suffer or gain from the decisions of the voters.
1. A. Conclusion follows necessarily from the statements given.
 2. B. Conclusion contradicts the statements given.
 3. C. Neither follows necessarily nor contradicts the statements given.

CCTTADET 3 150. Most eighteen-year-olds don't know the difference between right and wrong. The right to vote should not be possessed by the members of a group if most of them don't know this difference. It is obvious then that eighteen-year-olds shouldn't have the right to vote.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTNDET 4 151. Many eighteen-year-olds are serving their country. Now there can be no doubt that many people serving their country ought to be allowed the vote. From this you can see that many eighteen-year-olds ought to be allowed to vote.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTNDET 5 152. I agree with Mr. Pinder that anyone who will suffer or gain from a decision made by the voters ought to be permitted to vote. And it is true that eighteen-year-olds will suffer or gain from these decisions. But so will ten-year-olds. Therefore, eighteen-year-olds shouldn't be allowed to vote.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTADET 6 153. Mr. Wilstings has said that most foreigners have made positive contributions to our country. This is true. I will also admit that a group is not bad if most of its members do make positive contributions. But don't be deceived by Mr. Wilstings' fine-sounding language. Foreigners are a bad group and shouldn't be admitted.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTADET 7 154. All of you think it was all right to open our doors to all people from distant lands in the nineteenth century. Any person who thinks it was all right to do so at that time ought also to be in favor of doing so now. Thus, you ought to be in favor of opening our doors now to those from distant lands who are seeking admission to our country.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTNDET 8 155. Mr. Wilstings has proposed that we open our doors to all the foreigners who want to enter our beloved country. But foreigners always have made trouble and they always will. Most of them can't even speak English. Since anybody who makes trouble is bad, it follows that foreigners are bad.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTNDET 9 156. You may not know it, but for the past ten years the Communists in our country have been supporting a policy of unrestricted immigration. It is obvious why they support this policy of opening our doors to foreigners. Now I hate to say this, but Mr. Wilstings' support of this policy leaves us but one conclusion: Mr. Wilstings is a Communist.

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTNDET 10 157. I'm sorry that Mr. Pinder feels that way about it. Sure, foreigners make trouble and most of them can't speak English. But even though it's true that people who make trouble ought not to be admitted, we still ought to admit foreigners to our country. You don't want to be selfish, do you?

1. A. Conclusion follows necessarily from the statements given.
2. B. Conclusion contradicts the statements given.
3. C. Neither follows necessarily nor contradicts the statements given.

CCTTADET 11 158. DOBERT: I hear that you and some other crackpots are trying to get Gallton to chlorinate its water supply. You seem to think that this will do some good. There can be no doubt that either we should chlorinate or we shouldn't. Only a fool would be in favor of chlorinating the water, so we ought not do it.

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

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

CCTTADET 12 159. DOBERT: I guess you know that to put chlorine in the water is to threaten the health of every one of Gallton's citizens, and that, you'll admit, is bad.

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

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

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

CCTTADET 13 160.DOBERT: Furthermore, Gallton's water is pure already. I know this from the report, which you haven't seen yet, that will soon be released by the State Water Survey.

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

1. A. Algan is not using "know" in its ordinary sense, yet he is expecting the effect that follows from its being used in the ordinary sense.
2. B. Dobert, in using secret evidence, is not being fair, since this evidence is not available to everyone for inspection.
3. C. Algan can't know that an error was made in the investigation.

CCTTADET 14 161.ALGAN: The question boils down to two alternatives. Either we want clean, chlorinated water or we want bad-smelling, disease-ridden water. The citizens of Gallton certainly don't want bad-smelling, disease-ridden water. What is left but to chlorinate?

1. A. Algan hasn't shown that there are only two alternatives.
2. B. Algan is using emotional language that doesn't help to make the argument reasonable.
3. C. Algan is using the same word in two ways.

CCTTADET 15 162.DOBERT: Laying aside the question of whether medication is bad or good, wouldn't you say that you are proposing a plan for medication?

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

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

1. A. There is a serious mistake in the thinking in this part.
2. B. Dobert's conclusion doesn't necessarily follow from the reasons he gives.
3. C. Dobert and Algan are using the same word differently.

CCTTNDDET 16 163.DOBERT: I understand that you look on this thing as an experiment. I'm sure that the citizens of Gallton don't want to be guinea pigs in this matter.

ALGAN: This is a demonstration. Nobody ought to object to a demonstration, since the purpose of a demonstration is not to find out something, but rather to show us something that is already known. An additional value of this demonstration of chlorination is that its purpose is also to test for the long-range effects of chlorination on the human body. This objective of the demonstration is a worthy one.

1. A. Algan has not shown that knowing the long-range effects of chlorination is a worthy objective.
2. B. Algan is using a word in two ways.
3. C. There is an error in thinking in this part.

CCTTNDDET 17 164.DOBERT: Can you prove that chlorination is useful in making water safe?

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

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

CCTTNDDET 18 165.DOBERT: In reality, you are proposing to poison our water supply when you propose to put chlorine gas in the water. Chlorine gas has been used in war to kill human beings. It is a deadly poison. Nobody wants to be poisoned.

ALGAN: But when chlorine is mixed 3 1/2 parts per million, nobody will be hurt at all.

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

1. A. Algan is missing the point.
2. B. Dobert is using the same word in two ways.
3. C. Dobert's thinking is in error.

CCTTNDDET 19 166.DOBERT: Furthermore, Gallton's water is safe now.

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

1. A. Algan has made the word "safe" useless for communicating information.
2. B. Algan hasn't said what he means by "safe."
3. C. There is a flaw in Algan's thinking.

CCTTNDDET 20 167.DOBERT: The citizens of Gallton will have to make a choice. Either we want absolutely pure water or we should keep our present setup. Now any chemist can tell you that from a practical point of view it is impossible to remove all the impurities from a water supply. So we should leave things the way they are.

1. A. Dobert hasn't shown that there are only two alternatives.
2. B. Dobert is using the same word in two ways.
3. C. The conclusion doesn't necessarily follow from the reasons given.

CCTTNDDET 21 168.DOBERT: To add chlorine is to add a drug to Gallton's water supply. Obviously, we don't want our citizens to be drugged every time they take a drink of water.

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

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

1. A. Dobert's thinking is in error.
2. B. Algan should realize that a person has a right to use a word in a special way. The important thing is that there be understanding of what is said.
3. C. Dobert is using a word in two different ways.

CCTTADET 22 169. A. Cabbage worms are poisonous to ducklings (said by Dr. Kolter).

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

C. Neither statement is more believable.

1. A. First statement is more believable.
2. B. Second statement is more believable.
3. C. Neither statement is more believable than the other.

CCTTADET 23 170. A. During the week following the experiment, all of the ill ducklings died. (From an article in a magazine that can be found on almost every newsstand. The author, a popular international writer, stated that he obtained his information from Drs. Brown and Kolter.)

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

C. Neither statement is more believable.

1. A. First statement is more believable.
2. B. Second statement is more believable.
3. C. Neither statement is more believable than the other.

CCTTNDDET 24 171. A. Six Pintails were healthy at the end of the experiment (said by Dr. Brown).

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

C Neither statement is more believable.

1. A. First statement is more believable.
2. B. Second statement is more believable.
3. C. Neither statement is more believable than the other.

CCTTNDT 25172. A. Independent laboratory studies have shown conclusively that ducklings sprayed with Wrodane will not be harmed by eating cabbage worms (from an article in a magazine published by a chemical company that makes Wrodane).

B. No satisfactory way has yet been found to counteract the poisonous effects of cabbage worms on ducklings (from the magazine article mentioned in Item No. 23, which appeared two months after the Wrodane article).

C. Neither statement is more believable.

1. A. First statement is more believable.
2. B. Second statement is more believable.
3. C. Neither statement is more believable than the other.

CCTTADT 26 173. The experiment is repeated in Canada with twice as many ducklings. None of the ducklings die. At the end of the week, two of the regular-diet ducklings are ill, and three of the worm-diet ducklings are ill.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTADT 27 174. It is discovered that during the original experiment the regular-fed ducklings had less sunlight than the worm-fed ducklings. It is not known whether or not the difference in amount of sunshine would have an effect on the health of ducklings.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTADT 28 175. A group of well-known Canadian duck breeders report that they discovered long ago that it was dangerous to ducklings to let them run in a cabbage patch.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTADET 29 176. It is discovered that both sets of ducklings reached through their cages and drank water from a little ditch that ran past both cages. They drank practically no water out of the pans that were in the cages. The water in the ditch was ordinary water.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTADET 30 177. A similar experiment is performed with young dogs. Another is performed with young turtles. In both cases the results are similar to those of the original duckling experiment.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 31 178. The experiment is repeated. The results are similar.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 32 179. The experiment is repeated with three different varieties of ducklings, which are younger than the ones used in the original experiment. At the end of the week, two of the regular-diet ducklings are dead, and twenty of the worm-diet ducklings are dead.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 33 180. At the time of the original experiment, there was an apple tree shedding apples into the cages of both sets of ducklings. The experimenters did not expect this to happen. About the same number of apples fell into each cage. This kind of apple does not affect the health of ducklings.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 34 181. The experiment is repeated in Scotland. At the end of the week, all of the worm-fed ducklings are dead, and all of the regular fed ducklings are alive and healthy. But it is discovered that the man who handled the worms had been spraying fruit trees with arsenic and had carelessly transferred some arsenic to the feeding pan of the worm-fed ducklings. Arsenic is a deadly poison.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 35 182. A team of expert biologists examines the body structure and processes of ten common varieties of ducklings, including the three used in the experiment. The biologists can find no significant differences among the varieties examined except for coloring.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 36 183. The experiment is repeated in Canada with three different varieties of ducklings. All of the ducklings die, whether worm-fed or not.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 37 184. The experiment is repeated in the United States with twice as many ducklings. At the end of the week, 40 of the 44 regular diet ducklings are alive and healthy, and 39 of the 44 worm-fed ducklings are alive and healthy.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTNDDET 38 185. It turns out that at the time of the original experiment, a large oak tree was dropping acorns into the cages of the worm-fed ducklings only. The effect of this kind of acorn on the health of ducklings is not known.

1. A. If true, this information supports the conclusion.
2. B. If true, this information goes against the conclusion.
3. C. This information does neither.

CCTTDET 39 186.Of j, k, and l, which is the best prediction?

1. Mark A for j.
2. Mark B for k.
3. Mark C for l..

CCTTADET 40 187.Of n, o, and p, which is the best prediction?

1. Mark A for n.
2. Mark B for o.
3. Mark C for p.

CCTTADET 41 188.Of k, l, and m, which is the best prediction?

1. Mark A for k.
2. Mark B for l.
3. Mark C for m.

CCTTNDET 42 189.Of m, n, and o, which is the best prediction?

1. Mark A for m.
2. Mark B for n.
3. Mark C for o.

CCTTADET 43 190.“That’s a nice stock car you have there, Bill,” his mother remarked.

“Stock car!” exclaimed Bill. “That’s no stock car. Did you ever see a car in a dealer’s showroom with bumpers made out of heavy pipe? Do the automobile manufacturers turn out cars with no fenders? Of course not.”

Bill’s mother then asked, “Just what do you mean by ‘stock car’?”

Of the following, which is the best way to state Bill’s notion of a stock car?

1. A. A stock car is an automobile that is, for the most part, made of standard parts put out by automobile manufacturers, but which might have missing fenders and special bumpers.
2. B. A stock car is an automobile that has fenders and does not have bumpers made out of pipe.
3. C. A stock car is a standard automobile, as turned out by the factory and sold to the public.

CCTTADET 44 191. “It certainly is a stock car,” said Joan. “It has an ordinary engine that hasn’t been changed since it came off the assembly line. That alone makes it a stock car and that’s all that matters.”

Of the following, what is the best way to state Joan’s notion of a stock car?

1. A. A stock car is an automobile that is, for the most part, made of standard parts put out by automobile manufacturers, but which might have the fenders missing and special bumpers.
2. B. A stock car is an automobile with a standard engine.
3. C. A stock car is where the engine is standard.

CCTTNDET 45 192. “What are you making with that dough?” asked Mary’s father.

“Dough!” exclaimed Mary. “Did you ever see anything made with yeast that was baked immediately after it was mixed? Naturally not,” she said as she put the mixture into the oven immediately after mixing it. “Therefore, it’s not dough.” “What do you mean by ‘dough’?” her father asked.

Of the following, which is the best way to state Mary’s notion of dough?

1. A. Dough is a mixture of flour and other ingredients, including yeast.
2. B. Dough is a mixture of flour and other ingredients, not baked immediately.
3. C. Dough is a mixture of flour and other ingredients, often baked in an oven.

CCTTNDET 46 193. “Why, of course that’s dough,” said Jim. “You’re making cookies, aren’t you? It’s not even called dough unless it’s used for cookies.”

Of the following, which is the best way to state Jim’s notion of dough?

1. A. Dough is a mixture of flour and other ingredients not baked immediately unless used for cookies.
2. B. Dough is a mixture of flour and other ingredients which is used for cookies.
3. C. Dough is a mixture of flour and other ingredients, which is used for cookies unless it’s baked immediately.

CCTTADET 47 194. MR. ALGAN: The explanation of the misbehavior of Gallton's present-day crop of youngsters is a simple one. These children have been severely punished at some time or other. That's the trouble.

1. A. Children who have been severely punished misbehave.
2. B. Children who misbehave have been severely punished at some time.
3. C. Children who haven't been severely punished behave properly.

CCTTADET 48 195. MRS. DOBERT: Their behavior can be explained by realizing that most of these youngsters have never been punished.

1. A. Children who are punished behave properly.
2. B. Children who behave improperly have never been punished.
3. C. Children who have never been punished behave improperly.

CCTTADET 49 196. MR. DOBERT: What we should do is never punish them. That would take care of things.

1. A. Children who behave badly have been punished at some time.
2. B. Children who are punished will misbehave.
3. C. Children who behave properly have never been punished.

CCTTNDDET 50 197. MR. DOBERT: The fact that Gallton's children have been forced to work explains their misbehavior.

1. A. Children who have never been forced to work behave properly.
2. B. Children who behave improperly have been forced to work.
3. C. Children who have been forced to work behave improperly.

CCTTNDDET 51 198. MRS. DOBERT: What we should do is not make them work. Then they would be all right. I know it.

1. A. Children who are forced to work will misbehave.
2. B. Children who are not forced to work will behave properly.
3. C. Children who behave properly have not been forced to work.

CCTTNDDET 52 199. MRS. ALGAN: We ought to make them work. That will cure them.

1. A. Children who aren't forced to work will misbehave.
2. B. Children who are forced to work will behave properly.
3. C. Children who behave properly have been forced to work.

CCTTADETR/ 1-52 200-251. Score details on repeat assessment taken in the alternate language.

CCTTNDETR 1. A
 2. B
 3. C

TotTime 252. Total time of the TAP session.
 1. Less than 50 minutes.
 2. 51-60 minutes.
 3. 61-70 minutes.
 4. 71-80 minutes.
 5. 81-90 minutes.
 6. 91-100 minutes.
 7. Over 100 minutes.

TimeCCTT 253. Total time spent on the CCTT.
 1. Less than 50 minutes.
 2. 51-55 minutes.
 3. 56-60 minutes.
 4. 61-65 minutes.
 5. 66-70 minutes.
 6. 71-80 minutes.
 7. More than 80 minutes.

TimeSRMT 254. Total spent on the Sample Reasoning Mindset Test.
 1. 0-5 minutes.
 2. 6-10 minutes.
 3. 11-15 minutes.
 4. 16-20 minutes.

AddTime 255. Time spent on breaks, questions, and clarifications.
 1. 0-5 minutes.
 2. 6-10 minutes.
 3. 11-15 minutes.

TotTimeR 256. Total time of the repeat TAP session.
 1. Less than 50 minutes.
 2. 51-60 minutes.
 3. 61-70 minutes.
 4. 71-80 minutes.

TimeCCTTR 257. Total time spent on the repeat CCTT.
 1. Less than 50 minutes.
 2. 51-55 minutes.
 3. 56-60 minutes.

- TimeSRMT 258. Total spent on the repeat Sample Reasoning Mindset Test.
 1. 0-5 minutes.
 2. 6-10 minutes.
- AddTimeR 259. Time spent on breaks, questions, and clarifications in repeat session.
 1. 0-5 minutes.
 2. 6-10 minutes.