A DESCRIPTIVE ANALYSIS OF THE CRITICAL THINKING MODEL
IN TEXAS ELEMENTARY EDUCATION

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Contributions from elementary education to the practice and reality of critical thinking are rare, largely because attempts in basic education to elucidate a concept of critical thinking have a hard time breaking through the elusiveness and indeterminacy that characterize the history and reality of the concept. This situation is due to, and a consequence of, the difficulty of delimiting critical thinking from related fields, such as metacognition, higher-order-thinking, problem solving, informal logic, reasoning skills, and decision making, to name a few. Texas school authorities designed and put into practice a battery of tools to evaluate critical thinking through the assessment programs TAKS and STAAR, without taking a position regarding the indeterminacy problems of the content of critical thinking. The purpose of this study was to reconstruct the pieces of the critical thinking model imparted to Texas elementary school children since 1999 and continues today.

The findings indicate that the critical thinking model implemented in Texas elementary schools is a particular version of a skills-only approach of critical thinking that follows the classical logical paradigm, consisting of two sets of complementary skills. This model acquaints students with the components and structure of five types of arguments while it fails to substantiate the logic of argument support that demonstrates how reasons support claims and the strength of support. The application of an adequacy conditions rubric showed the strengths of the model at the argumentation analysis level, yet it showed clear signs of incompleteness and inconsistencies at the argument structure level that distort its purpose and function.
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CHAPTER 1

BACKGROUND

Overview

This study examined the concept and model of critical thinking implemented in Texas elementary schools in the last decade. Critical thinking is an enduring, broad, and controversial topic overlapping with many areas of study in various disciplines, including philosophy, cognitive psychology, educational psychology, human development, and curriculum development, to name a few (Kennedy, Fisher, & Ennis, 1991). It has also been considered by many researchers as the heart of the reasoning skill movement that guides, feeds and informs a worldwide school reform movement (Jones & Idol, 1990). In spite of constituting a decisive element of students’ academic success in Texas, little is known about what critical thinking really entails at the elementary level. As we see in this study, a theoretical rationale for what makes an academic skill critical is hardly accessible to researchers or practitioners. Therefore, this study was devoted to the following:

1. Understanding the curricular structure of critical thinking in elementary education in the state of Texas.

2. Understanding the critical thinking concept and the different types of critical thinking skills that are implemented in the elementary educational system in Texas.

3. Understanding the consistency of what it means to think critically in Texas elementary education.

To develop a clear position on the aforementioned issues, it was important for this investigation to explore and understand the following:

• The controversial nature of the concept of critical thinking.

• The constitutive elements of the problem of defining critical thinking.
• Previous research on theoretically sound definitions of critical thinking that are part of elaborated theoretical models in critical thinking research today.

• Pivotal research on theories that transcend the classical paradigm to study the critical thinking phenomenon, namely informal logic and argumentation theory to capture the essence of critical thinking as an argument.

This investigative process provided a framework for describing and analyzing the model of critical thinking that is being implemented by the Texas State Board of Education (SBOE) and the Texas Education Agency (TEA) throughout the state reading curriculum. The requirement of a “well balanced and appropriate curriculum” was fulfilled by the Texas Administrative Code, Title 19 Part II, Chapter 110, known as Texas Academic Knowledge and Skill (TEKS), and complemented by the corresponding state-wide assessment program called Texas Assessment of Knowledge and Skills (TAKS).

The Evolution of Critical Thinking as an Educational Ideal

Critical thinking is part of an ancient business dedicated to the study of attributes of thinking and reasoning. According to a very influential historiography of critical thinking (Paul, Willsen, & Binker, 1993), its evolution is nothing but the history of reason itself as being critical. Tracing its origins implies rewriting the history of human reflection about the world and about itself (Fasko, 2003a). As such, its origins could be traced back to the Greek logos tradition of Socrates, or to Aristotle’s rhetoric and logic, and it would span philosophical, psychological and educational thinking/learning theories of today. Critical thinking’s illustrious and controversial history from ancient times and into modernity would be seen as a faithful expression of both its importance and its complexity.

In this historiography, the progression of critical thinking reveals great contributions delivered in complex and polemic constructions. It would include, in addition to the early Greek Enlightenment, the contributions made by the European Renaissance and European
Philosophical Enlightenment. It would also encompass the contributions from both the empirical sciences in the 19th and 20th centuries, and the philosophy, logic, and theories of language and sciences from the late 19th, 20th and 21st centuries, including most psychological and educational theories, as well as the contributions of today’s physics, mathematics, computer science, and artificial intelligence theories, etc. (Paul, 2009). In this respect, the nature of critical thinking is recognizable in the common denominators of the history of thinking, as follows:

…in the systematic monitoring of thought…in the assessment of its clarity, accuracy, relevance, depth, breadth, and logicalness…in recognizing that all reasoning occurs within points of views, …that proceeds from goals and objectives…that all data has to be interpreted, that interpretation involves concepts; that concepts entails assumptions, and that all basic inferences in thought have implications… (Paul, 2009, p. 2)

In that sense, nearly every science can claim to have decisively contributed to the notion of critical thinking that we share today. Each epoch struggles to set the standards and to establish wide-reaching agreements that shape the content of critical thinking, its limits, and, especially important for this study, its institutionalized practice in education. The literature review chapter of this study attempts to narrow down the history of critical thinking, as outlined here, to theories that would inform more precisely the research questions of this study.

For the more recent development of critical thinking in education, this introduction makes reference to two important historical epochs: the so called thinking skill movement of the 1980s and the more recent standards movement in education.

Critical Thinking and the Thinking Skills Movement

The 1980s became sort of a paradoxical symbol of our time: eloquent in the denunciation of stagnation in educational matters, and vocal witness of an explosive renaissance of research on thinking and reasoning. Exemplary in that respect was the famous report called A Nation at
Risk from 1983\(^1\). A colorful description of the crumbling foundation of the American education system by the mediocre performance of its institutions coexists in the report with a powerful vision of a “learning society” capable of overcoming that challenge (1983, p. 14). The beginning of a new era seemed hopeful and dramatic in the way the nation was urged to address the questionable condition of the American K-12 education system. Hopeful because the learning society envisioned in that report possessed the capacity to overcome difficulties… where “basic literacy had become the goal of education rather than the starting point, about 13% of all 17 year-olds were functionally illiterate, the majority of the 17 year-olds do not possess the ‘higher-order intellectual skills’…, and 40% of all students cannot draw inferences” (p. 11). In such a place and time, teaching and learning critical thinking and reasoning skills were considered a pre-requisite and condition of the learning society envisioned in that report.

However, where danger abounds there grows rescue, as the founder of the modern philosophical hermeneutics, the German philosopher Schleiermacher (1977), used to say. That is exactly what the Thinking Skill Movement brought into life. From within, it pulled out immense collective efforts to refocus the educational establishment in the United States. Ever since, demands for improvements in the quality of education and educational reform have materialized in increasingly more specific demands for teaching and learning critical thinking, reasoning skills, and higher-order level thinking. Those demands have consistently carried the hope of the educational establishment of coping with general and always more acute perceived challenges of modern times (Jones & Idol, 1990).

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\(^1\) Knowingly, the secretary of education T.H. Bell created the National Commission on Excellence in Education in 1981 to examine the quality of education in the United States. That report, historically known as *A Nation at Risk* was published in 1983 in two versions: a summary and a complete report. Whenever cited in this research, it refers to the complete report (see literature list.)
These demands have historically materialized in different, important ways. The publication of Resnick’s report, *Education and Learning To Think* (1987) and the report of a commission of educators headed by Brand and supported by the North Central Regional Educational Laboratory (NCREL) and the Association or Supervision and Curriculum Development (ASCD), from 1985⁵, paved the road for modern thinking skills research. The framework for the research and teaching of thinking skills ever since has been outlined in the so called dimensions of thinking. Critical thinking ranked prominently among those dimensions, along with cognitive processes, metacognition, core thinking skills, creative thinking and content knowledge. Additionally, the thinking skill movement led to a parallel development of a number of initiatives, such as problem solving theories, decision making approaches, and reasoning skills theories, which together have delineated the parameters that one way or another have led to the development of curricula and educational standards for the teaching of reasoning and critical thinking (Johnson, 2000b; Marzano & Kendall, 2007).

Furthermore, the revision of the federal Elementary and Secondary Education Act (ESEA) in the year 2000, and finally the enactment of the No Child Left Behind (NCLB) Act, can be read as genuine attempts to highlight reasoning skills and higher-order level thinking skills as the ultimate pinnacle of education (Sunderman, Kim, & Orfield, 2005) and as culminating acts of war declarations against mediocrity and basic-education philosophy vehemently raised in the *A Nation at Risk* (1983) report and the *Time for Results* report³ (1991).

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³ The *Time for Results* report was published in 1991 by the National Governors’ Association, co-chaired by President Bill Clinton as a result of an initiative conceived by the association in its 1985 meeting. The report includes summaries reports and recommendations of seven task forces formed for the purpose of examine in-depth critical problem areas in American education.
Critical Thinking and the Educational Standards Movement

Since *A Nation at Risk* (1983)\(^4\), the *National Education Goals Panel* (1991) and *Goals 2000: Educate America Act* to *No Child Left Behind Act*\(^5\) (2001), there is the increasing demand for critical thinking, reasoning skills, and higher-level thinking in American education (Brown, 2009). The strong advocacy for the role of thinking skills in education, led by institutions such as the Commission on the Humanities (1980), the College Board (1983), the American Federation of Teachers (1985), and the National Education Association (1987), among others (Idol & Jones, 1991), paved the road for the entry of critical thinking into the body of educational standards. In a comprehensive compendium of standards for K-12 education, Kendall and Marzano (1995) noted that virtually all of the standards documents studied, either explicitly or implicitly, acknowledged the importance of emphasizing higher-order thinking and reasoning in the articulation of standards. As of 2008, all 50 states organize their K-12 education around high-quality educational standards\(^6\). Nearly all states regard, in one way or another, the importance of higher-order thinking standards as the central element of education. The common core standards, launched on June 2\(^{nd}\), 2010, and already adopted by 45 states, explicitly incorporate critical thinking standards\(^7\). Through educational content standards, CT has not only turned into a reality in the US but it also has become the heart of the educational reform, the

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\(^{6}\) US Department of Education, *A Nation Accountable. Twenty Five Years after a Nation at Risk* (2008, p. 5)

“Emperor’s New Cloth of modern education,” according to the words of John Chaffee (1992, p. 25).

Texas has not been an exception in this regard. Both the prior and the new, reformed Texas Essentials Knowledge and Skills (TEKS)\(^8\) and corresponding assessment and accountability systems require the teaching and assessment of critical thinking skills at nearly all grade levels in K-12 education. In states like Texas, where the ratio of critical thinking content relative to the total amount of items in a state-mandated reading test is high, the clarity, consistency and thoroughness of the critical thinking concept or model adopted are crucial. It is safe to say that, in the state of Texas, not having a clear understanding or having a misconception of the meaning of critical thinking seriously compromises the passing of the state-mandated tests and thus, at some grade levels, of meeting grade advancement requirements or student promotion to the next academic grade\(^9\).

*The Content of Critical Thinking*

Despite its overall presence and its prominent role in education, the content of critical thinking is elusive. To keep on using the above metaphor, the material of the emperor’s new cloth is rather dreary. It is vague and equivocal, both in theory and in its everyday practice. The fact that critical thinking spans several centuries of intense debates and theory building left a lasting mark in the collective idea of its meaning, and has remarkably impacted our conception of the phenomenon. This manifests itself in the way critical thinking entered into our daily

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\(^8\) The “new” TEKS were adopted by the Texas legislature to be implemented beginning the 2009-2010 school year and amended on February 22\(^{nd}\), 2010, Texas Education Code §7.102(c)(4) and §28.002.

\(^9\) Enacted by the 76\(^{th}\) Texas legislature, the Student Success Initiative (SSI) grade advancement requirements determines a student’s advance to the next grade level only by passing the state mandate test or unanimous decision of his or her grade placement committee that the student is likely to perform at grade level after additional instruction. The initial SSI grade advancement requirement applied to reading at third grade and mathematics and reading at fifth and eighth grades. It was amended in 2009 to eliminate TAKS SSI requirements for third grade. See TEA SSI webpage at http://www.tea.state.tx.us/index3.aspx?id=3230&menu_id=793
vocabulary. The way we designate the critical thinking phenomenon is not analogous to the way in which other cognitive functions took footage in our language (Jones & Idol, 1990; Idol & Jones, 1991). Other abstract cognitive functions, like basic understanding, extracting important ideas or even problem solving, have a relatively stable common core representation in the minds of people, regardless of contexts (Davidson, 2003). Not critical thinking. When we hear critical or arguing in connection with thinking, we might associate positive characteristics as well as negative. Critical could mean something very desirable or something very despicable. We can praise or condemn or create clarity or confusion with the same term; critical thinking may be concrete and clear or abstract and polemic.

Now, this situation seems to be a true reflection of the intricate diversity of the ways people conceptualize critical thinking. It is difficult to unequivocally answer the question of what critical thinking is. McPeck, author of one of the most debated theories on critical thinking, affirmed in 1981 that there has been no way of coming to an understanding of what the concept entails and what it precludes because of its persistent vagueness, both in the literature and in its practical use (McPeck, 1981, pp. 5-14). Common sense notions of critical thinking are as confusing and uncertain as its conceptual counterpart, as Webster’s definition of critical thinking actually shows. What Beyer assured in 1987, namely that critical thinking is “one of the most abused terms in our thinking skills vocabulary” (pp. 32-33), has been confirmed in more recent literature (Geertsen, 2003). More recently, Moon (2008) counted 28 different meanings of critical thinking. And Johnson, a leading researcher in the area of informal logic and

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10 The Webster dictionary offers a range of possibilities for defining critical from “inclined to criticize severely and unfavorably” to “exercising or involving careful judgment or judicious evaluation.” http://www.merriam-webster.com/dictionary/critical.

11 As examples, the following CT approaches are popular: CT as reflective thinking...as analysis of situations...as a way of developing own arguments...as ability of looking at things from different points of views... as thinking strategically ...deep thinking...higher order thinking...not being conventional...thinking objectively...evaluating
argumentation theory, categorically stated that, in the research literature, there are as many notions of critical thinking as there are authors (1992a, pp. 71-72).

Furthermore, the interchangeable use of terms like critical thinking, metacognition, higher-order-thinking, cognitive strategies, reasoning skills, informal logic, etc, in the research literature covering this long, historically complex category-building process added to the confusion about the defining characteristics of all of them (Johnson, 1992b, p. 39). Definitions of critical thinking, higher-order thinking, critical reasoning, problem solving, decision making, metacognition, informal logic, etc, intertwine and come and go depending on the area from which we argue, on the theoretical approach that is being used, or on the school of thought to which the author ascribes. Resnick denounced that problem in 1987, stating the following:

> How should we make sense of these many labels? Do critical thinking, metacognition, cognitive strategies and study skills refer to the same kind of capabilities? And how are they related to problem-solving abilities that mathematicians, scientists and engineers try to teach their students? (p. 1)

Johnson (2000) concluded that the indeterminacy of the content of critical thinking has resulted in a special double issue impacting the research on the nature and definition of critical thinking. On one hand, there is the difficulty of defining the specific content of critical thinking (what critical thinking is not or should not be) over other thinking concepts such as those described above. He called this the “network problem” of critical thinking (Johnson, 2000, p. 22). On the other hand, there is the difficulty of determining the scope of critical thinking (what critical thinking is and what it includes or the scope problem of critical thinking). The literature review chapter of this dissertation will study the factors and conditions of the network and scope...
problems as a framework to filter and classify critical thinking definitions and theoretical models of critical thinking.

Problem of the Study

The indeterminacy of the concept of critical thinking, as expressed in the network and scope problems of critical thinking, has had disastrous consequences for the comprehension of critical thinking in the world of public education. Pernicious effects on curriculum construction can be observed in many curriculum proposals, some ranging from courses in Latin to logic and clever puzzle games (McPeck, 1981). However, intent on framing the formulation of the problem of the study, I will refer here, in particular, to the detrimental effects the indeterminacy of critical thinking has had on the understanding of critical thinking, both in Texas higher education and at the K-12 level.

Paradigmatic is a study carried out by Paul, Eder and Bartell (1997), from the Center for Critical Thinking at Sonoma State University, for the Californian Commission of Teacher Credentialing. They interviewed 101 education faculty and 39 members of faculties of arts and science in California to evaluate the content and teaching practices being employed by postsecondary faculty to train teacher candidates. Although the overwhelming majority (89%) of the faculty claimed critical thinking to be a primary objective of their instruction, only 19% could give a clear explanation of what critical thinking is and only 8% could provide a clear conception of the critical thinking skills they thought were important for their students to develop. While the overwhelming majority (78%) claimed that their students lacked appropriate intellectual standards (to assess their thinking), only a small minority (8%) could enumerate any intellectual criteria or standards they required of students. Although 67% said that their concept
is largely explicit in their thinking, only 19% could elaborate on their concept of thinking. A significant percentage of faculties interviewed:

- Did not understand the connection of critical thinking to intellectual standards
- Were unable to give an elaborated articulation of their concept of critical thinking
- Could not provide plausible examples of how they fostered critical thinking in the classroom
- Were not able to name specific critical thinking skills they thought are important for students to learn
- Could not specify basic structures essential to the analysis of reasoning
- Could not give an intelligible explanation of basic abilities either in critical thinking or in reasoning
- Have had no involvement in research into critical thinking and have not attended any conferences on the subject (Source: Taken from point 11 of the findings from Study of 38 Public Universities and 28 Private Universities to Determine Faculty Emphasis on Critical Thinking in Instruction)

This situation affects conceptions of critical thinking not at the college level only. Wright (2002) critically reviewed recent published research findings on K-12 teachers’ perceptions and corroborated the above-mentioned for college faculty. Wright evaluated available qualitative studies about the conceptions, pre-conceptions, epistemologies and attitudes of social studies teachers regarding critical thinking in the US from 1991 to 2002.

In the course of that review, Wright could not find any evidence that critical thinking courses were being taught in schools (2002, p. 138). Rather, critical thinking was meant to be infused in content area teaching. Public school teachers and district curriculum developers responded with more confusion regarding the network problem and multiple critical thinking conceptions and models than post-secondary instructors. They showed no organized knowledge from any elaborated critical thinking theories/models available today that could substantiate their
assertions of an infusion model of teaching critical thinking (p. 140); Wright concluded that “given the varying definitions of critical thinking and the variety of ways that critical thinking can be incorporated into the school curriculum, it is no wonder that teachers don’t know where to turn” (p. 141-142).

Unlike the post-secondary critical thinking scenario, public school teachers usually have no critical thinking department home and have little support from the few professional organizations that exist for school-level critical thinking (Wright, 2002, p. 137). Renowned professional organizations like the Association for Informal Logic and Critical Thinking; the Center for Research on Reasoning, Argumentation and Rhetoric (CRRAR); the Foundation for Critical Thinking; the International Society for the Study of Argumentation (ISSA); and the American Philosophical Association (APA) are not available to the K-12 community and neither are institutions that provide support for school level teaching of critical thinking.

Given this chronic lack of critical thinking instruction in K-12 classrooms (Wright, 2002, p. 140), most teachers give way to a notion of skills-based critical thinking where isolated skills are being taught in an “uncritical thinking manner” (pp. 140-141), that is, without reference to criteria that qualify an argument as acceptable. Classroom teachers’ lack of knowledge about key concepts in reasoning, reasoning theories and critical thinking skills was alarming to Wright (pp. 144-145) who, to further support these assertions, referred to a variety of findings from several studies conducted with large samples of high school teachers, pre-service teachers,

12 Despite the broad institutionalization of CT initiatives across the US, mainly three scholars have developed theoretically funded curricular materials and designed programs for use in schools: Richard Paul has produced training programs and curriculum materials for infusing critical thinking into all subject areas; M. Lipman has a thorough and voluminous program (The Philosophy for Children program) that requires well-trained teachers and a separate timetable slot. Applying the Bailin, Case, Coombs and Daniels's (1999b) conception of critical thinking, Daniels and Case (1997) have produced "critical challenges" that can be incorporated into many subject areas in all grade levels (Wright, 2002, 141). For a review of arguments about teaching CT at school level see D. Willingham (2007a) and Carroll (2005) as well.
veteran instructors and school specialists in 43 high school systems in the USA. Here are some of the highlights: only 52% of them could distinguish between statements of facts and statements of opinion, and 50% of the sample could not differentiate between empirical, conceptual, and value claims. A vast majority of teachers viewed basic skills training as the major goal in education and could not list any critical thinking skill while 41% of them said that knowledge, sound judgment, truth and moral values were a matter of personal preferences and taste. An overwhelming majority of teachers could not identify any of the theoretical and philosophical orientations that facilitate critical thinking understanding and instruction and had no knowledge of critical thinking standards and their relationship to critical thinking skills (pp. 144-146). An immense majority regarded knowledge as “objective” and a fixed entity (p. 144) and favored “disciplinary” standards for teaching critical thinking. Under the conditions of such statistics as this, sound teaching of critical thinking was judged by Wright as likely doomed to fail (p. 145).

By way of conclusion, it can be said that, given the overwhelming reality of the indeterminacy of teacher understanding of critical thinking, the degree of clarity that can be obtained from their concept of critical thinking seem to rely on a partial or complete solution of the network problem. In other words, for educators, the clarity of the concept of critical thinking, its defining elements and distinctive features, will depend on the degree of clarity that educational standards, explicit curriculum and assessment guidelines might provide.

Structure of the Problem

One feels encouraged to argue that this is what prima facie seems to have happened in Texas since 1999. Since then, the school authorities, namely the State Board of Education (SBOE) and the Texas Education Agency (TEA), have promoted the teaching of critical thinking.

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13 In Texas’ school system, the state assessment program (TAKS) provides specific information and guidelines (TAKS booklets) for teachers and administrators, whereas the curricular document TEKS does not.
through the TEKS and have designed and put into practice a battery of evaluation tools to measure (since 2003 through the TAKS and STAAR tests) how effectively critical thinking is being taught to Texas students from third to eleventh grade.

Chapter 4 of this study and the literature review reveals that, in fact, the state of Texas seems to have elaborated a curriculum framework from which it could be inferred of what critical thinking might consist and what the constitutive features of a critical thinking model might be. Notwithstanding, despite academic standards and a critical thinking curriculum framework, the state of Texas does not define the content of critical thinking neither conceptually nor operationally. None of the official records of the SBOE or the TEA curriculum division define or discuss in any way the content or the theoretical orientation of curricular components of critical thinking nor explain the rationale for the conceptual unity of selected critical thinking skills.\(^{14}\)

How can this quasi paradoxical situation be understood, in which the Texas educational system solves the network or scope problem of critical thinking without defining the content and without specifying the scope of what it means to think critically? I argue in this study that school authorities in the state of Texas solve the problem of the indeterminacy of critical thinking by defining the parameters for the evaluation but not for the promulgation of critical thinking. In short, the concept and model of critical thinking are assessed, but not defined. The problem of this study can therefore be formulated in the statement that a solution for the scope and network problem of critical thinking in Texas does not revolve around enacting the content of what it means to think critically, but around evaluating it. Critical thinking became a performance standard rather than a curricular category in the Texas educational system.

\(^{14}\) See Chapter 4 of this study
Thus, I hold in this study that the problem of understanding what critical thinking is must follow from the analysis of how critical thinking is assessed and not how critical thinking is postulated. A definition and model of critical thinking must follow out of the analysis of all critical thinking items in the history of the Texas assessment programs.

Significance of the Study

As demonstrated by the literature review in Chapter 2, the elusiveness and indeterminacy of one of the most complex and central concepts in elementary education is a significant problem. Opinions still diverge as to what defines critical thinking and what is the rationale of a set of skills to be qualified as critical. The facts that academic authorities in Texas do not explicitly and clearly take a position in that debate, and do not disclose the research behind the skills selected as critical, aggravate factors for the vagueness and indeterminacy of understanding critical thinking.

The fact that teachers, curriculum designers, instructional experts, educational administrators, educators in general and the general public do not have at their disposal a clear guide about the content, scope, and complexity of one of the most central goals of education in Texas (Willingham, 2007a), critical thinking, makes difficult the planning, teaching and evaluating of critical thinking. The fruit of reconstructing the critical thinking model from the resulting structure and history of its assessment would allow teachers to understand, plan and instill in children critical thinking competence, as opposed to uncritically teaching isolated, unrelated thinking skills. This would also allow educators to eliminate uncertainty in instruction and to advance in the achievement of a highly desired academic goal while eliminating or reducing the tendency to teach to the test that makes its triumphant round in Texas classrooms nowadays. I elaborate on this in Chapter 5.
No one knows for sure about the impact of this uncertainty of the critical thinking content on the low levels of Commended Performance ratings state wide\textsuperscript{15}. Commended performance is a category used by the state authorities to measure academic excellence of students. But it can safely be assumed that this uncertainty plays a prominent role in those statistics. Defining the concept and reconstructing the theoretical approaches that inform the practice of critical thinking should have a measurable and positive influence on the practice of teaching and assessing critical reasoning.

Recognizing and understanding what makes a particular thinking skill critical and understanding the scope and complexity of the critical thinking concept and model used in Texas would potentially do the following: (1) enlighten teachers and educators in general as they plan, teach, and evaluate the content of one of the most complex educational objectives to be taught at the elementary level; (2) help publishers and experts design quality instructional materials and strategies that more adequately reflect the scope and complexity of critical thinking; and (3) make clear to academic authorities in Texas the presumptive risks and problems, and negative consequences, of not making accessible for teachers curricular guidelines with clear conceptual or operational definitions of highly debatable concepts, and highly controversial or highly abstract educational standards.

\textsuperscript{15} Commended Performance was one of the three Performance-Level Descriptors (PLD) alongside Met Standard and Not-Met Standard TEA used to set levels of performance required of students in Texas between 2003 and 2011. The PLD for Met Standard and Commended Performance were set at 2100 and 2400 respectively. Raw score conversions changed slightly every year, the last one being 22/36 and 33/36 for third grade reading, 27/40 and 37/40 for fourth grade reading and 30/42 - 39/42 for fifth grade reading in year 2011. See http://www.tea.state.tx.us/index3.aspx?id=3222&menu_id=793 and http://www.tea.state.tx.us/index3.aspx?id=3272&menu_id=793 for more specific information about performance standards.
Additionally, the outcome of this study may warn educational authorities about the negative effects of restricting the public release\textsuperscript{16} of the state-mandated tests\textsuperscript{17}. In the case of the critical thinking concept, those tests constitute the only accurate source of information on content and the only available material to understand scope and complexity of curricular standards.

**Purpose of the Study**

This study sought to unveil the foundations of the critical thinking notion as it is implemented in the elementary education system in the state of Texas in regard to curriculum, definition, concepts-skills and theory. So the purposes of this study were as follows:

1. To describe the *curricular* structure of critical thinking and its components in the Texas elementary education system;
2. To describe the *conceptual* and *theoretical* dimension of *critical thinking* through a descriptive analysis of the nature, types and structure of critical thinking concepts and skills used to evaluate critical thinking competence in basic education in Texas;
3. To understand the *conceptual* and *theoretical* dimension of critical thinking through the description of criteria that make a critical thinking concept valid or justified; and
4. To descriptively reconstruct the elements of a *definition* of critical thinking as they are employed in elementary education in Texas.

**Research Questions**

This study attempted to answer the following research questions:

1. What is the critical thinking curriculum and how is it structured in the Texas elementary education system and in the TEKS?
2. What are different types of critical thinking concepts and skills and their structure?

\textsuperscript{16} The Texas legislature conceded school authorities to extend the public release of TAKS assessments from two to three years. The three-year release schedule was enacted by the 80\textsuperscript{th} Texas Legislature in 2007 and modified by the 81\textsuperscript{st} Texas Legislature in 2009. See TEA website http://www.tea.state.tx.us/index3.aspx?id=44&menu_id=793 (retrieved on January 18, 2011)

\textsuperscript{17} In contrast and as a way of example, the Virginia and Florida state mandated tests are being released and published with commented guidelines every year. See http://www.academicbenchmarks.com/search (retrieved 8-21-2010) and http://www.doe.virginia.gov/testing/sol/standards_docs/english/index.shtml
3. What does it specifically mean to think critically in Texas elementary education?

4. What are the elements of a general definition of critical thinking in elementary education in Texas, its purpose, components and its implications for STAAR?

Summary

This chapter has presented a rationale for the importance of investigating the elements of curriculum that are embedded in how the state of Texas defines critical thinking, especially since the state requires testing of critical thinking in the state-mandated content-standards-based assessments. Chapter 2 presents a comprehensive review of literature that is related to the overarching concept of critical thinking.
CHAPTER 2
SYNTHESIS OF RELATED LITERATURE

Introduction

The concept of critical thinking has become one of the core components in both the discussion on the value of teaching thinking and reasoning and the educational reform in general (Kennedy, Fisher, & Ennis, 1991, p. 12). Its history is ancient, complex, and rich in theoretical production. However, its content is elusive and indeterminate; even today it is the subject of intense and intricate debates. There are as many definitions of critical thinking as there are authors (Johnson, 1992a, p. 72; 1992b, p. 40).

The state of Texas, through its educational authorities who are aware of the value and necessity of critical thinking (TEA, 1997, 2004) explicitly postulated its significance, assigned an important role to it within the Texas academic standards, and even developed a comprehensive framework for its evaluation. Nonetheless, critical thinking remains undefined explicitly by the state. No official state document provides a definition of critical thinking and its components (conceptual or operational)\(^\text{18}\). In other words, despite its crucial importance, despite the fact it is considered an essential ingredient of the Texas assessment program TAKS, and despite the fact that critical thinking is comprehensibly being assessed in the K-12 educational system in Texas, the public is left in darkness regarding the content, components and theoretical orientation or critical thinking.

However, the content of critical thinking in the Texas educational system - its scope and complexity - is implicit in the way that it has been evaluated since 2003 until today. The most central assumption of this research, therefore, is that, despite the lack of defining what critical

\(^{18}\) TEA published for the first time a glossary of terms used in curricular documents as an addendum to the reformed Texas Academic Knowledge and Skills (TEKS) in 2009.
thinking actually entails and despite the absence of explanations of its components, it is possible to reconstruct its content and scope and thus make it accessible to the general public and teachers, educators in general, curriculum specialists, educational administrators, publishers, etc.

This study is intended to reconstruct the content, scope and complexity of what is conceived as thinking critically at the elementary level in the Texas school system. It was undertaken through an analysis of the way critical thinking has been assessed throughout its assessment program history in an attempt to both assemble the original pieces of its content (definition), and to analyze its theoretical consistency or coherence. Prior to studying the phenomena proposed by this dissertation, it was necessary to review the following categories of prior research to provide the proper framework and rationale for the overall study.

1. Studies recreating the theoretical paradigms in the history of critical thinking, to elaborate on the inherent problems of defining critical thinking, its conceptual nature or deep structure.

2. Studies that develop theoretically-funded definitions of critical thinking and that are part of elaborated theoretical models in critical thinking research today.

3. Studies related to theories that transcend the classical paradigm to study the critical thinking phenomenon, namely informal logic and argumentation theory.

The Problem of Defining Critical Thinking

In the introduction to the study (Chapter 1), I pointed out that the long history of the term critical thinking, and the complex category-building process which took place from the Greek enlightenment to the explosive renaissance of the critical thinking literature in the 1980s, among others, led to widespread confusion regarding the defining elements of critical thinking in the research literature. There are authors who assimilate critical thinking and problem solving (Ennis, 1991; Halpern, 1996); others study critical thinking within a taxonomy of higher-order thinking skills in the tradition of Bloom (Geertsen, 2003). Still other groups of researchers consider decision making and critical thinking indistinct and parts of one and the same reasoning
process (Ennis, 2011; Glaser, 1941). A more recent tradition confines critical thinking into the many layers of metacognitive skills (Griffith & Ruan, 2005; Kuhn, 1999). All this begs the question of whether or not it is possible to formulate a definition of critical thinking that is universally valid. If yes, under what parameters? What are the reasons for the difficulty of reaching a minimum consensus?

This amalgamation of indeterminate conceptualizations, blurred distinctions, and diverse theoretical orientations confuses the ontological status of critical thinking. Defining what critical thinking is has become a priority in the debate since the 1990s (Johnson, 1992b; McCarthy, 1992; S. Norris, 1992b; Siegel, 1992b). A definition of critical thinking is necessary not only for the advancement of scholarly awareness of the problem; it is a central piece for the enunciation of a valid criterion of what critical is in our thinking so that the efficacy of critical thinking pedagogies, critical thinking programs, and critical thinking assessments can be determined (Ennis, 1993).

However, this indeterminacy in the content of critical thinking observed in the indiscriminate and interchangeable use of a series of interrelated concepts (such as critical thinking, problem solving, metacognition, higher-level thinking, decision making, creative thinking, etc.) is certainly not due to a lack of definitions. On the contrary, the proliferation of definitions of critical thinking may be an expression of the same confusion. One of the most comprehensive frameworks for the description of the confusion in defining critical thinking was elaborated by Johnson (2000, pp. 22-23) and named the network problem in critical thinking. This indeterminacy of the critical thinking concept is – as Figure 1 shows – at the heart of what defines the network problem (Figure 1).
Figure 1. The network problem. This figure illustrates distinct and interrelated concepts in the field of reasoning that need to be defined.

According to this approach, what is needed is not just clarification on the nature of critical thinking or metacognition or problem solving. What is needed in this view of the network problem is a theory in which all these terms are given appropriate definitions in their relationship to one another. For instance, using the terms “critical thinking” and “problem solving” as though they were interchangeable, is confusing. Such confusion cannot be cleared up simply by providing a definition of critical thinking or of problem solving because what needs to be seen is not just the real nature of critical thinking or of problem solving of but how these two phenomena stand in relation to each other.

The network problem of critical thinking, then, consists basically of the idea that the characteristic features of critical thinking are not clearly delineated in relationship to other constructs of a network that could generically be called thinking or reasoning network (Adler, 2008). Additionally, the confusing nature of critical thinking not only compromises its ontological status, it also extends to regions designed to account theoretically for all phenomena
contained in the network problem such as rationality, reasoning, argument, logic, etc. Johnson (2000) suggested that delivering these clarifications is the job of a theory of reasoning that at the present time does not exist. There is much work done on the theory of knowledge, the theory of intelligence, or the theory of rationality. Johnson asserted that “there is next to nothing that can be looked to as a theory of reasoning” (Johnson, 2000, p. 23). This leads subsequently to an additional form of the network problem which emerges when we post another set of questions, such as the following: 1) How does reasoning relate to argumentation? 2) How is reasoning related to rationality? 3) How does reasoning relate to knowledge, thinking, or argument? The problems distinguishing critical thinking from problem solving from metacognition from higher-order thinking mirror the difficulties justifying a clear distinction between knowledge and reasoning, rationality and thinking, reasoning and argument, etc.

Thus, for Johnson (2000), the threads of each and every one of these isolated components of the reasoning network are woven into a theory of reasoning. Both a theory of argumentation and a theory of critical thinking or of any other phenomenon in the network problem can not be properly understood without the support of a theory of reasoning that both conceptually draws constructive boundaries between every segment of the network and adopts definitions for each segment of the network. The reality of this double level of needed clarification suggests that the widespread pollution of definitions may be the manifestation of the true problem of defining critical thinking19.

Clarity about any of them necessarily involves not only seeing it clearly but seeing it in a relationship to the others in the network. To understand what critical thinking is, one must not only have some kind of definition of what it is but also some idea of how it is like and how it is different from, say, problem solving, higher-order thinking, or metacognition. (Johnson, 2000, p. 22)

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19 A generic Google search for “critical thinking books” yielded 1,520,000 books published in English on January 12, 2011. A textbook search on critical thinking textbook on the same day yielded 896,000 available resources.
According to this, we need not only a definition of each construct, in particular, but one that allows us to distinguish all constructs from one another and to clarify their interrelationships. Unfortunately, and to date, we do not have a comprehensive theory of reasoning of this nature available that would allow us to establish these distinctions and explain those relationships consensually.\footnote{Even though there is no need to emphasize that a such theory of reason is not yet available to us, that appreciation has found good echo in the research literature. Meanwhile a series of publications have advanced in that direction, e.g., Adler & Rips (2008); Gabby/Woods (2002)}

The need of educational systems, however, to be able to operate with a concept of critical thinking in the absence of a theory of reasoning, has made it possible to establish at least minimum requirements for articulating definitions that tentatively meet the challenges of the network problem. Johnson (2000, p. 23) and Ennis (1992b), among others, advanced the conversation in establishing basic requirements for discussion-worthy definitions of critical thinking. These requirements are as follows:

1. A definition of critical thinking should explain why and when thinking is “critical” or what makes thinking “critical”. That would imply that a definition of critical thinking can not be assimilated to a theory of thinking or reasoning without specifying what makes reasoning “good” or “critical” or “sound” or whatever the critical thinking criterion might be called. (Johnson, 1992b, p. 52)

2. A definition of critical thinking must be embedded in a theory of critical thinking. Free-standing definitions – that means definitions that are not theoretically founded – are not considered good candidates to respond in an acceptable way to the network problem challenges. By theory of critical thinking is meant a body of concepts, principles, arguments, and assumptions which support the definition, its components and evaluation, and the relationship among those components. (Johnson, 2000 p. 40)

3. This implies additionally that a definition of critical thinking has to display its connection with the historical practice of critical thinking and/or with the history of the term. Complete idiosyncratic or unhistorical accounts of critical thinking are therefore not acceptable. (McPeck, 1981, pp. 39-42)
Consequently, a theoretically supported definition of critical thinking will show two distinct aspects. The first is an internal aspect regarding characterization, description, and logical consistency of each of its components (per Condition 1). This literature review refers to this aspect as the concept of critical thinking and will reveal the internal coherence of critical thinking (Hodder, 2000, pp. 703-715). The second aspect is external and is intended to yield a theoretical justification of the relationship that components of the concept maintain among themselves, and that allow differentiation from other similar constructs of the reasoning network (per Condition 2). This literature review refers to this second aspect as the model of critical thinking and will deal with the external coherence of critical thinking.

This literature review chapter succinctly reviews some features of the internal and external coherence of exemplary and historical critical thinking definitions and models, with the intention of showing its nature and its deep structure. Chapter 4 reports on the internal and external consistency of the critical thinking concept and model adopted by the state of Texas at the curriculum and assessment level between 1999 and 2009.

The Nature of Critical Thinking in the Classical Logic Paradigm

Authors like Finnochiaro (1996), Fasko (2003a), and even Paul (1997), who reconstructed the historiography of critical thinking, insisted that the genealogy of every thinking movement is nothing but the history of the reason being critical (Finocchiaro, 1987, pp. 34-). Each enlightenment tradition produces for itself not only an impressive knowledge of the world but also reveals its power, attributes, skills, principles and criteria that justify and validate these authors’ findings and theories.

It is not the intention of this section to take historical snapshots of the evolution of critical thinking discourses. The reasons for the following historical review are methodological in nature
and fairly simple. The first reason is reconstructing out of the classic Aristotelian archetype of critical thinking pieces of the skeleton that remains constant in subsequent definitions of critical thinking. The second reason is pointing out that, in the transition from Socrates' elenchus to Aristotle's logic, a sort of a prototype of the pendulum becomes visible that swings between theories of critical thinking: between the dialectic sensitive approaches from Socratic origin (extended theories that add dialectical dispositions to a skill assessment model) and the skill-alone theories of critical thinking from Aristotelian provenience.

There is relative consensus in tracing back the origin of what we understand about critical thinking in Western thought to Socrates in Ancient Greece (Fasko, 2003b; Vlastos & Burnyeat, 1994). Socrates is credited with developing the notion that our common beliefs and conventional explanations about events and phenomena used in real life conversations cannot adequately be justified and accepted, other than through rigorous scrutiny and systematic inquiry. Key in this conception is Socrates’ initial observation that individuals involved in most types of interactions - from seeking clarification of terms, to solving problems and to performing scientific inquiry - are basically and originally in a sort of dialectic state of rational disagreement, characterized by opposing viewpoints about a subject (Blair, 2003, p. 94). This original dialectic human condition involves an oppositional discussion in which one point of view is pitted against another with the intention of establishing either the truth of the matter or a common understanding of what is the case (Paul, 2006). Due to the inevitable differences in the viewpoints about one and the same event, Socrates concluded that thinking and insight about something can not rely on conventional notions (uncritical) represented by the different opinions, but require the practice of a discourse (elenchus) which, by refuting all kinds of propositions, becomes critical (Robinson, 1971). That

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21 The word ‘dialectical’ and its cognate ‘dialectic’ are ambiguous in early Greece thought. It is used here in the sense of the ‘refutation’ condition used in early Socratic writings (Woods, 2002)
means it becomes capable of examining reasoning and assumptions, tracing implications, providing evidence, etc. (Paul, 1997).

In essence, elenchus as discourse unfolds itself as a twofold process: as rational and dialectical praxis. The rational or reasons-assessing component of Socrates’ approach is best seen in this notion of refutation (Robinson, 1971). Elenchus is, in a strict sense, a form of cross-examination or refutation to a claim made by someone in a real-life dialogue situation. This cross examination means examining a person’s claim by constantly presenting questions calling for further statements in the hope that the meaning and the truth value of that person’s initial claim can be determined (Woods, 2002a, p. 45). Elenchus’ original intention was, therefore, finding a way - through contradictions and internal inconsistencies - into a place where both arguer and opponent can come to recognize the narrowness of their rational beliefs about something. In other words, the essence of elenchus consists in making visible to an arguer the “link between certain of his actual beliefs and the contradictory of his present claim” (Woods 2002, p. 46).

In addition to its rational character, for Socrates, however, elenchus constituted a dialectical enterprise as well (Higgins, 1994, pp. 2-4). Dialectical, in Socrates’ dialogs, implies considering in the argumentation the psychology of actors and their particular affections as well as the contexts and conditions of the actual exchange of arguments in both the phase of successful refutations and the closing or final phase of elenchus (Woods, 2002a, p. 48). The art of elenchus is to find premises believed by the party who makes a claim, yet entailing the contrary of his thesis (Robinson, 1971, p. 8). To find these assumptions and to make the point of the argument, Socrates frequently used his insight into the psychology of the speaker. Socratic’ elenchus often took on particularity and accidentalness in a series of ways, for instance, in the
switching of roles as proponent and opponent in the dialogs, in the way he addressed only the here-and-now of view-points of actors participating in the discussion, etc. (Robinson, 1971). The general consensus is that, along with the effectiveness of the logical component in the elenchus, dialectical as well as rhetorical elements play a decisive role in the works of the Socratic questioning or dialogical approach (Blair, 2003, p. 90). Socrates exemplarily showed that the way out of our human condition of perennial disagreement starts with real-life arguments, involves a strong rational or reason assessment instance, and is embedded in concrete contexts and situations with real actors about life-world issues. Socrates’ discursive method is considered even today by many as still the best critical thinking pedagogy of systematically evaluating beliefs and all types of statements for their clarity and consistency (Browne & Keeley, 2007; Paul & Elder, 2007).

Notwithstanding, a series of reasons, such as the context dependency of Socrates’ approach, the absence of objective truth and validity criteria for discourses, etc., historically gave rise to subsequent revisions of Socrates’ elenchus (Vlastos, 1980). Both Plato’s critical transformation of Socrates and Aristotle’s revolution of those early reconstructions of reasoning are classical models in the history of critical thinking. In this context, Aristotle’s solution to the problem of acceptable or good reasoning is constitutive and a key paradigm of modern critical thinking. Aristotle’s solution is considered the birthplace of logic22 and with it the assumption - still common today – of a close relationship between logic and reasoning (Woods, 2002, p. 45).

Since Aristotle’s approach constitutes the basic paradigm of most rationalist conceptions of critical thinking, I will succinctly describe it here. Hence, this research, however, will focus on comprehending the basic model of critical thinking for elementary education in Texas. The

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22 Aristotle did not himself called his program ‘logic’. The term ‘logic’ seems to have originated with Alexander of Aphrodisias in the third century A.D. (Lear, 1988, p. 209)
section that follows condenses the analysis of Aristotle’s critical thinking model to only four basic steps: The account of elements of the critical thinking definition will be followed by the description of the basic theoretical categories of critical reasoning. The characterization of two pairs of key concepts out of his logic program is as essential as the description of three lasting consequences drawn from Aristotle’s logical conception of critical thinking.

Aristotle’s Definition of Critical Thinking

Aristotle originated his logical theory on the footsteps of the Sophists’ rhetorical approaches, Socrates’ elenchus, and Plato’s dialectical transformation of it. As such, his starting point was the world of everyday situations, conceived as arguments presented by ordinary people about a great deal of ordinary simple and/or complex issues of everyday life (Lear, 1980 cited by Woods, 2002, p. 50). As mentioned earlier, in Socratic terms, arguments are refutations of asserted claims informally presented by one or more parties engaged in interactions produced in real time (Woods, 2002a, p. 45). Aristotle inherited this Socratic idea of refutation as an attempt to induce an opponent into accepting a concession inconsistent with what he said before. For Aristotle, the whole purpose of a Socratic refutation is to show that a proposer of a claim could not be right now (his statement cannot be true) if he was right then.

Aristotle not only inherited this concept of refutation. He made it the starting point for an organized theory of critical thinking. From his early works on (Topics and Sophistical Refutations), Aristotle aimed at determining the conditions in which refutations worked (Lear, 1980 as cited by Woods, 2002a, p.48) to distinguish sophistical (today we would say rhetorical) argumentations from valid or good ones. On his search for the conditions of good refutations as opposed to bad ones, Aristotle formulated the conditions and requisites of statements that would generate consistency in conclusions (syllogisms). A modern commentator put Aristotle’s
program about how to define critical thinking in the following terms: “When one party claims to have refuted another party, is there a principled way of determining whether he has in fact?” (Woods, 2002a, p. 45). Aristotle’s answer to this question could be stated as follows: A person’s (B) refutation of another’s (A) claim is successful when A’s concessions to B’s refutations are inconsistent with A’s former claim (Smith, 2000). Aristotle’s definition of critical thinking can be formulated in the statement that critical is a thinking that secures the consistency of claims through contradiction-free refutations.

*Aristotle’s Theory of Critical Thinking*

Aristotle directed his definition of syllogism as follows:

A deduction [syllogism] rest on certain statements (*premises, OQ*) such that they involve necessarily the assertion of something other than what has been stated, through what has been stated. (On Sophistical Refutations 1, 165a 1-3, cited in Gabbay, 2002, p. 10)

What we call ‘logic’ today was actually the first systematic framework developed to analyze elements and conditions of real-life arguments, the first operative framework to determine how thinking becomes critical. Logic (Syllogistic) is the first theory of critical thinking. As such, it was designed by Aristotle to mark the distinction between good and bad refutations, evidently a dialectical problem in nature. Some scholars put it this way: Aristotle invented logic to facilitate the solution of a problem in dialectic (Woods, 2002, p. 46).

In this respect, syllogism is a transformation of a dialectical (real-time, real-life) condition of transacting claims of real people in real situations into a theory of (logical) elements and conditions which can guarantee the effectiveness of arguments. With Aristotle, critical reasoning is inaugurated as an analysis of the conditions under which syllogisms are successful. As a result, critical thinking would not be an analysis of dialectical (material) conditions of disagreements or refutations anymore (along with contexts and intentions of subjects) but an
(formal) analysis of requirements that need to be met for syllogisms to be effective. By conditions Aristotle understood formal conditions, such as that syllogisms need to be consistently premised and should have at least two premises and a conclusion, that the premises jointly necessitate the conclusion, that syllogisms are categorical propositions, and that there are only four types of categorical propositions (Walton, 2006, p. 50). The premises of a syllogism must be relevant to the conclusion; the conclusion can’t be circular, etc.

Note that Aristotle formulated his syllogism as a finite sequence of propositions in which premises deductively, but not superfluously nor circularly, necessitate the conclusion. The following example mirrors Aristotelian conditions of a syllogism:

1. Carl was the first person finding bones of a T-Rex.
2. Carl died before anyone could look at the bones.
3. Therefore, Carl died before the value of his discovery was recognized.

In this regard, reasoning, the relationship between (1), (2) and (3), is a transition in thought where some thoughts (1), (2) provide the ground or reason for coming to another statement (3) or conclusion. This proposition (conclusion) is inferred from the truth of the premises (1) and (2) and the (deductive) relationship of (1) and (2) and it is warranted since the argument is valid. That means, sentences (1) and (2) imply sentence (3) since it is not possible for (1) and (2) to be true and (3) false. Aristotle believed that (1) and (2) (categorical propositions) are different from (3) in that the two premises constitute the grounds to believe the conclusion. Indeed, the person who draws the inference (3) takes the premises as his reasons to believe (3). Since Aristotle’s reasoning model, this inference process has been called deduction and is based on at least these two assumptions: that the conclusion constitutes a necessary

23 Obviously there are more conditions for a syllogism to be true. This refers to the two most sine quanon conditions for a syllogism to be accounted for. Stanford Encyclopedia of Philosophy
relationship between the premises and that the conclusion is valid (true) only if the premises are true. By contrast, the following transition in thought does not constitute reasoning.

(4) Carl was the first person finding bones of a T-Rex and

(5) Carl was a very hard-working person.

(6) Therefore, Carl died before the value of his discovery was recognized.

For, even though (4) and (5) are true, their relationship can not be taken as reasons for believing (6). In the classical syllogistic model, the fact that the relationship between (1) and (2) is implied in (3) is called deduction (Johnson, 2000, p. 57; Woods, 2002, p. 50\textsuperscript{24}); whereas, it is not the case for the relationship between (4), (5) and (6), even though they all may be true. In this sense, it is safe to say that in this basic classical model, reasoning means that the relationship of premises in the production of inferences is not accidental to the truth or acceptability of conclusions (Adler, 2008, pp. 2-3). Critical reasoning is our faculty to operate with reasons in a way that can warrant the truth of a claim or in a way that we can believe its truth.

The intention of reconstructing the Aristotelian archetype of reasoning (see above page 29) was to pinpoint important pieces of this skeleton of reasoning that remain constant in subsequent definitions of critical thinking. These important pieces are two specific pairs of concepts and two consequences of the logic paradigm.

*Key Concepts in the Logical Paradigm of Critical Thinking*

Next, I refer to two additional pairs of key concepts of the logical paradigm of critical thinking that have an enduring impact in the history of this paradigm.

Propositions and beliefs. Since Aristotle’s logic call for it, reasons will be expressed in propositions. Although there is disagreement about the precise extent of the term proposition in

\textsuperscript{24} Even though Aristotle’s notion of deduction is quite different from the modern concept of ‘implication’, deduction in Aristotelian sense leads to a certain type of implication (Woods, et al. 2002, 50-)
the Aristotelian logic, there is relative consensus on the propositional nature of assertions that carry reasons for claims (Smith, 2000 Chapter 4). As such, propositions are the content of statements from which we can say that they are true or false ("Proposition," n.d., p. 3). For instance, any sentence of the following types is a proposition: ‘Chris is a girl.’ ‘In a test, an ‘A’ is better than a ‘B.’’ or ‘North Korea successfully tested missiles this year.’ On the other hand, conative statements (statements that refer to feelings, values, preferences, etc. and therefore can’t be true or false) such as the following are not propositions: “I like ice cream sundae.” “I feel great today.” “I’d like to change the world.”

From the above sentence, if we acquire evidence that North Korea successfully tested missiles this year, then we can come to believe the statement that ‘North Korea successfully tested missiles this year’ even if we are indifferent to, or agree or disagree with that fact. There is no difference between judging that \( p \) is true and believing it. Knowledge, to Aristotle, is the foundation of our beliefs (Adler, 2008, p. 4). A statement of the kind I think \( p \) is true but I don’t believe it is actually not possible in regards to propositions. Beliefs are the products of reasoning. Therefore, evidence or reasons constitute a sufficient condition not only for the determination of what one believes but for the truth of the claim, e.g. “North Korea successfully tested missiles this year.” In other words, reasoning as our way of dealing with reasons is critical when those reasons actually are the foundation of our beliefs. The ultimate purpose of critical reasoning is to build and give support to our belief system.

Beliefs and actions. On the other hand, and since Aristotle, there are sufficient reasons to distinguish between reasons to believe and reasons to act or to do something. That means there is an important difference between propositional sentences and connative sentences (Johnson, 2000).

25 Pinto assures that despite the variations in terminology, there is a wide agreement that reasons for acting involve both cognitive elements such as beliefs and conative elements such as desires. Conative elements include desires, hopes, preferences, fears, etc (Pinto, 2003, p. 3).
2003; Pinto, 2003). The aim or purpose for reasoning on how one should act is different from reasoning towards belief in the sense mentioned above.

(7) Gabriel’s Dad promised to take him to ride horses next Sunday.

(8) Gabriel can not sleep Saturday night.

(9) He was excited because he is going for the first time to gather cattle.

In these cases, (7) and (8) can be good reasons for concluding that (9) is true. But, unlike the first case of belief (1)-(3), this conclusion (9) does not aim at finding reasons for what one believes but at how to act or feel. The first case of belief, or belief 1-3, aims at answering the question of whether (3) is true and not whether I ought to believe it. On the other hand, whether (3) is true or not, it won’t help me to know if I ought to act or feel in a certain way. The second type of belief, or I would say “belief 2” (statements 7-9), on the contrary aims to figure out how one feels or should act.

Even if propositions from the sort “the nearest ice cream store is in Westend and 4th Street” are true, they won’t serve as a reason to “like ice cream” or to “want to go and get ice cream”, whereas the opposite may be the case. Statements such as “I like ice cream” can be a good reason to go to the nearest ice cream store in Westend and 4th Street. Beliefs can guide action and are the reason why reasoning matters so profoundly to us. Aristotle’s foundation of reasoning, as sketched here, has been considered in the Western tradition as the milestone for the foundation of the difference between theoretical and practical reasoning (Gabbay, 2002, p. 2).

The Aristotelian approach to critical reasoning has been the backbone of school and college logic education for longer than two thousand years ("History of logic," n.d., p. 12; Smith, 2000). This logical transformation of argumentation in Aristotle, on the one hand, was bought at the expense of the context-situation orientation of Socrates’ elenchus, excluding the dialectical
components out of the argument structure. On the other hand, it reduced argumentation to only one argumentative practice (Harman, 2002), namely to the discursive practice that deals with objective statements (the theoretical one that includes propositions and excludes conative statements). As it is well known, the implications of this have been profound across all sciences and argumentative practices (Johnson & Blair, 2002; Woods, Johnson, Gabbay, & Ohlbach, 2002).

Consequences of the Logical Conception of Critical Thinking

For the purposes of what concerns us here, I will refer to only three major consequences that this logical transformation of reasoning has brought into the theoretical field of critical thinking. First, with Aristotle’s formal concept of reasoning, a clear difference was established between argument analysis and argument evaluation, since analysis of the components of reasoning, the truth and independence of the premises (argument analysis), is structurally different than the explanation about the relationship between the premises and the conclusion, or how the conclusion flows from the premises. Secondly, the formal theory of reasoning opens a way for an ambiguity in the concept of argument, and thirdly, it reveals a fissure between argument and inference that needs to be clarified.

Distinction between argument analysis and argument evaluation. It was mentioned above that, since Aristotle, ‘facing’ or ‘encountering’ arguments in real life turns into a ‘logical’ analysis of ‘formal’ conditions under which an argument can be accepted or can be successful. It was also brought up that Aristotle’s analysis of argumentation (syllogism) is, in a certain way, a formal analysis. It is formal in the sense that it is not an empirical or material analysis of a claim expressed by somebody as a proposition and addressed to somebody else in specific conditions and contexts –historical, cultural or otherwise. It is neither an analysis of the circumstances of its
(dialectical) origination, nor an analysis of its meaning for the context and situation for which it was intended. Formal means here the analysis of the theoretical conditions or restrictions that need to be met for an argument to exist, such as whether or not the syllogism is properly premised or its conclusion follows the premises, or its premises jointly necessitate the conclusion or if subject term, qualifier, copula and predicate term are present, or whether or not the syllogism contains idle premises or its conclusion is circular (repeats a premise), etc. (Walton, 2006, pp. 54-59). Since Aristotle, the circumstances in which an argument takes place are divided into two main strands: 1) an analysis of the conditions that allow for an argument to exist, or argument analysis, and 2) an analysis of the conditions under which an argument is good, valid or sound - argument validity.\(^{26}\)

**Argument analysis.** As stated above, in a classical logical perspective, understanding an argument with the intention of responding to a claim implies an analysis of certain formal conditions under which arguments exist. Scholars are in agreement, since Aristotle, that these conditions are subdivided in two subcategories: argument interpretation and argument structure (Chittleborough, 1993; Cogan, 1998; Eemeren, Grootendorst, & Henkemans, 2002; Johnson, 2000; Warnick & Inch, 1994). The first level designates conditions that help us answer questions like ‘Do we have an argument here?’ If yes, what are its parts? What are the premises, what is the conclusion? Can we distinguish the premises from the conclusions? Are they propositions? Are they clear and understandable? Are they true? This level of analysis is traditionally called level of argument interpretation and its purpose is fulfilled by answering the question of whether there is an argument and how to understand it.

\(^{26}\) The subdivision of a theory of argument in argument analysis and argument appraisal has become standard nowadays among informal logicians and argumentation theorists. Specially important for this research are the conceptions of Govier (1987), Johnson (Johnson, 2000; Johnson & Blair, 1983), and Toulmin (Toulmin, 2003).
The second subcategory depicts conditions regarding the argument structure (Walton, 1996). Argument structure deals with questions like the following: ‘Is the conclusion really supported?’ What reasons really support the conclusions and which don’t? Are there implicit (hidden) premises required for the conclusion to be supported? Is the support weak, strong, why? Is the inference process that sustains the conclusion flawless? What type of inferences are we dealing with? Argument diagramming is the means by which the structure of arguments can be graphically represented and the different types of support being provided by premises and grounds.

**Argument evaluation.** The second level relates to the analysis of the conditions for the conclusion to (necessarily) follow from the premises or argument validity. Even though Aristotle did not have available a theory of logical validity in the style or at the level of the logical implication or logical consequence of modern symbolic logic, he did hold a rudimentary notion of logical necessitation in the sense of deductive validity\(^{27}\) that carries the idea of a substantial relationship between assertions. Since Aristotle, and throughout the history of the symbolic logic, deduction is the term that is associated with the validity of arguments (Beall & Restall, 2009; Smith, 2000). Aristotle defined deduction as “speech (logos) in which, certain things having being supposed, something different from those supposed results of necessity because of their being so” (Smith, 2000, p. 25)\(^{28}\). Each of the things being supposed is a premise and what results of necessity is the conclusion, as noted above. The core of the concept of validity in Aristotle is the notion of necessity of the conclusion and not the form of the argument as in modern formal deductive logic (FDL). This core concept of validity leads to two notions of

\(^{27}\) See Robin Smith (2000), specially Chapter 5, for an insightful analysis of the significance of Aristotle’s concept of validity for modern logic theory.

\(^{28}\) This is Aristotle’s definition from the *Prior Analytics* (I.2, 24b18-20) cited by R. Smith in his article on Aristotle’s Logic in the Stanford Encyclopedia of Philosophy (2000).
vital importance to the theory of modern critical thinking: the concept of validity and the concept of soundness. These two concepts are related but radically different. To illustrate, $X$ results, of necessity, from $Y$ and $Z$ if it would be impossible for $X$ to be false when $Y$ and $Z$ are true. According to this definition, the necessity of $X$ depends on the truth of the premises $Y$ and $Z$. The following syllogism is valid because it would be contradictory to affirm the truth of (12) being (10) and (11) false.

(10) Penguin’s usual temperature is freezing.

(11) Global warning affects penguins’ environment.

(12) Therefore, it is difficult for penguins to survive nowadays.

However, a valid argument is not necessarily sound. An argument as follows would be valid because the conclusion (15) satisfies the validity condition of following necessarily from the premises (13-14).

(13) All fire-breathing rabbits live on Mars.

(14) All humans are fire-breathing rabbits.

(15) Therefore, all humans live on Mars.

Even though it is a valid argument, it would not be a sound argument. To be sound, the argument needs to meet both requirements, namely that the conclusion is valid and that all its premises are true. Therefore, the argument (13)-(15) is valid but not sound.

Two conclusions are of interest here. First, despite the remarkable differences between the Aristotelian logic and the modern mathematical predicate calculus, Aristotle’s interest in finding basic forms of deductive predication in syllogisms resulted in the formulation of the central axioms of the most basic logical forms of contemporary logic, the *modus ponens* and

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29 See Article ‘Validity and Soundness’ in Wikipedia ("Validity,” n.d.)
**modus tollens.** Second, Aristotle’s concept of validity is the main reason for his incomparably long-lasting impact (almost three thousand years) upon contemporary mathematical logic, artificial intelligence, and computer languages of today (Smith 2012).

Summing up, since Aristotle's (Woods, 2002a) syllogism, analysis of conditions that must be taken into consideration to settle arguments is somewhat formal. The analysis of Aristotelian arguments does not require consideration of the origin of the premises nor the context of the findings, nor the conditions of the utterances, nor the historical context of the statements.

**Two concepts of arguments.** It is important to note the ambiguity between the two quite different concepts of the term argument in the way they have been presented here. Although this distinction is not a consequence of the logical paradigm in itself, it does come from the need to rationalize the object and procedure of rational disagreement. O'Keefe (1977), in his work on the concept of argument, made mention of the fact that one meaning of argument is manifest in sentences like the following: He made an argument. Another quite different meaning is expressed in statements like We had an argument.

The object to which the term argument refers to in the first case (he made an argument) is a kind of utterance, a type of communicative or speech act. O’Keefe called this argument₁. The object of the second type, found in sentences like “We had an argument,” is a particular kind of interaction. He called this argument₂. The first sense of argument, or argument₁, relates to the object of the disagreement whereas the sense of argument₂ refers to the fact of having a disagreement, to the action of arguing. Argument₁ expresses itself in the noun, while argument₂ arises in the verb. O’Keefe sharply elaborated the difference between argument₁ and argument₂ in the difference between “argue that” and “arguing about,” between the object of the argument...
and the making of an argument. “Mel and Madeline argued about what they will do.” This sentence implied that they had an argument2. The sentence, “They argued about whether or not it is okay to go to a party right after a funeral” indicates the argument1 they had. In this manner, O’Keefe defined argument1 as a linguistically explicable claim with one or more overtly expressed reasons, whereas argument2 or “argument making,” depicts an interaction “in which overt disagreement between interactants occurs” (O’Keefe, 1982, p. 14).

This distinction between argument1 and argument2 is crucial for their characteristics (definition, components, interpretation and evaluation) are utterly different. One of the most important features of the distinction is evident in the fact that it allows one to describe arguments1 independently of the peculiarities of its occurrence (argument2) (Chittleborough, 1993). This differentiation also permits us to analyze the structural elements of an argument1 without the structural elements of how arguments2 come to be. Put it in a different way, it helps detach “the content of the communication from its vehicle” (O’Keefe, 1982, p. 18). This differentiation will finally allow us to understand the disparity between argument and inference that comes next.

**Distinction between argument and inference.** From the differentiation between argument1 and argument2 can be drawn two ontologically relevant conclusions: Argument1 is a product of argument2. Argument2 is a necessary condition for argument1 but not vice versa (O’Keefe, 1982, p. 23).

Not every argument as interaction ends up in formulation of arguments1, but every argument1 results from an interaction (argument2) in which claims are being handled. This only means that arguments1 have always a dialectical origination within the real-life conditions of arguments2. Both premises and conclusion spring from real-life interactions that aim to solve
dialectically expressed disagreements. In the literature, these argumentation conditions have come to be called generically arguments on the hoof (Finocchiaro, 1996, pp. 93-94; Woods, 2002a, pp. 41-44) to distinguish the contextual sensitivity and psychological richness of the process of arguing from the isolated products of arguing. Syllogisms, as more or less formalized arguments, are built on those real-life transactions around real-life concerns. Yet syllogisms are not themselves arguments on the hoof. However, as Woods (2002a) assured, there is sufficient consensus in the literature to hold that Aristotle regarded syllogisms as the framework to understand arguments on the hoof.

Now, from this follows a dichotomic distinction between argument and inference. While the literature usually uses the term argument to refer to the entire syllogism (premises and conclusion), the term inference has come to designate more or less a psychological ability or competency (Adler & Rips, 2008; Nisbett & Ross, 1980) for establishing a relationship between argument parts so that conclusions follow out of premises, with certain degrees of consistency.

As a result, a lot of context-sensitive information flows into the inference process; information that, although not often expressed linguistically, intuitively is being absorbed through the particularities of the interaction. This information itself may not be part of the argument but it is available to interactans in arguments on the hoof and may help so that the argument makes sense.

The point and meaning of the distinction between argument and inference become clear in an assumption Aristotle had to make. He assumed that rules of thinking are rules of inference available to both real-life reasoners in real-life situations and to syllogism-makers, regardless of any difference between them (Woods, 2002; Smith 2012). Just as Aristotle knew that syllogisms

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30 It follows an additional ‘theoretical layer’ (or metatheoretical layer to be more precise) around the term syllogism. Syllogism is both an argument and a ‘logical’ theory of arguments (Lear, 1988, p. 210).
are not all that there is to arguments on the hoof, so was he aware of the considerable difference between reasoning as rules of inferences present in arguments on the hoof and reasoning as rules of inferences available only to formalized speeches that satisfy the theoretical constraints of the syllogism. So, the above-mentioned distinction that ontologically emerged out of the concept of argument (argument₁ and argument₂) is reflected in the differentiation between syllogism and inference.

The Problem with the Modern Logical Critical Thinking Paradigm

This notion of critical reasoning as logic, or logical inferencing, established by Aristotle’s logic system, stood more or less undisputed in the history of Western thought for about two and a half millennia ("History of logic," n.d.; Lear, 1980). Despite some partially aggressive skepticism and criticism exercised during certain periods of time, logic’s hegemony persisted until the late nineteenth century. Kant’s popular dictum about the hegemony and final validity of the classical Aristotelian logic, according to which Aristotle included in his logic system, everything there was to know about logic ("History of logic," n.d.) practically stood unchallenged until the publication of Frege’s Begriffsschrift in 1879 (Smith, 2000), the birth place of modern mathematical, symbolic logic as predicate calculus.

As with the previous section, it is not the intent of this segment of the literature review to make a historic sketch of the two processes that characterized the later development of modern logic. I only and briefly mention some relevant features to indicate the direction taken by contemporary critical thinking theories.

The first trend was basically an internal critique of the scope and effectiveness of the theory of syllogism as theory of argument. The second trend, which implied an external critique, was directed against the inappropriateness of the tradition of syllogism as a theory of validity and
consequence relation (Gabbay, 2002, p. 6). The first was directed to reform and extend the program of classical logic. The second involved a transformation or revolution of the standard logic in the sense of a rigorous and formalistic discipline that evolved as an application in logic of the exact method of proof used in modern mathematical calculus.

The internal criticism of logic as a paradigm of reasoning shows two characteristics I would like to mention because they are highly significant for contemporary critical thinking theories.

a) The first could be formulated in the following terms: Logic does not seem to be the best candidate for a theory of everyday reasoning and therefore of critical thinking. This criticism is based on the modern thinkers’ intuition about the inappropriateness of deductive logic for analyzing human ordinary language (Fogelin & Sinnott-Armstrong, 2005, pp. 3-28; Johnson, 2000, p. 78). Modern philosophers and thinkers thought that syllogistic did not deliver a good basis for a theory of practical reasoning about people’s practical agendas. Examples of these are both the empiricist philosophical tradition (from Francis Bacon, John Locke and David Hume), the logic of Port Royal (Arnauld and Nicole), Sidgwick and Mill (Gabbay, 2002, pp. 1-7). Those traditions agreed on the appreciation that syllogism is psychologically unreal and not well-suited to apply to reasoning of everyday concerns (Smith, 2000).

b) The second characteristic deals with the place of inductive reasoning in the classical logic system and can be summarized in the criticism that standard logic neglects inductive reasoning. The classical standard logic of the Aristotelian tradition could not account for the type of inferential processes associated with the fact that sometimes reasoning comes from observations and observed data instead of axioms and accurate data, as in the case of deductive systems (Woods, 2002b, p. 107).
The two basic types of standard inductive inferences (Woods, 2002b)\textsuperscript{31}, what we call generalizations\textsuperscript{32} and predictions\textsuperscript{33}, are based on the intuition that the characteristics of observed data reflect with certain likelihood the characteristics of the population. To this effect, it can be said that inductive inferences are valid, relative to the degree of increased likelihood that the data confer on the generalizations or predictions drawn from the data (Adler, 2008, pp. 12-13). The task of the inductive logic has since focused in finding and establishing in a principled way the condition under which such likelihood occurs\textsuperscript{34}.

Inductive logic has been dismissed by logicians and philosophers of the FDL traditions as a critical reasoning model ever since. Charles S. Peirce, for instance, who along with Bertrand Russell and more recently Karl Popper, denied the possibility of inductive logic whatsoever, dismissing the very idea of a logic of everyday affairs as absurd (Gabbay, 2002, p. 5)

The second tradition, or external criticism, has been called the mathematization or formalization of logic. There are two features of interest here that would help answer some of the research questions. First, logic became a mathematical calculus of prepositions. In the revolution of the logic that began around the middle of the nineteenth century, with the development of propositional logic by Frege (1879) and the origins of mathematical logic by Boole (1845), logic developed into a rigorous and formalistic discipline. Despite maintaining the pretension of being the most developed theory of argument and inference (Johnson, 2000, p. 57), the theory of analysis of such arguments is based on the notions of deductive inference and

\textsuperscript{31} The term induction here refers to the ‘classical’ notion of induction that was considered universally valid up until the end of the last century (Woods, 2002b, pp. 105-106)
\textsuperscript{32} In sample S, the Fs are Gs. So, Fs are Gs.
\textsuperscript{33} In the sample, Fs are Gs. So, the next-observed F will be a G.
\textsuperscript{34} With Hume we can assure that “any generalization justified by this principle can be true and untrue” In this way arguments generated with the “Principle of Induction” can’t be arguments at all but habits of our own that have no argumentative value (Vickers, 2006)
logical form. Formal deductive logic (FDL) is a formal theory of validity and implication and can be identified with the predicate calculus. Modern, deductive logic is basically a calculus whose rules of operation are determined by the form and not by the meaning of the symbols employed, as in mathematics.

The primary purpose of FDL is to abet the recognition of a particular class of sentences, namely, the logical truths; or, as others hold, to capture the properties of a propositional relation such as entailment or logical consequence. (Woods, 2002a, p. 42). The interest in the process of formalization and mathematization of logic does not seem to have been to make logic a better instrument for the analysis and evaluation of arguments but rather to clarify some questions about the nature and foundations of mathematics. Boole's statement that arithmetic is pure logic can condense the modern project of formalization of logic as a tool for analysis of human language ("Mathematical logic," n.d., p. 15).

Second, FDL points to a separation of logic and argumentation. Unlike the Aristotelian tradition, the purpose of argument through the use of symbolic logic is not to understand human affairs or intentions of settling practical matters of coexistence but the establishment of true propositions that are context and subject insensitive. By becoming an abstract science, logic as mathematical logic became a protologic of idealized languages and idealized agents, aprioristic and separated from all psychological and epistemological questions of human reasoning. The mathematical turn of logic obtains the critical at the expense of the reasoning (Gabbay, 2002, pp. 6-7). The process of analysis and appraisal of human discourse through critical reasoning that started with Socrates ends up in the twentieth century in the mathematical analysis of idealized languages and agents without real disagreements and real-life reasoning. What started in

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35 FDL is not referred to a particular logic theory but, rather, to a group of theories whose common denominator is the reliance on the notion of a formal standard for the evaluation of arguments. (Johnson 2000, p. 58)
Aristotle as a timid theory of validity, and as a reduction of the universe of arguments to propositions, culminated in the symbolic logic of the 20th century with the elimination of logic as a theory of practical reasoning (Johnson, 2000, pp. 59-77).

The following outline of historically dominant developments of principled accounts of reasoning can give us a better idea of the process that began with Aristotle and led to the emergence of informal logic and argumentation theory.

- Birth and establishment of the logic of propositions by Aristotle and Stoic logicians
- The reformulations of the syllogism and the revival of the system of formal dialectic by mediaeval logicians
- The creation of the probability calculus by Leibniz and Laplace and other seventeenth century thinkers
- Modern mathematical logic independently co-established by Frege and Peirce, and the subject of a very large number of important ramifications in the century following 1879
- Critical theories and cognitive psychology, from the 1970s onwards
- Computer science and artificial intelligence, developed during this same period
- Informal logic and argumentation theory also developed in this period.

In this characterization developed by the team that edited the handbook of the Logic of Argument and Inference (Gabbay, D.M. et. al. 2002), there is a natural break (marked by a line) after the entry for mathematical logic. As can be seen, this transition is characterized by a turn toward practical reasoning. Interesting is the fact that this criticism of the mainstream logic for its irrelevance and inappropriateness to account for the complexity of practical discourse has been practiced within the same rationalist paradigm of reasoning and helped raise relatively new approaches to critical reasoning while it also revived old traditions from different new perspectives (Gabbay, 2002).
Henceforth and until the end of this chapter, the literature review focuses on succinctly presenting core contributions of key critical thinking approaches coming from cognitive psychology and education as well as from innovative approaches such as informal logic and argumentation theories, especially Toulmin’s (2003) theory of argumentation. The expectation is that the final picture described here will allow us to understand both the concept of critical thinking being implemented in the elementary education system in Texas as well as the theory behind it.

Critical Thinking Definitions in Contemporary Approaches

*Ennis’ Definition of Critical Thinking*

It is common to cite the Ennis publication (1962) as the birth place of the modern critical thinking movement. Although the term critical thinking had been used beforehand and since the classical definitions of John Dewey, Glaser and Russell (Streib, 1992), to include the scientific method, inquiry and problem solving, there is no doubt that Ennis’ early work is pioneering in the thematization of critical thinking within the constraints of what we called here the network problem (McPeck, 1981, p. 40; Siegel, 1988b, p. 5). Some authors do not hesitate to regard Ennis’ “concept of critical thinking (1962) as the first solid theory of modern critical thinking” (Siegel 1988, p. 5-10). Ennis is not only one of the most influential critical thinking authors alive, he is also the leading theorist of critical thinking testing. In Siegel’s words, “he (Ennis) exhibits a rare mastery of both the philosophical and educational dimensions of critical thinking, along with the psychology of testing (Enns is the co-author of the renowned Cornell critical thinking tests and the Ennis-Weir critical thinking essay test, and is the author of a whole new generation of critical thinking evaluations”36.

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36 See his website for more information http://faculty.ed.uiuc.edu/rhennis/Assessment.html).
Along with Dick (1991, cited by Taube, 1995, p. 2) and D'Angelo (1978, cited by Streib, 1992), Ennis’ definition of critical thinking also fits in the more narrowed classification of critical thinking known as the proper evaluation of statements approach. However, to do justice to his definition and theory of critical thinking, one must reconstruct at least two phases in the development of his position.

*Ennis’ pure skills conception of critical thinking.* Ennis’ book, *A Concept of Critical Thinking* (1962), marks the first phase in the development of his conception. There, Ennis defined critical thinking as the theory of “correct assessment of statements” (p. 4). In this, his first approach to critical thinking, Ennis addressed exclusively the reasons for the assessment component of critical thinking and its ability to warrant beliefs and claims. To this effect, he developed three dimensions (logical, criterial and pragmatic) and 12 aspects of critical thinking, from which he derived 12 central critical thinking skills, while developing a “dimensional makeup” (p. 28) of each of them to elaborate some criteria that can be used for the correct assessment of statements. The heart of the pure skills conception of critical thinking is outlined in those 12 critical thinking skills, such as identifying criteria for judgment, inferring, asking questions, judging sources of information, identifying assumptions, etc. A competent critical thinker is a person who is equipped with the skills necessary to analyze statements and claims and to make an accurate and reasoned judgment or appraisal of the claims he or she faces in situations. Accordingly, education for critical thinking entails the imparting to students of the required skills, or proficiencies, to appropriately and skillfully assess statements and arguments. As an illustration, a student will become a critical thinker with respect to inductive reasoning only if he or she acquires the mastery of those skills and the complex set of criteria for correctly assessing the warrantedness of inductive conclusions.
Critique on Ennis’ pure skills conception of critical thinking. Commentators have called this first elaboration of critical thinking the pure skills conception of critical thinking. In this regard, critical thinking, as “the correct assessing of statements,” has been definitely in line with the scope of classical logical theories of critical reasoning from Aristotelian provenience, as noted above (Weinstein, 1997, pp. 285-287). In the context of this literature review, approaches based only on the conditions of validity of arguments tend to leave out the dialectic origin of claims regarding the subjects and the importance of the matter of the disputes. With renewed reworking of the standard logic, the pure skill approach has been very fruitful, not only in the past, but also in modern times. In a way, Glaser (1941), with his classic study of 11 basic skills of critical thinking; Browne, Haas, and Keely (1978, cited by Taube, 1995, p. 3), who defined a similar set of eight critical thinking skills; Dick (1991, cited by Taube, 1995, p. 4); and most recently Hughes, (2000) and Fisher (2001), to name a few, represent the philosophy of a skill-only approach in a symptomatic and exemplary manner. Some authors, like Dick (1991), Greenlaw and Deloach (2003, cited by Taube, 1995), Govier (1987) and Ennis himself (1987), have even developed complete taxonomies of the skills involved in analyzing/evaluating arguments.

The standard criticism against a pure skills approach of critical thinking initially gets mixed up with the positivism and logicism critique of old. However, Siegel, one of the modern, most prominent theorists of critical thinking, developed perhaps the strongest criticism of this tradition nowadays, well-known under the motto Not by Skill Alone (Siegel, 1993). Albeit complex and extensive, Siegel's critique also served to streamline the pure skills conception of

37 There is a certain similarity to the list of 11 cognitive skills needed for critical thinking in Glaser’s (1941 cited by Siegel, 1988, p. 8 ) model.
critical thinking in general and, in particular, Ennis’s conception. I will refer here to the central points of interest regarding Siegel’s work.

Siegel developed his criticism against the skills-only approach in his work *Educating Reason* (1988). He basically held against the tradition that conceives critical thinking skills as abstract entities, regardless of the people who own them. That is, Siegel objected to the separation between critical thinking and critical thinker, an assumption that underlines the very core of the skills-only approach. Siegel (1988) asked: “Can we call ‘critical thinker’ a person who learned critical thinking skills but refuses to use those skills and never actually acts critically?” (p. 6). In other words, how can we talk about critical thinking in absence of evidence of its existence? Siegel suggested that a skill-only concept of critical thinking, leaving out contexts and situations of the reality of arguments, removes at least two dimensions that are crucial for an epistemologically-relevant theory of critical thinking: a) it eliminates evaluative questions regarding the value of critical thinking (What is its value?) or why should critical thinkers have the tendency to act or apply critical thinking skills once they have acquired them? b) It eliminates questions about the attributes (tendencies, dispositions or habits of mind) of the person who performs critical thinking judgments. Critical thinking theories should deliver not only criteria for assessing pieces of reasoning, but also a characterization of the attributes of the sort of person regarded as a critical thinker (Siegel, 1988, p. 9).

*Ennis’s extended conception of critical thinking.* No doubt, Siegel’s critique had an impact on Ennis’ revision of his definition of critical thinking. In his second phase, Ennis considered this (1989b) and other criticisms (1992b) when he redefined critical thinking as “reasonable, reflecting thinking that is focused on deciding what to believe or to do” (2011, p. 1).

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38 That means beyond the empirical evidence of passing a critical thinking test (Siegel, 1988, p. 6)
This definition includes both the reason assessment component and the dispositions component. Ennis made sure that this definition actually captured the intention of the critical thinking movement and developed both strands extensively (pp. 2-8). Ennis’ revised definition of critical thinking, with his highly elaborated sets of dispositions and skills, is probably the most detailed one in the whole spectrum of the critical thinking movement (Johnson, 1992b, p. 41; Norris & Ennis, 1989; Siegel, 1992b).

The reasons assessment portion of Ennis’ critical thinking concept is very comprehensive and has served as the basis for the development of a number of similar approaches and textbooks on critical thinking and informal logic (Ennis, 1996). In his most updated version (2011), the reasoning or theoretical component is composed of six class categories of cognitive skills that, taken together, make out the cognitive apparatus of a critical thinking theory. It is important to outline here at least the most salient features of his conception.

1) Basic clarification skills (three skills) include a series of skills that mark the cognitive focus when confronted with an argument or claim. They include cognitive focus, argument analysis and argument interpretation skills.

2) Basic decision making skills (two skills) include the criteria and skills necessary to judge the credibility of sources and to perform and judge observations.

3) Inference (three skills) is composed of all the skills needed to make and judge deductions and material inferences, such as generalizations, explanatory hypotheses and value judgments.

4) Under advance clarifications skills (two skills), Ennis understands the judgment of definitions and the analysis of unstated assumptions.

5) Suppositions and integration (two skills) refer to suppositional thinking (reflection on reasons from premises and disagreements) as well as other cognitive dispositions required for making and defending a position or decision.

6) Auxiliary abilities (three skills) are those abilities that do not belong to the specific terrain of critical thinking but are helpful strategies in appraising arguments such as steps in problem solving reflections, metacognitive level of thinking and rhetorical strategies.
Critique on Ennis’ extended conception of critical thinking. Despite the highly elaborated level of Ennis’ theory, it is advisable to point to some standard objections brought against Ennis’ revised critical thinking notion, as follow:

1) First, Ennis’ concept of critical thinking is coextensive with rationality. Ennis identified critical thinking and general rational thinking. Although it is true that Ennis’ account of critical thinking skills is very comprehensive, it is difficult not to find, in his description of critical thinking skills, other cognitive abilities associated with different reasoning domains such as problem solving, creative thinking, decision making, etc. (Johnson, 1992b). In fact, Ennis himself was clear about including in his critical thinking model other conceptualizations belonging to other reasoning domains, as mentioned above (Ennis, 1991, pp. 5, 7). In this respect, Johnson pinpointed that Ennis’ broad critical thinking theory has been bought at the expense of blurring the boundaries of the network problem (Johnson, 1992b, p. 41). In fact, decision making and problem solving, for instance, appear to be special cases of critical thinking (Ennis, 1991, pp. 5-11).

2) Second, Ennis’ critical thinking conception is inaccurate. The so-conceived critical thinking definition blurs the scope of critical thinking. The theoretical foundation of reflective thinking is extended to the realm of action no less than belief. Ennis’ definition claims validity in areas outside the limits of the skills initially listed in his concept of critical thinking; for instance, there are moral reflections and psychological/philosophical dimensions of a theory of action that are not accounted for in the elaboration of the definition.

3) Third, the criterion for critical, according to Ennis, becomes so diffuse that the question emerges where Ennis’ list of proficiencies and tendencies derive. In Johnson’s words,

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39 This another criticism presented by Johnson (1992 -b, pp. 42-43)
“How does one get from his definition of critical thinking to this list?” (1992b, p. 41). These are just a few of the concerns expressed regarding one of the most elaborated theories of critical thinking.

Ennis recognized that the skill assessment dimension is not enough for critical thinkers to have the opportunity and possibility to rationally respond to claims. It is necessary to want to use those skills and make them a reality. Critical thinking dispositions are considered by Ennis as an integral part of a definition of critical thinking and consequently as the second component of a stabile and fruitful theory of critical thinking. 1) What is his concept of critical thinking dispositions and their purpose? 2) Which are those dispositions? 3) How can they be justified?

What is a critical thinking disposition and what is its purpose? Ennis calls dispositions those normative, psychological and ethical principles that show that critical thinkers not only are capable but are willing to rationally face disagreements and to meet human conflicts at the cognitive level of discourse. Reconstructions of cognitive competences to settle all types of disputes are not enough if participants don’t show minimal openness or tendencies for rational thinking.

Which ones are those dispositions? Ennis (1996) worked out a comprehensive system of dispositions. As with the conception of rational thinking skills, Ennis examined preexisting theories of human dispositions for rational analysis and held that all attempts done so far revolved around a model with three basic dispositions: inclinations, sensitivities and abilities. He criticized existing theories of critical thinking dispositions on the principle that they don’t show to be necessarily connected to each other. He argued that while inclinations are necessary conditions of the reality of critical thinking, sensitivities and abilities are not. We don’t have to have sensitivity towards an issue of interest to develop an inclination to rationally respond to it.
Likewise, the ability to ask questions does not have to be a necessary condition of wanting to take a critical position on an issue of direct interest (Ennis, 1996b, p. 166).

To remedy these deficiencies, Ennis proposed a system of dispositions grouped in three basic categories. According to Ennis (1996a, pp. 7-8; 1998, p. 17; 2011, p. 1),\textsuperscript{40} ideal critical thinkers are disposed to do the following:

1. Care that their beliefs be true.
2. Represent a position honestly and clearly.
3. Care about the dignity and worth of every person.

Each one of these categories is composed of sub-categories such as the following: seriously considering points of view (to be subsumed to category 1), taking into account total situations (to category 2), and listening to others’ views and reasons (to category 3), etc. The three major categories contain a total of 12 sub-dispositions. These subsets somewhat overlap and, though interdependent in a lot of ways, their listing is basic and comprehensive, although not exhaustive (Ennis, 1987, 1989b).

Where do dispositions come from?\textsuperscript{41} How can they be justified? Why exactly these dispositions and no other? To answer these questions, Ennis (1996b) claimed a strange, if not contradictory, status for the dispositions. On one side, he held these dispositions to be constitutive or correlative. He assigned a constitutive character to the first two and a correlative character to the third. With the term constitutive, he seemed to hold a substantial relationship between dispositions and his definition of critical thinking; that means a substantial relationship

\begin{footnotesize}
\textsuperscript{40} To earlier positions Ennis (1991) and (1962)

\textsuperscript{41} One of the common characteristics of critical thinking dispositions is their arbitrariness (Norris 1992b, p. 2; Siegel (1988, p. 20).
\end{footnotesize}
exists between the rational skills and the human disposition or inclination to use those skills. Ennis seemed to be affirming these dispositions to be constitutive, either to the fact of being reasonable or reflective, or to the fact of being capable of making decisions on what to believe or to do in concrete situations. They seem to be required by the critical thinking definition. Ennis, unfortunately, did not elaborate on this any further.

On the other hand, Ennis (2011) affirmed that he extracted this dispositional system of values and inclinations from the direct practice with subjects in argumentative contexts and from the criticism formulated by other critical thinking authors (Norris, 1992a; Siegel, 1988a; Tishman & Albert, n.d.; Tishman, Jay, & Perkins, 1992), not from a theoretically reconstructive analysis of his critical thinking model or critical thinking definition. In this respect, it begs the question whether Ennis held these dispositions to be theoretically constitutive to his critical thinking model or whether they are constitutive to the critical thinking practice he observed in his professional experience (Ennis, 1996b).

For Ennis (1996b), correlative is a disposition that encompasses the moral character of thinking. He defined the term correlative as related to critical thinking but not “required by critical thinking definition” (p. 173). Even though not required by definition, the lack of moral disposition makes critical thinking less valuable, said Ennis, “perhaps even harmful….”(p. 171), “…perhaps dangerous” (p. 172). According to him, an ethical principle cannot be derived either from the dispositions (only moral expectations) or from the critical thinking definition.

Although Ennis did not elaborate his position any further, I think the differentiation made between skillful thinker and critical thinker could sustain the development of the constitutive character of cognitive ethics. His position could profit from the pragmatic-linguistic attempt to

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42 The relationships among the referents of these concepts and terms, he says, are not conventional albeit fallible (subject to falsification) (1996, p. 8-9)
develop a cognitive and universal ethic out of the reflection on the conditions of the argumentation situation, as it has been attempted in Germany by Habermas (1983) and Apel (1973) within their discourse ethics program.\footnote{Habermas’ (1983 Chapter 3; 1991 Chapter 6) ; Apel’s (1973; 1988 Chapter 1) discourse ethics programs. From different perspectives, both Apel and Habermas have tried in a very successful manner to justify a meta-ethical principle of argumentation out of the analysis of the conditions of an argumentation situation.}

Instead of opting for a reconstructive approach, Ennis (1996b) chose an indirect justification of the dispositions. Ennis did not elaborate on the justification for his approach out of his critical thinking conception. He articulated external criteria that render the defensibility of his and any other conception of a rational dispositional system for critical thinking. These six criteria are “simplicity, comprehensiveness, value, comprehensibility, conformity of its language to our everyday meanings, and the fitting of subordinates (if any) under super ordinates” (1996b, p. 170). While this attempt seems to be pragmatical and positive for educational and practical purposes, it imposes additional constrains on his theory. Not only would we have to agree on the critical thinking definition, and on the list of dispositions, we also would have to remove the arbitrary and conventional character from those additional criteria that justify them.

Siegel had already objected to Ennis’ dispositions that, despite the appearance of completeness and fine-tuning, they are disconnected from the skills conception. For Siegel, Ennis’s dispositions suffer from the same illness as his skill conception: they are just lists of skills and inclinations. In Siegel’s terms, this would explain why Ennis regarded critical thinking as the fourth “R” (in addition to reading, writing and arithmetic). For Siegel, critical thinking is not a set of skills plus a system of inclinations. Critical thinking is not another “R” in a system of skills; it is the building ideal of educational endeavor, the “first R” which justifies and make sense of our commitment to the other three” (Siegel, 1988, p. 8).
Siegel’s Critical Thinking Program

Exactly on this basis did Siegel (1985, 1992b) build his conception of critical thinking. Siegel popularized his theory of critical thinking as an "educational ideal" (1985, p. 8). The concept of critical thinking as an educational ideal has long been the center of the debate in the critical thinking movement (Talaska, 1992, p. xvii). While Ennis’ theoretical production has been very prolific, Siegel’s critical thinking theory is among the strongest. On what is the conception of critical thinking as an educational ideal built? How can critical thinking be defined in these terms? And how can it be justified?

Siegel’s definition of critical thinking. Siegel’s conception can better be understood in the light of a more formal illustration used by McPeck to sustain his own concept of critical thinking. McPeck stated the following:

Let $X$ stand for any problem or activity requiring some mental effort. Let $E$ stand for the available evidence from the pertinent field or problem area. Let $P$ stand for some proposition or action within $X$. Then we can say of a given student (S) that he is a critical thinker in area $X$ if S has the disposition and skill to do $X$ in such a way that $E$, or some subset of $E$, is suspended as being sufficient to establish the truth or viability of $P$. (McPeck, 1981, p. 9)

For Siegel, what this formal illustration affirms is that a critical thinker is simply a person who possesses the necessary dispositions and skills to question the power of $E$ to warrant $P$. That is, “the critical thinker has the disposition and the skill to query the extent to which $E$ actually provides compelling reasons for $P$, or justifies $P$” (1988, p. 23). In this short illustration, we can see the two defining characteristics of critical thinking, according to Siegel: the focus on reasons and the power of reasons to justify beliefs, claims, and actions.

Prima facie, Siegel’s (1985) description seemed to mirror the traditional reasons assessment approach for the building and justifications of beliefs. However, as we saw in the earlier description of Siegel’s criticism of Ennis’ skill-alone conception of critical thinking
(Siegel, 1988b, 1990), Siegel has been emphatic on the need of an extended notion of critical thinking that goes beyond pure skills.

For Siegel, the statement quoted above contains two distinct but separable moments of critical thinking. First is the ability to assess reasons properly. This would be the reasons assessment component for which both formal and informal logic are crucial (more about this later). This proper assessment of reasons shall end in the justification of beliefs as sufficient reasons to establish either the truth or viability of \( P \). Second is the willingness and disposition to base one’s beliefs and actions on reasons. In other words, critical thinking involves both doing reason assessment and being guided by the results of such assessment (Siegel, 1988, p. 23). One thing is the epistemological virtue of reasons to establish the validity or acceptability of \( P \), and another quite different is the power to be moved by those reasons.

Despite its importance, this distinction constitutes only a layer in Siegel’s notion of critical thinking as an educational ideal. Siegel emphasized that it is in the critical thinker’s ability and disposition to suspend the belief of \( E \) as being sufficient to establish both the truth of \( P \) and the viability of reasons for our actions. In my view, this belief suspension is of double nature and carries a number of assumptions that altogether shall justify the thesis of critical thinking as an educational ideal.

On the one hand, the critical thinker has the ability and disposition of suspending \( E \) or the validity of \( E \) as sufficient evidence for the truth of \( P \) because there are convincing reasons for him or her to assume that the reasons for a belief do not constitute just mental states but rather facts which serve as the content of that state (Adler, 2008, pp. 2-3). The critical thinker rationally expects the truth to be the substance of his/her belief.
On the other hand, the critical thinker possesses the ability and disposition to suspend E or the legitimacy of E as sufficient evidence for the viability or acceptability of P when S is in a situation to do X (Siegel, 1988b). The critical thinker can suspend the legitimacy of E because he/she has convincing reasons to expect that his/her beliefs do not constitute just mental states but valid reasons to act (Siegel, 1992b). The critical thinker expects the acceptability or validity of her reasons for actions to be the substance of her practical beliefs. Belief guides actions and those actions are expected to succeed (be valid and legitimate), only if the beliefs that guide them are valid (Siegel, 1992a). That is the reason why Siegel condensed his definition of critical thinking as “being properly moved by reasons” (Siegel, 1988, p. 20-23). In summary, components, the critical reasoning, and the critical spirit, along with the reasons and assumptions just mentioned, are essential to the proper conceptualization of critical thinking.

Siegel’s critical thinking as an educational ideal. This definition of critical thinking as “properly moved by reasons” (Siegel, 1992b), along with the set of normative assumptions mentioned, are the major characteristics of the conceptualization of critical thinking as an educational ideal. Critical reasoning skills will not be a reality if we do not acquire the disposition of a critical spirit that will allow us to be moved by reasons. We follow the inclination of a critical spirit because we recognize the value of critical reasoning in the making of people who will understand that building their own judgment is the condition for individuals to be responsible members of a community of equals (Siegel, 1997).

So far it is evident that Siegel unreservedly followed the philosophical ideal of the classical modernity. Following Kant’s (1977) enlightenment program, critical thinking is the educational ideal of an emancipated individual. For Siegel, the goal of the modernity hasn’t

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44 Detailed in Kant’s ‘What is enlightenment?’ (Kant, 1977)
changed; it has rather been building in people the abilities and dispositions to consult their own autonomous judgment; building on the freedom to judge independently of external constrains on the basis of their own reasoned appraisal; providing them with the skills and dispositions to responsibly and critically control their own adult lives, and being in charge of their own destinies is the power of critical thinking today (Siegel, 1985, p.70-71). According to Siegel, the times of facing religious intolerance with reasoned discernment, the political indoctrination of many, and paternalizing educational practices among others are not just historical facts of times past. Fighting against intolerance, and against dogmatism, vassalage, etc is as acute today as it was yesterday. The challenge to critical thinking is faced not only at the level of the common person of everyday life. The ideal is also challenged by many factions of the academic-intellectual community (Siegel, 1995). Siegel quoted only some of them, such as 1) the feminist denouncement of rationality as male, labeling it as biased, sexiest, etc; 2) the post-modern attack of rationality as logo-centric, 3) and the widespread relativisms of an increasing number of contemporary epistemologists and philosophers of science. These and others undercut and undermine the educational ideal of critical thinking nowadays (Siegel, 1985, p. 70).

Justifying critical thinking as an educational ideal requires a positive account of the desirability and worthiness of educational efforts to foster those skills and abilities in students (Siegel, 1995). I cannot reproduce the complete argumentation used by Siegel to justify his theory of critical thinking as an educational ideal. I will only mention, though, that it is based on an idea either implied in the definition of critical thinking or in the components of critical thinking mentioned above (critical assessment of reasons and the critical spirit). Siegel built on Kant’s (1974) concept of individual autonomy (Siegel, 1985, p. 75). Siegel assumed Kant’s autonomy concept and developed it into the following two dimensions. 1) The critical thinker
must be autonomous in the sense of his/her freedom to act and to judge independently, only on
the basis of personal reasoned appraisal. 2) The critical thinker must be autonomous in the sense
that he/she is self-sufficient and capable (insofar as possible) of determining his/her own future
(Siegel, 1985. p. 72-73)45.

As a result, Siegel’s justification of critical thinking as an educational idea seems more an
analysis of its implications than a justification of its need. Siegel spoke of three reasons that in
his judgment, justify talking about critical thinking.

1. The first reason deals with the moral obligation to treat students (and everybody else)
with respect. According to this, we have to honor students’ demands for reasons and
explanations, deal with them honestly and recognize the need to confront students’ independent
judgments.

2. The second reason has to do with the task of preparing students to become competent
with respect to those abilities necessary to manage the adult life. We seek to make them self-
sufficient to empower them to control their own destiny.

3. For Siegel, critical thinking is coextensive with rationality and rationality is
concerned with reasons and the relevance of reasons for judgments. For Siegel, critical thinking
is the educational cognate of rationality; it embodies the paradigm of rationality and rationality
leads to critical thinking. It is the maximal expression of all rational traditions, both in the
sciences and in logic and in argumentations (1988, p. 127).

Critique on Siegel’s critical thinking conception. Despite the wide reception of Sigel’s
(1988) theory of critical thinking, there are some standard arguments formulated against

45 Kant’s autonomy as the fundament of his practical philosophy shows these two moments as well: the capacity of
an individual to legitimate all moral rules (external factors) out of the workings of the categorical imperative
(generalizability of his reasons) and second, her willingness to actually act according to the reasons found to be
general rules of social coexistence.
fundamental aspects of his conception. I will refer only to those that will be of some significance for the understanding of the guiding research questions of this research.

1. Several authors criticize Siegel’s identification of critical thinking with rationality. This identification blurs the boundaries between other rational foundations of discourses mentioned above in the network problem. That Siegel does not distinguish between rationality and critical thinking, or critical thinking and scientific explanation, or critical thinking and metacognitive thinking, is problematical. In fact, against McPeck (Siegel, 1985), Siegel holds that critical thinking is not a subset of rational discourse. Siegel rejected as absurd that reflections such as careful planning for a trip, examining maps, noting terrain, balancing time demands against the goal of the trip, etc be not equivalent with the rationality put in support of convictions about ethical norms and values (p. 35). Johnson (1992b, p. 44) argued against Siegel that there is more to rational thinking than critical thinking. For example, devising an hypothesis to explain a phenomenon or fleshing out the plot line of a novel, etc, would be instances of rational thinking but not necessarily critical thinking (Johnson 1992a, p. 44-45).

2. Some other authors criticize the dualism extant in the distinction between critical thinking skills and critical spirit. Garrison (1999) argued that Siegel’s separation of critical skills and critical dispositions, of moral and epistemological, is unnecessary, confusing and even dangerous. Not only is it difficult to justify the separation, it is artificial to hold a rationality to examine reasons and a different rationality to decide whether to act or not. For Garrison, skills and spirit are just two different aspects of an integrated function (p. 213)

3. Finally, Siegel’s definition of critical thinking as appropriately moved by reasons (Siegel 1992b) seems to share ground with Ennis’ (2006) scope problem of critical thinking. They both include actions as part of the definition of critical thinking. Acting is considered a
decisive element in qualifying something as critical. Ennis and Siegel had to extend the notion of critical thinking into the realm of action at the expense of the scope of critical thinking. In order to think critically, people have to act critically (Johnson, 1992b, pp. 43-44). In order to decide what critical is in our thinking, we have to contemplate it from the perspective of our actions. From that perspective, we have to assume a certain degree of symmetry between the structure of our thinking and the structure of our actions. A complete evaluation of Siegel’s critical thinking definition would require including, in addition to a theory of rationality, a theory of moral reflection and a psychology and philosophy of action (Weinstein, 2002).

Paul’s Concept of Critical Thinking

Paul (1990, 1992) is, without doubt, one of the key authors of the critical thinking movement; along with Elder, he is a cofounder of the National Council for Excellence in Critical Thinking and of the Center for Critical Thinking that operate the Critical Thinking Community. His emphatic conception of critical thinking has been characterized by a unique and genuine interest in the teaching of critical thinking. Paul’s interest in the practical and pedagogical implications of theorizing about critical thinking has considerably impacted his theory. Definition and theoretical justification of critical thinking have been strongly influenced by his professional practice.

Paul’s definition of a critical thinker. Both Paul and Eder (Paul, 1992; Paul & Eder, 2002; Paul & Elder, 2003) and the previous authors studied hold an extended notion of critical thinking. According to Paul, a complete theory of critical thinking would imply a tendency or disposition to utilize critical thinking abilities. In fact, this extended notion of critical reasoning is the underlying basis for his famous differentiation between “weak sense” and “strong sense”

46 Information about both the National Council for Excellence in Critical Thinking and the Center for Critical Thinking is to find in their website www.criticalthinking.org
critical thinking (1990, p. 446). To introduce this pair of concepts, Paul used a phenomenological description of the uses of critical thinking. A student of critical thinking generally possesses a…

Highly developed belief system buttressed by deep-seated uncritical, egocentric and sociocentric habits of thought by which he interprets and processes his or her experience. The practical result is that most students find easy to question just and only those beliefs, assumptions and inferences that [they] have already ‘rejected’ and very difficult, in some cases traumatic, to question those in which they have a personal, egocentric investment. (Paul, 2002, p.165)

According to Paul, when a student of critical thinking learns a set of skills of argument assessment, he or she would first utilize these skills to fend off challenges to deeply held egocentric beliefs. The primary tendency is to become skilled in “rationalizing or intellectualizing” (p. 166) one’s own biases. Paul called this first level “critical thinking in the weak sense” (p. 161).

The most important feature of critical thinking in a weak sense is the idea that critical thinking is a battery of technical skills that can be mastered one-by-one without any significant attention being given to what makes the thinking critical. Paul and Eder called this critical thinking teaching and learning atomistic that ultimately is very uncritical (2002, pp. 18-21). Critical thinking is reduced to finding errors in the application of a list of fallacies, to finding logical mistakes in the implementation of a list of skills.47

Paul (1992) rejected critical thinking in the weak sense, among other reasons, because it has the unfortunate effect of producing uncritical or sophistic thinkers who specialize in manipulating arguments, in demonstrating the legitimacy of deep-seated commitments and convictions, and in protecting them from any argumentative challenge. Obviously, this is not the

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47 Referred is the reader to extensive lists of critical thinking skills as we saw in Ennis’ taxonomy for instance (Paul & Elder, 2003, pp. 4-5)
desired effect of learning and teaching critical thinking. Critical thinking in the weak sense misses the “global Socratic effect of refutations of the obvious, the unraveling of the faulty and the emancipation from the chains of unjust cultural conventions” (Paul, 1992, p. 142).

Strong sense critical thinking is, according to Paul and Eder (1992; Paul & Elder, 2006), the thinking that focuses on argument networks and not on atomistic exercises. It is an argument that takes a dialectical/dialogical approach instead of atomistic evaluations. It is an argumentation that moves from the egocentric and socio-centric components of our own world view into the universal dimension of a global community of thinkers.

One is led to see that atomic arguments (traditional conception) are in fact a limited set of moves within a more complex of actual or possible moves reflecting a variety of logically significant engagements in the world. In this real world, whether that of ordinary or philosophical discourse, argument exchanges are means by which contesting points of view are brought into rational conflict, and in which fundamental lines of reasoning are rarely refuted by an individual charge of fallacy however well supported. (Paul, 1992, pp. 144-145)

It is hard not to agree with Paul on those two prototypical descriptions of critical thinking. With Weinstein, I also would say that the spirit of Paul’s proposal is more important than his theoretical approach (Weinstein, 1982, pp. 13-14). Unlike the two authors previously analyzed, Paul’s and Eder’s (2003) account of critical thinking is not built as a theory nor is it formulated as a definition (McPeck, 1985). Paul’s phenomenological approach focuses on the characterization of two prototypes of critical thinking practice. While authors like Siegel (1988, p. 10-18) and Weinstein (1982, p. 14) see Paul’s description of weak sense critical thinking as a depiction of the skill-based critical thinking model, Paul’s (2006) strong sense critical thinking can be characterized as follows.

First, there is a rejection of atomism (Siegel 1988, p. 10-18) in favor of argument networks or what Paul calls “worldviews” (1992, p. 145). An argument exchange in strong
sense critical thinking is, for Paul, a clash of opposing perspectives in which a real critical thinker actually transcends atomic pieces of arguments in order to achieve a grasp of the underlying world of the opponent (2006). Transition from egocentric and sociocentric to universal worldviews presupposes critical dialogues between opposing viewpoints that are global in nature. A global perspective is characterized not by an accumulative effect of atomistic criticisms. Global, according to Paul, means that arguments would bring a whole host of considerations and perspectives outside the atomistic approach (2002, p.201). However, if critical thinking is endemically egocentric, then the whole weight of strong sense critical thinking lies on the pedagogic ability or abilities of teachers to carry them out in students (Siegel 1988).

Second, there is a focus on self-deception in the practice of atomistic critical thinking, for which a disposition of the critical thinker corresponds to know oneself (Paul, 1992, pp. 137-138). The need of knowing the deepest beliefs and the nature of our deepest convictions is what drives the transition from egocentric to universal critical thinking. This is a key disposition in the notion of strong sense critical thinking and it should be exercised in the same manner in which one challenges the beliefs and commitments of others.

**Criticism of Paul’s strong sense critical thinking.** In this section, I will bring up two standard arguments pinpointing strong deficiencies in Paul’s conception of critical thinking. The first counter argument eloquently has been stated by Siegel (1988, p. 10-18). Siegel’s argument goes from the assumption that strong sense critical thinking is embedded in worldviews versus the atomistic conception of weak sense critical thinking. This would mean that if a given piece of argument is fallacious, this would not be the consequence of a technical error in the application of some set of skills applied in an atomistic view of critical thinking. Its fallacy
would depend on the worldview itself, from which one addresses the issue at hand. What might be fallacious in one worldview would not be necessarily in another worldview.

This amounts to saying that the criterion for the evaluation of arguments would lie rather in worldviews than in the property of arguments. For Siegel (1988, pp. 10-18), this brings a lot of difficulties and implications. The only one I will refer to here can be formulated as follows. What is a worldview for Paul? Are worldviews commensurable? Is the criterion to evaluate worldviews itself worldview neutral, so that an impartial assessment of worldviews would be possible? Is critical thinking itself a worldview so that the value of critical thinking is itself contentious and binding only to those already committed to the critical thinking worldview?

There are only two possible answers for those questions, so said Siegel. Either worldviews admit of rational appraisal in terms of non-question begging criteria or they do not (Siegel 1988, p. 14). If they are not subject to independent appraisal, then we face here a vicious form of relativism, in which all disputes are unanalyzable and should be considered as worldviews expressions. All thinking would be critical in the sense that it is defensible by criteria of some worldview. Consequently, the concept of critical thinking would collapse as a coherent notion distinct from ‘uncritical’ thinking.

In case of the second option, and if worldviews accept rational appraisal, then they must do so in accordance with atomistic criteria of evaluation. Appraisal terms such as “acceptable evidence”, “deal adequately with objections”, “truth of premises” etc, would be either part of a particular worldview or worldview neutral and sanctioned by a theory of critical thinking (Siegel, 1998, p. 15). So, relativism is avoided at the expense of embracing atomism (p. 15), that is by the possibility of identifying specific flaws in particular worldviews, flaws that are recognizable by members of all worldviews.
The second critique alludes to the concept of self-deception and its counterpart in a moral disposition of knowing oneself. Johnson postulated this critique on Paul’s conception of critical thinking as a specific scope problem of critical thinking, as the dependency of critical thinking on the moral character of the critical thinker. What is the relationship between critical thinking and moral character? In order to think critically, must one have a certain moral character or set of traits? If so, which ones? What is the borderline between critical thinking and morality? What is actually that which decides the critical aspect of my thinking? Is it my skillful analysis/interpretation/appraisal of arguments or my moral character?

Despite serious flaws in Paul’s account of critical thinking, his significance is undeniable. Paul pointed out the pervasiveness of weak sense critical thinking as a technical conception of critical thinking skills. He also pointed out the fact that critical thinking can be taught in the most uncritical way. Having referred the value of critical thinking directly from and to the practical world of education is not only meritorious, it also opened and extended the discussion into aspects, levels, principles, and factors in the teaching and learning of critical thinking that were unknown before him. Definitely, Paul’s contribution to critical thinking is very significant.

Critical Thinking in the Delphi Report

The Delphi Report is an important milestone in the evolution of the concept and teaching of critical thinking. I briefly point to the historical background of the report, its significance, its content, and how it defines critical thinking.

Historical background of the Delphi Report. As stated in the introduction of this review of literature, the eighties witnessed an impressive renaissance of interest in thinking and

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48 *The Delphi Report* is the name commonly used to refer to the research report published by the American Philosophical Association (APA) and conducted under the direction of Peter A Facione titled *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction* (APA, 1990). The executive summary was edited by Peter Facione and published with the same title by The California Academic Press in 1990 (Facione, 1990).
reasoning. Out of that increased interest emerged an agreement, according to which the heart of the educational reform lies in the process of inquiry, argumentation, and thinking rather than in the accumulation of disjointed skills and information (Finocchiaro, 1996).

However, concomitant with this agreement, the same explosion of interest in reasoning and thinking made manifest the latent disagreement within the expert community about what 'critical thinking' is. Questions about what exactly critical thinking is, what it entails or even how can it be taught and how can it be assessed (Facione, 1990) stood in the forefront of the academic discussions of that time. Philosophers, for obvious reasons, felt called to play a significant role in this development, so they stepped forward by formulating a clear position with respect to these and other questions regarding critical thinking. For instance, the American Philosophical Association – through its Committee on Pre-College Philosophy – took great interest in the critical thinking movement and its impact on education, and in 1988 designated Peter A. Facione of Santa Clara University with the task of building a multidisciplinary committee49 of key investigators on critical thinking50 to make a systematic inquiry in the field and into the current state of the critical thinking pedagogy and assessment. The committee met from February 1988 to November 1989, and, using the powerful qualitative methodology known as the Delphi Method, published the findings and recommendations in 199051 in a document known ever since as The Delphi Report (APA, 1990).

49 Panelists were affiliated with philosophy, education, social sciences and physical sciences. Delphi Report. Executive Summary p. 3. (Facione, 1990)

50 All forty six members of the Delphi research committee are well known representatives and researchers of the critical thinking, argumentation theory, and informal logic community. See list of all panelist in the Delphi Report (APA, 1990, p. 18-19)

The importance of the Delphi Report lies in three factors. For the first time in history a group of renowned experts collectively identified the core elements of a concept of critical thinking. Despite the difficulty of reaching an agreement on a general conceptual framework and on the specific content of each component in particular, the report clearly articulated the voice of the scientific community regarding the underpinning of a definition of critical thinking.

Second, the Delphi Report’s consensus around the key factors defining the scope of critical thinking supplied the conceptual architecture for a series of federal and state initiatives and has served as the basis for designing instructional programs and curricula for critical thinking at the college level (Facione, 1990, p. 19). Findings and recommendations also include guidelines that can be used to collectively organize the instruction of critical thinking at the K-12 level. Third, the reached consensus on the foundational components of the critical thinking concept has been often translated into effective frameworks for the development of critical thinking assessments at all levels.

Specific content of the Delphi Report. The key finding of the critical thinking panel of experts was the articulation of a conceptualization of critical thinking that is groundbreaking in its character and profound in its implication. The Delphi Report experts adopted what is being called in this literature review an extended view of critical thinking. This means a conception of critical thinking that, besides cognitive skills, includes dispositions or inclinations. The consensus statements regarding the description of each of the skills and sub-skills, and regarding

52 As an illustration, the Delphi Report’s definition of critical thinking was used by the US Department of Education to address the Education Goals 2000. Cited in the California Critical Thinking Skills Test (CCTST) 2000 interpretation document at http://www.insightassessment.com/Products/Critical-Thinking-Skills-Tests/California-Critical-Thinking-Skills-Test-CCTST

53 The list of critical thinking tests developed on the basis of the Delphi Report conceptualization is large and varied. It includes college level tests, critical thinking tests for business and health science professionals, test for K-12 education, for legal and government services, etc. See complete list in http://www.insightassessment.com/Products.
the parts and sub-parts of the three major sections of the report, namely the skills conception, the dispositions and the teaching/assessment components are historically remarkable. Additionally, fifteen recommendations addressed key aspects of critical thinking instruction, curriculum, and assessment.

**Definition of critical thinking.** The experts characterized critical thinking basically as a process of purposeful, self-regulatory judgment. Critical thinking, so defined, has become the framework for a series of evaluation and replication efforts which yielded a wide consensus among educators and policy makers nationwide (Facione, 2009). Despite the length of the definition, I will transcribe it here in its entirety so elements and components can be seen all at a glance.

We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. Critical thinking is essential as a tool of inquiry. As such, critical thinking is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, critical thinking is a pervasive and self-rectifying human phenomenon.

The ideal critical thinker is 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. Thus, educating good critical thinkers means working toward this ideal. It combines developing critical thinking skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society. (APA, 1990, p. 80)

The first part of the definition characterizes the skills assessment portion, and the second part (critical thinker) refers to the dispositions. While almost unanimously (N>95%) the experts recognized the classical skills of analysis, evaluation and inference to be at the core of critical thinking, a strong consensus (N>87%) was reached about including another set of skills, namely
interpretation, explanation and self-regulation as basic critical thinking skills as well. The following table (Table 1) contains the full list of critical thinking cognitive skills and sub-skills.

Table 1

*Critical Thinking Cognitive Skills and Subskills*

<table>
<thead>
<tr>
<th>Skills</th>
<th>Subskills</th>
</tr>
</thead>
</table>
| Interpretation | Categorization  
                  | Decoding Significance  
                  | Clarifying Meaning |
| Analysis      | Examining ideas  
                  | Identifying Arguments  
                  | Analyzing Arguments |
| Evaluation    | Assessing Claims  
                  | Assessing Arguments |
| Inference     | Querying Evidence  
                  | Conjecturing Alternatives  
                  | Drawing Conclusions |
| Explanation   | Stating Results  
                  | Justifying Procedures  
                  | Presenting Arguments |
| Self-Regulation | Self-Examination  
                      | Self-Correction |

Source: CT Cognitive Skills and Sub-Skills, (Facione, 1990, p.6)

Regarding the cognitive dimension, the Delphi Report highlighted three significant findings. The first one referred to the fact that although the definition of critical thinking is a product of multidisciplinary agreement, it is no less a list of skills, and therefore not substantiated by any theory which would justify either the selection of the specific cognitive skills nor the coherence of the relationships among those skills. At the same time, and since the critical thinking skills and sub-skills themselves transcend specific subjects or disciplines, the
successful practice of those skills in certain contexts may demand domain-specific knowledge and with it an understanding of methodological principles and competences. Some of these principles and competences may call upon specific methods and techniques used to make ‘reasonable’ judgments. The explicit mention of “evidential, conceptual, methodological, criteriological or contextual considerations” (p. 80) reinforces this point.

The second group of findings referred to the fact that despite the absence of a unifying theory that substantiates and justifies the elements of the definition, this same agreement reached on the definition is extended to the interrelationships skills have to each other. So, although the experts conceived critical thinking as a “family of closely related forms of higher-order-thinking” (Facione, 1990, p. 6), they perceived critical thinking as different from problem solving, creative thinking, and decision making. The panelists, however, could not “positively identify criteria that would explain the relationships and differences among this network of topics (p. 5)”. As a result, the panelists could attest that not every useful cognitive process is critical thinking, and not every valuable thinking skill is a critical thinking skill. However, they were not able to provide reasons for it (APA, 1990, p. 25).

The very last finding is a consequence of the previous one. Although the consensus description of both the skills and the sub skills statements reached a high degree of specification, the panelists were not able to unanimously establish criteria for their evaluation (APA, 1990, p. 16). Regardless of the reached consensus on the analysis of the skills and sub skills, the Delphi Report experts could not agree on a theory for the evaluation of this analysis. As a consequence, the Delphi Report can tell us positively what interpretation actually consists of, or what analysis implies, but it cannot tell us what a good interpretation is or what is an acceptable analysis of arguments or a valid inference. Nevertheless, the report makes clear that critical thinking is not
synonymous with good thinking. Good thinking means soundness in the deductive logic tradition and soundness presupposes a common notation of argument validity. Questions about the value of operational definitions without theoretical tools of validation are open in the report and surely constitute areas for further cooperative work\textsuperscript{54}.

\textit{Critical thinking dispositions in the Delphi Report}. As mentioned earlier, the panel of experts shared the general notion that there are dispositional components to critical thinking. Thinking skills can be learned with guidance and through practice to the extent of our natural abilities, but care must be taken not to confuse the component skills with the activity itself. Critical thinking is a judgment, reflective and purposive (Facione, Facione, & Giancarlo, 2000). As such, dispositions refer to the executable function of that judgment. Therefore, the panelists went from the empirical identification of these two factors as being present when engaging in critical judgments to the normative notion of skills and disposition dimension of critical thinking. The prevalent view of the panelists is that “there is a critical spirit, a probing inquisitiveness, a keenness of mind, a zealous dedication to reason, and a hunger or eagerness for reliable information which good critical thinkers possess but weak critical thinkers do not seem to have.” (Facione, 1990, p. 11)

A critical thinking definition should include the willingness as well as the ability because a person can master critical thinking skills without being disposed to use them. Even though the committee originally intended a more general classification of disposition in the sense of personal traits, habits of mind, attitudes, or affective dispositions which seem to characterize good critical thinkers (Facione, 1990, p. 12), a pragmatic view prevailed in the fact of assuming a clear distinction between a strict procedural concept of critical thinking and a more laudatory use

of the term. The procedural use of critical thinking distinguished sharply between what is true of *critical thinking* and what is true of good critical thinkers. The use of critical thinking emphasized that the primary concern is with the critical thinking skills. Therefore, this view assumed a correlation between the existence of the cognitive skill with the cognitive disposition to do so (Facione et al., 2000). That means that if the skill is observed to be exercised appropriately, then the person in question is said to have the aptitude to execute that skill. The obvious intention of this approach is not to make an ought-statement follow from an is-statement or deduce a normative statement out of a descriptive statement, but to point out a correlation between the descriptive and normative content in judgments (Facione, Facione, Giancarlo, & Gainen, 1995). Thus, the view of the laudatory use of critical thinking leaves the option open that a person might have the ability of a critical thinker but is “so mentally lazy, close-minded, unwilling to check the facts and unmoved by reasonable arguments that we simply cannot call him a critical thinker” (Facione, 1990, p. 13).

Based on this underlying assumption of a correlation between critical skill and aptitude, between the ability and the disposition to execute that ability, the Delphi Report proposed a simple two-group classification of basic dispositions: dispositions or affections that are strongly correlated with the use of cognitive skills, also called cognitive dispositions, and a more general type called affective dispositions. Tables 2 and 3 briefly illustrate the content of these two different but coexistent groups of critical thinking dispositions.
Table 2

**Critical Thinking Cognitive Dispositions**

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity</td>
<td>in stating questions or concerns</td>
</tr>
<tr>
<td>Orderliness</td>
<td>in working with complexity</td>
</tr>
<tr>
<td>Diligence</td>
<td>in seeking relevant information</td>
</tr>
<tr>
<td>Reasonableness</td>
<td>In selecting and applying criteria</td>
</tr>
<tr>
<td>Care</td>
<td>in focusing attention on the concern at hand</td>
</tr>
<tr>
<td>Precision</td>
<td>to the degree permitted by the subject and the circumstances.</td>
</tr>
</tbody>
</table>

Source: CT Cognitive Dispositions (Facione, 1990, p.13)

Table 3

**Critical Dispositions Concerning Approaches to Life and Living**

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquisitiveness</td>
<td>with regard to a wide range of issues</td>
</tr>
<tr>
<td>Concern</td>
<td>to become and remain generally well-informed</td>
</tr>
<tr>
<td>Alertness</td>
<td>to opportunities to use critical thinking</td>
</tr>
<tr>
<td>Trust</td>
<td>in the processes of reasoned inquiry</td>
</tr>
<tr>
<td>Self-confidence</td>
<td>in one's own ability to reason</td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>regarding divergent worldviews</td>
</tr>
<tr>
<td>Flexibility</td>
<td>in considering alternatives and opinions</td>
</tr>
<tr>
<td>Understanding</td>
<td>of the opinions of other people</td>
</tr>
<tr>
<td>Fair-mindedness</td>
<td>in appraising reasoning</td>
</tr>
<tr>
<td>Honesty</td>
<td>in facing one's own biases, prejudices, stereotypes, egocentric or sociocentric tendencies</td>
</tr>
<tr>
<td>Prudence</td>
<td>in suspending, making or altering judgments</td>
</tr>
<tr>
<td>Willingness</td>
<td>to reconsider and revise views</td>
</tr>
</tbody>
</table>

Source: Critical Dispositions Concerning Life and Living (Facione, 1990, p.13)

The first category of dispositions or cognitive dispositions is more closely related to the existence of critical thinking judgments whereas the second group contains desirable inclinations.
and psychological aptitudes or traits of persons for making critical thinking judgments. Facione, in a later publication (2009, pp. 11-13), explained this apparent ambiguity of the use of dispositions of a good thinker, arguing that a person can possess critical thinking abilities to make critical judgment and to be adept at the cognitive processes while still not being a good (in the moral sense) critical thinker. Nobody would disqualify philosophers or scientists, for instance, Sigmund Freud or Nikola Tesla or Arthur Schopenhauer, as not being critical thinkers because they did not cultivate many of the attributes from the second list (Facione, 2009, p. 11; Siegel, 1993).

Critique on the Delphi Report. Despite the great influence of the Delphi Report, particularly in the area of the critical thinking pedagogy, there are clear limits of the concept. The Delphi Report’s definition of critical thinking is more or less a standalone definition. Although it is being supported by the most productive and renowned researchers on critical thinking today, this notion of critical thinking has no unified, solid theoretical justification. Many of the panelists have published research that does not support the findings of the report. Second, the list of skills and subset of skills, although clear and significant, is ultimately only a list. It does not provide a theoretical justification about why critical thinking includes those skills listed and no other skills, and above all, it does not indicate why the listed skills are critical and others are not. Finally, the definition of critical thinking, with its skills and sub skills descriptions, was only intended to be a consensus statement rather than a theoretically funded critical thinking definition. The panel members did not intend to deliver a justification, either for the terms of the definition or for the list of skills.

However, I must stress the importance of the existence of an elaborated operational definition of critical thinking and critical thinking components which, as I said before, may be
used as a basis for the design of critical thinking curricula, critical thinking instructional
programs at the college level, and critical thinking assessments.

**McPeck’s Theory of Critical Thinking**

Very few critical thinking theories have caused so much turmoil in the critical thinking
community as the position developed by McPeck, in his already classic book, *Critical Thinking
and Education* (1981). One reason is that McPeck's approach has been received in many circles
of the critical thinking community as provocative. While McPeck organized a concept of critical
thinking, his position has often been presented as a denial of or an attack on the concept of
critical thinking or at least as a radical critique of the traditional concept of critical thinking.
This exposition will first explore the theoretical background of McPeck’s approach to critical
thinking, with the intention of understanding the elements and terms of his critical thinking
definition, followed by the arguments that justify his concept. I will close this section
summarizing the standard criticism against his position.

*Theoretical background of McPeck’s notion of critical thinking.* First, McPeck (1981)
started off with a well-known diagnosis that every person interested in the study of critical
thinking can confirm, with a superficial glimpse at the most basic literature, the wide-spread
disagreement around the meaning of the term critical thinking. McPeck’s diagnosis is, as was
mentioned in the introduction to this research, the lack of understanding of “what the concept of
critical thinking entails and what it precludes” (1981, p. 1). In his opinion, the imprecision and
vagueness of the concept has been so widespread that it has led to sordid critical thinking
curricula, ranging from Latin and logic courses to clever puzzle games. This generalized
confusion about the critical thinking concept stems - according to McPeck – from approaching
the concept ”as though it was a self-evident slogan whose precise ingredients were considered to
be clear and self-justifying by those who favor its promulgation” (p. 4). Nevertheless, asked McPeck, where might this fallacy come from? Where does this mirage of self-evidence stem from in a concept so central to the intellectual identity of our civilization? (p. 5). What might be the reason that the critical thinking field is so riddled with ambivalence?

McPeck’s (1981) answer to this question is the origin of the uniqueness of his approach. He assumed, in his response, that the underlying common assumption of the prevailing research on critical thinking lies in the fact that critical thinking is a thinking of some sort. The research on this type of thinking, however, was characterized traditionally as studies of very specific types of thinking, such as inductive or deductive reasoning, or specific types of problem solving, spatial reasoning, analytical reasoning, etc. This research focused mainly on substantiating a conceptual analysis of critical thinking in general. So the primary orientation of this general overview of related literature has been finding what characterizes the adjective critical before the noun thinking. The orientation of all the research of critical thinking, according to McPeck, focused on the assumption that there is thinking in general to which you can assign the adjective critical. As a result, research failed the most fundamental question, the question for the object of thinking, not for the adjective (the how) of thinking.

If we favor this first analytical question, we will realize - according to McPeck – what the general characteristic of thinking is, namely that it is thinking about something very specific. Thinking is always thinking of X. McPeck (1981) developed the argument that thinking is always about some specific subject in two phases: First, there cannot be thinking about nothing (logically impossible) and second – and this is the critical element - there is no thinking about general things. McPeck illustrated this point by arguing that statements like “I teach students to think” make no sense because the logical question will always be possible in the form “You
teach students to think what?” (p. 6). For McPeck, thinking is logically connected to an X, to something particular. Thinking is always an activity that falls on one particular thing (p. 6-8).

The fallacy of the previous research on critical thinking is that when we look at general features of our thinking activities, the assumption kicks in that the act of thinking is this general feature and not the fact that we think always about something specific. So the reflection progressively shifts from thinking to the how of the thinking without ever specifying the object of the thinking. Thinking can only be about something specific. If critical thinking is not about something specific, in a specific subject, then critical thinking is empty. The statement, ‘I teach critical thinking’ simpliciter is, according to McPeck, vacuous because there is no generalized skill properly called critical thinking (p. 7). Critical thinking is necessarily subject-specific and not generalizable so that educational efforts aimed at developing general critical thinking skills are ill-advised.

Take, for example, the ability to recognize underlying assumptions. That this is not a singular ability can be appreciated by considering the fact that to recognize an underlying assumption in mathematics requires a different set of skills and abilities from those required for recognizing them in a political dispute, which are different again from those required in a scientific dispute.... Assumptions are not all cut from the same cloth. And even trained logicians cannot ... “readily identify them” within the various domains of human knowledge. You can, of course, logically characterize assumptions for students, that is, tell them what an assumption is, but this logical knowledge will not enable them to discover the diverse assumptions in the various knowledge domains and contexts. (McPeck, 1981 cited by Siegel (1988, p. 20))

So, McPeck concluded that critical thinking, insofar as it is subject specific, will be determined by subject specific knowledge, principles and procedures. General logic knowledge (formal as well as informal logic) is empty and trivial for critical thinking and never by itself self-sufficient. Knowing what an assumption is and what a valid argument is will not be sufficient to enable people to engage in effective critical thinking (McPeck, 1981, p. 8-9).
Epistemology and specific scientific procedures are the basis for a theory of critical thinking and not logic (p. 10-13).

*McPeck’s critical thinking definition.* So, what is critical thinking and how can it be defined, according to McPeck? Since the origin of the confusion on theorizing about critical thinking is the abstraction of the object of thinking, the first aspect of a critical thinker should be a disposition, a sound skepticism on what we know about the specific object of our interest.

The most notable characteristic of a critical thought involves certain skepticism, or suspension of assent, towards a given statement, established norm or mode of doing things. (McPeck, 1981, p. 6)

Skepticism is the primary characteristic of critical thinking. Based on that, McPeck defined critical thinking as “the skill and propensity to engage in an activity with reflective skepticism” (1981, p. 8). One can see that despite the denial of a general critical thinking concept, McPeck incorporated both the skill assessment component and the critical disposition component. The centerpiece of all dispositions, in McPeck’s definition, is skepticisms that he characterized as follows:

a) It is reflective. Not any kind of skepticism, not a pervasive or unjustified skepticism of the sort that we would apply to any type of statements. It’s a reflective skepticism, one that does not take truth for granted. Instead, it’s one that leads the critical thinker to consider an alternative hypothesis and possibilities. McPeck is clear that exercising particular critical thinking skills - no matter how particular they are – is not sufficient to produce critical thinkers. One must develop the disposition to use those skills as well (1981, p. 10).

b) It is based on standards and knowledge of the specific subject area. This is, for McPeck, how we can distinguish reflective skepticism from incorrect or frivolous skepticism. Since the skeptic person reflects on the matter at hand, it presupposes that the person knows about the field in question. Since critical thinking is always critical thinking about $X$, it follows that critical thinking is intimately connected with other fields of knowledge. Thus the criteria for the judicious use of skepticism are supplied by the norms and standards of the field under consideration. Surprisingly, this simple insight runs against the general trend of text books on the subject, written primarily by philosophers who stress certain logical skills (1981, p. 8).
Since, according to McPeck, critical thinking cannot be general but must be subject specific, McPeck’s position is an epistemological rather than a logical approach to critical thinking. He insisted that logic (formal or informal) is entirely or largely irrelevant for the development of critical thinking skills and that the epistemology of various subjects should be the most reasonable route to explore for that end. Therefore, we can say that McPeck’s understanding of critical thinking, although he rejects the notion of a subject-neutral instance for reason assessment and his epistemological interpretation, is compatible with the reasons-assessing approaches discussed in this section.

Criticism of McPeck’s critical thinking concept. As previously stated, McPeck’s critical thinking concept has been, for years, an object of intense debate. Here, I will summarize in two points the standard critique on McPeck in a way relevant for this study. Against the idea that critical thinking cannot be generalized and that there is only subject specific knowledge and therefore subject specific critical thinking, I will bring two arguments (Johnson, 1992b; Siegel, 1988b).

A) When McPeck argued that thinking is always connected with X, he confused thinking generally with specific acts or instances of that thinking. McPeck was right when he said that if we think of thinking as acts, thinking is always episodes or single events of an activity. However, for McPeck to be able to talk that way, he must have conceived a perspective of a general sort that allowed him to identify thinking events as individual episodes of that activity. This perspective must be possible ‘on pain of inability to identify all the specific acts of thinking’ (Siegel, p. 1988, p. 19).

B) There are identifiable thinking skills that do not refer to any specific matter but apply to diverse situations, for instance, the skill of identifying assumptions that McPeck articulated
earlier. McPeck was right when he said that acquiring logical knowledge regarding the nature of assumptions will not enable students to identify assumptions in all contexts. However, students won’t be able to identify assumptions in one area if they don’t know what an assumption is. Logical knowledge on what an assumption is will not help students discover the assumption in specific areas but it will help them understand the specificity of the assumptions they need to discover (and even say what an assumption is not or that what an assumption is in one area is not in another). So, logical knowledge is important to critical thinking.

The concept of reflective skepticism is problematical (Siegel, 1988). First, it is circular. A skeptic might be reflective and yet his/her skepticism unjustified, for example, when skepticism is being justified by subject specific criteria that actually need to be justified themselves. We need to think even more critically when the criteria for the subject-specific knowledge are questioned or unjustified. Hence, justified reflective skepticism assumes critical thinking; consequently, it can not in turn explicate or define it. Second, the notion of reflective skepticism is incomplete and insufficient. Siegel (1995) and other authors called attention to the fact that there are areas in real every day life that are matters of intense critical discussions and are not subjects of specific knowledge or are governed by general principles, criteria and procedures as the subject areas McPeck had in mind.

Conclusion

This literature review chapter examined the idea that our conception of critical thinking rests on two simple but powerful beliefs. First, our common views of the world, or our conflicts and disagreements in the world, originate in real-life events pertaining to real individuals in real-life situations. Second, for our considerations or claims to be accepted as valid or reasonable,
they should carry the presumption of being justifiable against each other and be submitted to a rigorous scrutiny where reasons for their acceptability or reasonableness are transacted.

The first model was consistently designed to do just that. Aristotle’s logic project was established with an unprecedented historical effectiveness at the expense of two essential domains: the reference to real persons and the reference to real, situative contexts of human interactions. Consequently, the following two enduring and key conclusions were drawn from Aristotle’s logic mode; they are vital for comprehending the concept of critical thinking being implemented in the Texas elementary education system: The intrinsic relationship between propositions and beliefs and the extrinsic relationship between beliefs and actions.

Contemporary critical thinking approaches have come to the realization that a solid reason-examining theory of thinking is not sufficient to explain our critical reasoning abilities and needs (in the form of formal and informal logic) in our modern, technology driven and complex society. They also realize that human logical capacity must be complemented by elements from another dimension, a seemingly remote dimension marginal to Aristotle’s organon, called dialectic (Krabbe, 2013). However, the contemporary call to extend a theory of critical thinking, beyond logic, has not primarily materialized in an appeal for a philosophical dialectic of some sort. It has taken rather the form of a theory of human dispositions that integrates dialectic elements of real arguments between real interlocutors into a theory of reasoning.

In summary, a theory of human dispositions embodies the hope of critical thinking today. Either as a set of dispositions that accompany and supplement logical skills (Ennis’s concept of critical thinking) for a key element within a theory of a critical thinker who will be (or should be) moved by logical reasons (Siegel’s concept); Or as selection of dispositions in the strong sense,
which is not part of an atomized critical thinker but a key constituent of worldviews (Paul’s concept); or finally as a culturally homogenized notion of human dispositions that, through social consensus and curricula, will become part of our educational system (Delphi Report’s notion of critical thinking). Either way, human dispositions seem to carry the task of defining the future of critical thinking and help resolve an enigma of contemporary US educational reform efforts.
CHAPTER 3
RESEARCH METHODOLOGY

Chapter 3 provides a summary of the research methods for this study, including the research design, population and sample, limitations, and instrumentation. In addition, specific data collection procedures are detailed. This chapter concludes with a description of the data analysis and data reporting procedures that were employed in the study.

This study examined the conception of critical thinking that has been implemented in Texas elementary education since 1999. Its purpose is to reconstruct the conceptual nature of that specific critical thinking notion and to hypothesize about the theoretical underpinnings of a notion whose definition and theoretical background have not yet been unveiled. Reconstruction of the critical thinking concept and theory were derived from responses ascertained in this study to a series of questions in relation to variables that were determined in the data collection instruments.

Based on the nature of the inquiry for this study, a descriptive research design was used. As implied by the name, the goal of descriptive research is to generate a careful description of particular phenomena. While the nature of descriptive research may be quantitative, qualitative, or mixed, this study incorporated a qualitative approach to data collection. Gall, Gall and Borg (2007) defined qualitative research as follows:

Qualitative research – Inquiry that is grounded in the assumption that individuals construct social reality in the form of meanings and interpretations, and that these constructions tend to be transitory and situational. The dominant methodology is to discover these meanings and interpretations by study cases intensively in natural settings and by subjecting the resulting data to analytic induction. (Gall, Gall, & Borg, 2007, p. 650)

Descriptive analysis plays an important role in qualitative educational research. It is essential to understand the nature and function of people and phenomena. It helps elucidate
form, structure, activity, change over time, and relationship to other phenomena. Historically, descriptive studies have contributed significant insight into the field of education. Descriptive analysis is designed with the goal of portraying an accurate profile of persons, events or situations (Gall, Borg, & Gall, 2007), and its goal is to arrange the collected material so that the answer to initial problems reveals itself.

Limitations and Benefits

To properly evaluate the limitations and benefits of this research approach, it is necessary to introduce a methodological reflection. As overseer and managers of primary and secondary public education in Texas, the Texas Education Agency (TEA) and the State Board of Education (SBOE) regulate both the content (curriculum) and the educational assessment (assessment and accountability), as well as the adoption of instructional resources (textbook adoption) through several of their divisions. Particularly regarding curriculum content, TEA and SBOE comply with provisions of 2 Tex. Ed. Code § 4.001.4. ("Texas Education Code," 1995) that required that “a well balanced and appropriate curriculum will be provided to all students” by the enactment within the 19 Texas Admin. Code § 110 of a curriculum document called Texas Essential Knowledge and Skills, TEKS. The TEKS is the curriculum document of reference for the determination of what should be taught in the state of Texas. However, the term critical thinking was not part of the local curricular vocabulary. The TEKS did not define nor explicitly identify the content for critical thinking.\[55\]

\[55\] Ever since the first TEKS were approved by 74th Texas Legislature (effective September 4th of 1998), it has been customary for the Texas education system to not publish any accompany documentation to the TEKS. TEA did not provide the public with pertinent information regarding the research base for the TEKS on controversial issues about terms, concepts, etc. Just in 2009 the University of Texas and TEA published a Glossary (TEA, 2009) to the reformed TEKS that became effective in September 2008.
Limitations

Although there was neither a stated definition of critical thinking at the curricular (TEKS) level nor was a criterion identified by which to call certain academic thinking standards critical, the concept of critical thinking was, in fact, systematically utilized at the assessment (TAKS) level. It was TAKS, the Texas Assessment of Knowledge and Skills, that introduced a conceptualization and classification of academic standards as critical. This has allowed educators to conclude that critical thinking has been a performance concept in the Texas education system, an assessment category, rather then a curricular category.

Therefore, answering the research questions required a methodological shift away from the common conception of the state curriculum as the TEKS. This means that analyzing a critical thinking curriculum, elucidating the structure of critical thinking concepts and skills, and contributing to a definition of critical thinking in the Texas educational system has required a shift towards an examination of the assessment program TAKS. In other words, the platform for answering the research questions of this study was a reconstruction of the critical thinking content, out of the analysis of the way critical thinking has been assessed in the state of Texas. The universe of the content domain of what the State of Texas education system calls critical thinking flowed out of a reconstruction of its item domain.

This methodological shift placed a set of constrains, briefly described as follows:

1. It restricted the universe of the critical thinking content to those standards and student expectations that the state of Texas decided on or had an interest to assess. The conclusions drawn from the available TEKS being assessed through the TAKS assessment cannot be generalized to the universe of all other standards that would be critical thinking standards otherwise.
2. Items as measures of psychological constructs assume a measurable content as criterion to be included in the assessment program (McCreary & Crippen, 2007). Since there is no explicit criteria about what to consider critical, a conclusion about including possible non-measurable critical thinking skills cannot be supported. A reconstruction of critical thinking based on item domain sampling would yield only a critical thinking content selected to be assessed. This will not necessarily mirror the content domain supposed to be taught.

3. The lack of public access to the conceptual and operational definitions of the construct critical thinking reduces somewhat the legitimacy of any direct inference made from the item domain sampling to the content domain of critical thinking. A so-reconstructed item domain solely offers sufficient ground or the inference from the critical thinking item sampling to the critical thinking item domain population, but only indirectly to the universe of the critical thinking content domain. The results of such analysis, however, might yield a likely incomplete understanding of the critical thinking conception in question.

4. The conclusions drawn in this research can not be generalized to similar critical thinking concepts. Analysis performed and conclusions drawn from this study are specifically contingent on this historical data collected and the specific item sample studied.

Benefits

A reconstruction of the critical thinking content domain, out of an analysis of its performance domain, helps us make use of a series of functions of assessments that are commonly neglected in the educational research literature nowadays (Crocker & Algina, 2006; Popham, 2000). Items exemplarily:
a) Operationalize in concrete behaviors an important content of constructs that might still remain too general or confusing, even after the use of operational definitions (Popham, 2003, p. 19)

b) Determine deep levels of specificity of constructs by providing relevant and pertinent attributes of behaviors in question (Haladyna, 1977, p. 63)

c) Reveal intended levels of objectivity by making the perspective transparent from which attributes can be understood (Popham, 2008, p. 23)

d) Define levels of complexity by establishing diverse relationships between attributes within a construct or across constructs (Ainsworth & Viegut, 2006, p. 33)

Delimitations

This study was limited to analyzing critical thinking items which were designed to evaluate critical thinking competence of elementary students in Texas, within the scope of the Texas assessment program TAKS, in effect from 2003 to 2011. This analysis of the TAKS critical thinking items was limited to those TAKS tests that were publicly released within that time frame.

Consequently, this analysis limits itself to the reconstruction of the critical thinking curriculum, the conceptual and theoretical dimensions of the critical thinking concept implemented in the state of Texas at the elementary level. It does not pursue nor suggest nor insinuate in any way optimal definitions of critical thinking nor does it endorse a specific theoretical approach to critical thinking.

This attempt to build up the critical thinking content domain out of the unpacked item domain entails at least two important assumptions. First, it was assumed in this research that attributes of the item domain of critical thinking are legitimate, relevant and representative
manifestations of critical thinking behaviors that would be evident otherwise in operational definitions of the construct. Second, it was further assumed that those item domain attributes represent the essential elements of what TEA considers the core of thinking critically in Texas.

**Procedures for Data Collection**

Data were collected through the use of two different instruments. The first (Appendix A) is a document called TAKS Objective 4, contained in an official publication of the Texas Education Agency commonly addressed as TAKS Information Booklet (2004) or also called TAKS booklet\textsuperscript{56}.

The TAKS booklet was the official document in which the TEA formally presented the content of the TAKS assessment program. The core of the TAKS booklet was built around the rationale for the selection and categorization of eligible student expectations for testing on the third- through eighth-grade TAKS reading assessment under TAKS objectives. A TAKS objective was, according to TEA, an umbrella term or “assessment reporting category,” understood as a "heading under which student expectations from the TEKS can be meaningfully grouped” (p. 2). TAKS objectives, as broad statements, broke up knowledge and skills to be tested into meaningful subsets of content (TEA, 2004, p. 2), around which tests could be organized into reporting units. According to TEA, the function of reporting units is primarily to aid parents, campuses and districts in understanding students and school performance. However, there are good reasons to believe that TAKS objectives are more then just formal, reporting categories\textsuperscript{57}.

\textsuperscript{56} TAKS booklets were published for every test grade and every test subject. There are two editions of the reading TAKS booklets. The first came out in January 2002, the second in August 2004. Unless otherwise stated when the TAKS booklets are cited, the second slightly revised edition of 2004 is used.

\textsuperscript{57} For the discussion on whether or not TAKS objectives are just descriptive categories, reporting units of test scores or if they build additional ‘academic objectives’ with curricular implications, the reader is referred to Chapter 4.
TAKS Objective 4 broke up knowledge and skills for critical thinking\textsuperscript{58}. It meaningfully grouped and listed TEKS and student expectations that required students to apply critical thinking skills. The TAKS objective statement, its rationale and the listed knowledge and skill statements, as well as the TAKS Objective 4 student expectations, were used as a data collection instrument to gather and categorize all critical thinking items available in the TAKS history.

I will make the case in this research that TAKS Objective 4 is a genuine and necessary document to be used, both as a sampling frame for the description of the critical thinking curriculum in Texas, as well as a data collection instrument to gather data needed to reconstruct the content of critical thinking in Texas. It is not only an important source for answering the first research question. It is also an indispensable instrument to collect available qualitative data on the critical thinking content in the state of Texas.

The second data collection instrument (Appendix B), the adequacy conditions rubric, was used to gather information from the available critical thinking items at the elementary level. The adequacy conditions rubric, separately elaborated by Govier (1987) and Johnson (2000), was used to identify, describe and analyze the nature, purpose and classification of different types of critical thinking concepts and categories employed to assess the learning of critical thinking skills and concepts in the TAKS assessment program at the elementary level in Texas.

Study Instruments

As mentioned above, two instruments were utilized for this study: the TAKS Objective 4 was utilized to collect and describe qualitative data from the TEA TAKS assessment program about curriculum and curriculum structure for critical thinking in Texas. The second instrument, the adequacy conditions rubric, was employed to collect and descriptively analyze data from all

\textsuperscript{58} It is important to remind the reader that no other official document ‘groups’ and/or ‘identifies’ TEKS and student expectations as ‘critical thinking’. See Chapter 4 for more information.
available critical thinking items in the history of the TAKS assessment program at the elementary level.

The first instrument (Appendix A) was designed by the Texas Education Agency to break up knowledge and skills to be tested into meaningful subsets of conceptual categories (TEA, 2004). At the elementary level, the instrument TAKS Objective 4 is divided into three sections: 1) a rationale for the reporting category called TAKS Objective 4, 2) the TEKS/student expectations that fall under this category, and 3) an additional information section on how the student expectations were assessed on TAKS. The core of this data collection instrument consists of the student expectation section which contains all variables that the construct critical thinking is made of. These variables are organized into the following three conceptual categories: reading comprehension (inferential thinking), literary response (interpretations), and analysis of text structure/literary concepts.

The second instrument (Appendix B) contains a list of criteria that allows us to identify, describe and analyze the nature, purpose, classification, interpretation and evaluation of different types and subtypes of arguments. When Govier (1987) enunciated a first attempt to establish minimum conditions that must be met for a speech act or communicative act to be considered as argument, the following position was posed:

Except in limited circles, there is no recognized subject called ‘the theory of argument’. Yet there are clearly a number of questions about arguing and argument not answered by formal logic and of considerable interest. A theory of argument would discuss the nature and purpose of argument and specify and defend standards for the appraisal of arguments. It would specify how many types of arguments there are and how many standards are appropriate to assess each type…ideally a theory of argument would apply to all natural arguments. (Govier, 1987, p. 13).

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59 The actual unity of the whole TEA’s critical thinking model consists of two parts. The first is gradually being developed from third to eight grades and contain the same three major categories of critical thinking. The second part extends from ninth grade to exit level TAKS. See Chapter 4 for more information.
In the year 2000, Johnson, following Govier’s footsteps, argued the following, in an attempt to formulate his own argumentation theory:

Any theory of argument that seeks to apply to argumentative discourse and to play an instrumental role in addressing the tasks that arise in the practice of rationally conducted argumentation must accommodate ….adequacy conditions. (Johnson, 2000, pp. 52-53)

This means that this instrument can be used as a rubric to determine how arguments are analyzed, classified, interpreted and justified. Johnson himself applied the adequacy condition as a rubric to analyze and test the appropriateness of the formal deductive logic (FDL) as an adequate theory of argument (2000, Chapter 3).

This study uses mainly Johnson’s adequacy condition rubric but adapts some of Govier’s original questions to facilitate the adoption of the rubric for answering the respective research question. Due to the nature of this study’s research questions, it represents a slightly shortened version of Govier’s and Johnson’s adequacy conditions rubric which guided the evaluation of the instances defining and justifying the concept of critical thinking in elementary education in Texas.

Study Population

The target population of this study was established by the Texas Education Agency through the promulgation of a curriculum framework for critical thinking. According to Gall, Gall and Borg (2007), a target population includes all members of a set of people, events or objects to which researchers wish to generalize the results of their research (p. 166).

As mentioned earlier, this curriculum framework was built upon the concept of TAKS objectives (specifically upon the TAKS Objective 4). All academic standards and student expectations that fall under the concept of TAKS Objective 4 are being considered critical thinking standards by the Texas education authorities. Therefore, all items designed to test the
TEKS and student expectations mentioned in Table 4 build up the target population of this study. Basically, all TAKS test items ever created for the knowledge and skills statements displayed in the table below for elementary grades third to fifth, administered between the years 2003 and 2011, are critical thinking items and make up the target population of this research study.

Table 4

Basic Critical Thinking Model

<table>
<thead>
<tr>
<th>CT Categories</th>
<th>Fifth Grade</th>
<th>Fourth Grade</th>
<th>Third Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Comprehension</td>
<td>• make inferences - conclusions - generalizations</td>
<td>• make inferences - conclusions - generalizations</td>
<td>• make inferences - conclusions - generalizations</td>
</tr>
<tr>
<td>Inferential Thinking</td>
<td>• support inferences</td>
<td>• support inferences</td>
<td>• explain inferences</td>
</tr>
<tr>
<td></td>
<td>• distinguish fact-opinion</td>
<td>• distinguish fact-opinion</td>
<td>• Distinguish fact-opinion</td>
</tr>
<tr>
<td>Literary Response or</td>
<td>• support responses - connect-compare/contrast</td>
<td>• support responses - connect-compare/contrast</td>
<td>• support interpretations</td>
</tr>
<tr>
<td>Interpretation</td>
<td>ideas, issues, themes</td>
<td>ideas, issues, themes</td>
<td></td>
</tr>
<tr>
<td>Text Structure – Literacy</td>
<td>• authors organize info in specific ways</td>
<td>• authors organize info in specific ways</td>
<td></td>
</tr>
<tr>
<td>Concepts</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sampling Method

Although this study was intended to become an exhaustive analysis of the entire universe of critical thinking items ever created in the history of the Texas elementary TAKS test, it was necessary to draw a sample of critical thinking items that constitute the entirety of the accessible population of critical thinking TAKS questions created for third through fifth grade. The accessible population was determined essentially by three important factors. First, it was determined by the test blueprint for each grade level (Appendix E). Second, it was determined by the body of test versions created for specific targeted student groups within the TAKS

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60 The population of this research study is restricted to TAKS tests designated for academic programs that serve students through general education and bilingual/English as a second language program. Excluded are special
assessment program between 2003 and 2011, which have been released to the public. It was
determined thirdly by direct and indirect consequences of the Student Success Initiative (SSI)
regulations in existence since 1999. As Appendix E indicates, the test blue prints for third,
fourth and fifth grades of the TAKS reading tests show differences, both in the amount of test
items and in the number of critical thinking items.

As to the second factor, the Texas Education Code §39.023(e) required from TEA the
public release of the TAKS tests for every grade and subject tested. However, the yearly release
schedule of the TAKS tests underwent several changes. It actually began in school year 2002-
2003 and ended abruptly in school year 2003-2004. In 2006, upon TEA request, the Texas
legislature approved a change in the official release schedule of the TAKS test to two years,
which, enacted by the 80th Texas Legislature in 2007, became a three-year release schedule in
2009. Both changes affected the release publication of the 2007-2008 and 2009-2010
assessments. In lieu of the official and complete releases of the test, TEA was required only to
release sets of sample items in 2008 and 2010 that prima facie lack the rigorous quality control
procedure established by the TEA for its testing program61.

The series of changes in the regulation of the general access of the public education
assessment program culminated in 2009 with an initiative enacted by the 81st Texas Legislature
in the same year. According to this, TEA is only required to publicly release the primary form of
the TAKS test (and not the retakes). This last change of policy affected the assessments given in
the year 2009 (see Table 5 below).

61 TEA foresees a very detailed test development process (containing 19 regulatory steps) with twenty rigorous
development activities that every item needs to go through before facing public scrutiny. See Technical Digest 2007-
2008 Chapter 6. These ‘sample items’ are not necessarily part of the test versions students actually take.
The third factor affecting the sampling method of this study deals with the Student Success Initiative (SSI). Originally enacted by the 76th Texas Legislature in 1999, the SSI regulates grade advancement requirements of the Texas Assessment of Knowledge and Skills reading tests in grades three, five and eight and mathematics tests at grades five and eight. As specified by these requirements, a student was able to advance to the next grade level only by passing these tests or by a unanimous decision of his or her grade placement committee. The goal of the SSI is to ensure that all students receive the instruction and support needed to be academically successful in reading and mathematics (TEA, 2012). The short-term implication of the SSI legitimated the need of creating multiple test retake opportunities for students to show mastery of instructional goals, before retention decisions were made. This provision regulates the creation of three administrations of the reading test for the years 2003 through 2006 for third and fifth grades. Furthermore, the 81st Texas Legislature in 2009 eliminated the SSI requirements for third grade. Table 5 shows the slant of the final population sample for this research study.

Table 5

_TAKS Released Tests 2003-2011_

<table>
<thead>
<tr>
<th>Year</th>
<th>Third Grade</th>
<th>Fourth Grade</th>
<th>Fifth Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EN</td>
<td>SP</td>
<td>EN</td>
</tr>
<tr>
<td>2002-2003</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2003-2004</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2005-2006</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2007-2008</td>
<td>Rel. Items</td>
<td>Rel. Items</td>
<td>Rel. Items</td>
</tr>
<tr>
<td>2008-2009</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2009-2010</td>
<td>Rel. Items</td>
<td>Rel. Items</td>
<td>Rel. Items</td>
</tr>
</tbody>
</table>

EN= English Test, SP= Spanish Test, 3 or 1= Number of test administrations by year, Rel. Items= ‘extra released items as opposed to ‘regular released test items’. Taken from [www.tea.state.tx.us](http://www.tea.state.tx.us).
This sampling process allows for the inclusion of critical thinking items over the entire span of time from 2003 through 2011. Items identified as extra released items (as opposed to regular released tests items) will be analyzed as well, but classified separately.

Procedures for Data Analysis

The data for the first collection instrument (TAKS Objective 4 framework) were descriptively analyzed with the help of an analytical procedure called unwrapping academic standards, developed by Ainsworth (2003, 2004) and later refined by Robert Marzano and Heystead (2008). Data collected from this instrument were analytically classified in concepts and processes in order to produce a descriptive profile of the critical thinking variables (concepts and categories) used in Texas to assess critical thinking competence.

Data for the second collection instrument were analyzed through the application of an evaluative research approach called here adequacy condition rubric. The adequacy condition rubric was first postulated by Govier (1987) in the form of a questionnaire and further elaborated by Johnson (2000) in the format of a rubric. Both approaches, but particularly Johnson’s rubric, provide a detailed description of conditions that need to be met for something to qualify as argument and/or as an argument type. Along with the respective adequacy condition statement, Johnson’s rubric provides a justification for the condition and criteria required to judge whether or not the conditions for the existence or categorization of critical thinking concepts are being met. This study includes the criteria translated in the form of a series of questions to be applied to the data collected. By applying the questions to every item meeting the descriptive profile of critical thinking, as defined by the first data collection instrument, this study was in a position to hypothesize about the defining characteristics of a critical thinking concept or of a critical thinking model that has been implemented and assessed in Texas since 2003. Only the questions
that could be reasonably answered were used in the final analysis. Questions that can not be successfully answered were disregarded.

The actual process for descriptively analyzing the selected critical thinking items emerged as the review process began. The initial effort involved analyzing each selected item, applying the adequacy condition questions throughout the review. This process allowed for classifying, categorizing, comparing/contrasting and evaluating every item to decide whether or not items or item types meet the argumentative requirement of critical thinking theories. Both the criteria and the questions of the adequacy condition rubric can be read as a variable list. The variable list following each research question below was utilized to provide an answer to that specific research question.

1. What is the critical thinking curriculum and how is it structured in the Texas elementary education system?

TAKS Objective 4 Framework:

- Description of each critical thinking concept and categories of concepts
- Description of critical thinking processes for each critical thinking category
- Description of all critical thinking variables which make up the Texas’ critical thinking model for elementary education

2. What are different types of critical thinking concepts and their structure?

Adequacy condition 2

The theory must contain an account of how to understand the structure of arguments and how that structure may be analyzed (in its parts), and displayed in a clear and precise manner. Justification: We cannot adequately evaluate, appraise, or criticize an argument unless we understand its structure. If there are various types of arguments, they must be defined, and represented. These conditions fall to the theory of argument analysis.

- Arguments can be of different types. What are the different types of arguments?
- Different types of arguments can have different type of components. What are the components of each type of argument?
- Each type of argument can have a unique structure. What is the structure of each of the different types of arguments?
3. What does it mean to think critically in Texas’ elementary education?

Adequacy condition 3
The theory must recognize that an argument exists in a continuum from strong to weak with various points in between. To put it slightly differently, there are degrees of logical virtue in arguments and the theory must reflect this. These conditions belong to the theory of argument appraisal.
Justification: Arguments are a human product and as such are produced in ordinary language (not formalized, symbolic language). Therefore, they are expected to run the same range as other natural language constructs, that is, from strong to weak.
• Arguments must be supported. How is an argument supported?
• Arguments might be strong and/or weak. What constitutes a strong or weak argument?
• There must be criteria for strong and weak arguments. How can we know that the support for an argument is strong or weak?

4. What are the qualities that make an argument a good argument in Texas’ elementary education?

Adequacy Condition 4
The theory must be able to recognize that there can be good arguments for a given position as well as good arguments against it. This adequacy condition is part of the theory of argument appraisal.
Justification: In human affairs, there are often good arguments for a given conclusion and also good arguments against it. Validity is a problematic notion with respect to natural language argumentations. This condition falls to the theory of argument appraisal.
• An argument can be sufficiently justified. What are the qualities that make an argument a good argument? Can these qualities be justified?

5. What are the elements of a definition of the standard critical thinking concepts in elementary education in Texas, its purpose and components?

Adequacy condition 1
The theory of argument must contain a definition of argument and the elements that constitute an argument.
Justification: A theory of argument must begin and operate with an understanding of what argument is and what the elements or components of an argument are. This work falls to the theory of analysis.
• Arguments have a specific nature. What is the nature of arguments?
• Arguments have a purpose. What is the purpose of arguments?
• Arguments can be broken down in parts. What are the elements or components of an argument? What are the relationships among the components?
Reporting the Data

The results of the data are reported in accordance with the original research questions, as presented earlier in this chapter. The first research question is answered with corresponding data and, when available, in table format with narrative explanations. All other research questions are reported in narrative form.

This chapter has provided a summary of the methodology employed in this research that included research design, population and sample, limitations, and instrumentation. In addition, specific data collection procedures have been detailed. This chapter concluded with a description of the data analysis and data reporting procedures that were employed in the study.
CHAPTER 4
RESULTS OF THE RESEARCH

Introduction

This chapter presents the results of analysis of the data derived from the research design explained in Chapter 3. The results are presented in two parts. The first portion presents the findings from the qualitative analysis of answers to the first research question (what is the critical thinking curriculum and how is it structured in the Texas elementary education system?). This qualitative analysis is based on information provided within the first data collection instrument called TAKS Objective 4. As mentioned earlier, TAKS Objective 4 is contained in the TAKS Information booklets that are designed to give information on the tested reading curriculum of the TAKS assessment program in grades three through eight.

Research question 1

1. What is the critical thinking curriculum and how is it structured in the Texas elementary education system?

The second part of this chapter presents the narrative findings from the qualitative analysis of the samples of critical thinking items intended to test critical thinking at the elementary level in the Texas education system. This descriptive analysis is based on the application of the second data collection instrument called the adequacy condition rubric, outlined independently by Govier (1987) and Johnson (2000). It provides the framework for answering the remaining three research questions of this study.

2. What are different types of critical thinking concepts and skills and their structure used in Texas elementary education?

3. What does it specifically mean to think critically in Texas elementary education?
4. What are the elements of a general definition of critical thinking in elementary education in Texas, its purpose and components?

Research Question 1

The critical thinking curriculum for elementary education in the Texas education system can be described according to attributes contained in the first data collection instrument, TAKS Objective 4. I will develop the answer for Research Question 1 in three steps. First, I will describe TEA reasons for assimilating academic objectives with curriculum. Second, I will substantiate the thesis that there are good reasons to think that TAKS objectives are as much academic objectives as they are reporting categories. TAKS objectives, in their role of academic objectives, share the same curriculum characteristics that have been attributed to the TEKS. In the last part, I will describe the content of TAKS Objective 4 and the structure of the critical thinking curriculum within.

TEKS and the Texas Curriculum

The Texas Education Agency (TEA) generically uses the term curriculum to designate a set of academic standards that, in essence, contain clear and measurable criteria of what students should know and be able to do in all K-12 subject areas. In that sense, curriculum and TEKS are being used as interchangeable terms to designate one and the same thing, namely content standards. The Curriculum Division of the TEA is the official entity in charge of academic standards and in that capacity it “periodically updates the state’s curriculum standards called the Texas Essential Knowledge and Skills (TEKS)” (TEA, n.d. p.5).

According to this, academic standards, TEKS, and curriculum are equivalent terms. The reasons for assimilating curriculum and standards are varied. I refer only to one reason in particular because of its significance in the context of this research question. This reason refers
to the general significance of the process of standards setting and the particular significance of instruction-related curricular issues.

When talking about curriculum nowadays, the immediate implication is that we are referring to a standards-based curriculum. What does standards-based mean? The general use of the term standards here is formal. It’s pretty much the same concept we generically use to designate an expected level of acceptance of a practice, “something set up and established by authority as a rule for the measure of quantity, weight, extent, value, or quality” (Standards, n.d., p. 6). The use of the term academic standard, however, is more concrete and complex. When applied to academics, standards become a term that defines a cumulative body of knowledge and set of competencies that are the basis for quality education. In this sense, academic standards comprise a set of important facts, concepts, principles, and ideas that determine the knowledge and skills that students must attain in a particular course or grade level (Marzano, Kendall, & National Education Association of the United States., 1998). In essence, the term academic standards, as TEA uses it, calls for clear and measurable criteria of what students should know and be able to do.

On the other side, the term curriculum, as in standards-based curriculum, is richer than the above definition. Intuitively, we know that in today’s educational world the word curriculum means a lot more than standards. Curricula comprise more than academic standards inasmuch as they are concerned with how teaching of content standards occurs or should occur (Ainsworth, 2010; English, 2000; Flinders & Thornton, 2004). In an historically standard model of curriculum construction, like Tyler’s model, for instance (Tyler, 1949), determining academic objectives or content standards is just one of several aspects of curriculum construction. Others include identifying, defining, explaining and organizing educational experiences or instructional
approaches, and even curriculum evaluation issues (Pinar, Reynolds, Slattery, & Taubman, 2004 Chapter 3; Stanley, 2009).

Since undoubtedly the process of selecting and justifying academic standards has been considered the central and most relevant factor in curriculum construction (Marzano & Kendall, 1996; Tyler, 1949, pp. 43-62), Texas school authorities decided, when Texas Essential Knowledge and Skills (TEKS) were approved in 1997, to coin the term curriculum for this generic process and to designate the agency division in charge of the state academic standards the curriculum division. Since 1995, the curriculum division of the TEA spends an inordinate amount of time and resources designing, refining, updating, carrying out, and maintaining a scrupulous and stringent selection process of academic standards called Texas Essential Knowledge and Skills (TEKS) which, since their implementation in 1998, drive the educational world of Texas public education. Texas school authorities call curriculum the totality of academic objectives for a specific area or for a specific academic program. TEA holds that its curriculum division is…

…responsible for supporting development and implementation of the Texas Essential Knowledge and Skills (TEKS) in the foundation curriculum (English language arts, mathematics, science, and social studies) and the enrichment curriculum (CTE, fine arts, health education, languages other than English, physical education, and technology applications). (TEA, n.d., p.3)

_TAKS Objectives and the Texas Curriculum_

Nevertheless, in school year 2002-2003, with the implementation of the new state-mandated test called TAKS (Texas Assessment of Knowledge and Skills), TEA introduced a new category of objectives: The TAKS objectives. As test objectives, TAKS objectives were created with the intention of being formal categories, compartments for interpreting test scores. Yet, they became more than that. They became what they really are, namely academic
objectives. I will briefly develop the thesis here that the identification of academic standards and curriculum, as well as the double nature of TAKS objectives as reporting categories and academic objectives, sufficiently justifies the use of TAKS Objective 4 as the critical thinking curriculum in the Texas education system.

Officially, TAKS objectives were conceived as assessment categories, precisely reporting categories or reporting units. They were also called test objectives (TEA, 2004). The use of reporting categories is a common practice in the test construction field. Criterion-referenced tests such as TAKS and STAAR – as opposed to norm-referenced tests that interpret scores against the performance of other test takers – are constructed to allow users to interpret examinees’ test performance in relation to well-defined domains of content. In that regard, building test domains for the purpose of reporting and organizing performance scales is an acceptable practice (Crocker & Algina, 2006; Popham, 2000, Chapter 8). TAKS objectives were created to be just that, domains of content to be tested. However, the three-year development process of those TAKS objectives illustrates the double facet of TAKS objectives. With the purpose of ensuring that TAKS assessed the parts of the TEKS curriculum most critical to students’ academic learning, TEA first grouped students’ expectations to be tested in 1999, and drafted objectives that would justify the logic and rationale of the selection. This legitimation process was a long and expensive one; it consisted of two statewide rounds of discussions of expert committees composed of educators, administrators and scholars who studied the results of more than 27,000 survey responses in the first round and 57,000 survey responses in the second round. They, along with national panels of experts and several TEA official review committees, worked laboriously together for three years to come up with these four TAKS objectives. All TEKS and student expectations to be tested were classified into basic reading comprehension
skills (TAKS Objective 1), knowledge of literary elements (TAKS Objective 2), strategies to
analyze texts (TAKS Objective 3), and critical thinking skills (TAKS Objective 4).

The problem in the conception of TAKS assessment domains was that the philosophy of
those domains did not necessarily match the philosophy of the established content domains of the
TEKS, creating the figure of parallel content domains. The new objectives created new content
domains different from the domains originally assigned to the TEKS. Typically, reporting
categories match, in essence, the structure of the academic standards. As an illustration, not only
do the new STAAR reporting categories for all content areas mirror closely the organizational
structure of the TEKS (TEA, n.d); other state-mandated tests in the nation like Virginia’s,
Florida’s and Massachusetts’ reporting categories are extracted from the basic curriculum
structure.62 This was not so for the TAKS test. In other words, even though the rationale for
calling TAKS objectives into existence seemed to be technical in nature (the building of a
platform to read and interpret test performance), this rationale inaugurated a new nomenclature
of academic objectives (objectives at a whole new level) and a whole different rationale for
grouping academic standards as the one originally established by the TEKS, creating in this
manner the concept of a parallel curriculum.

TAKS objectives should have served only as umbrella statements to make sense of test
scores, organizing student expectations around the structure given to the TEKS They should
have been only “aids for campuses, districts, parents and the general public to understand the
academic performance of our students and schools” (TEA, 2004, pp. 1-3). Instead, they “broke
up knowledge and skills to be tested into meaningful subsets” of objectives “that are not found in

62 For Virginia’s reporting categories please see: http://www.doe.virginia.gov/testing/sol/blueprints/english_blueprints/blueprints_reading3.pdf. For Massachusetts’s
reporting categories, http://www.doe.mass.edu/mcas/2013/retest/mar-items.pdf (p. 6). For Florida’s reporting
categories see http://fcat.fldoe.org/fcat2/pdf/FL10SpISG35RWT3gfinal.pdf pp. 21
the TEKS curriculum” (TEA, 2004, p. 2). Instead, those objectives became alternative and competing ways of seeing, teaching and evaluating the TEKS; in essence, they became an alternative curriculum.

**TAKS Objective 4 and the Critical Thinking Curriculum**

Then what type of objectives are the TAKS objectives? Are they similar in nature to the TEKS and student expectations? Do they constitute a different type of academic objectives? The modern concept of educational objective – still widely in acceptance today – was established in the first half of the 20th century by Tyler (1949). For Tyler, an objective has two distinctive components: a clear reference to a specific type of knowledge (or content aspect of the objective) as well as the behavior that would demonstrate proficiency relative to that knowledge (or behavioral aspect) (Tyler, 1949, pp. 46-49). Prior to that conception, an educational objective was conceived as a general topic and did not specify either an area of knowledge or a skill target for learning (Cordero, 2004; Marzano & Kendall, 2007). Albeit Tyler’s (1949) recommendations for designing and evaluating educational objectives have become a norm nowadays, modern research has established distinctions within the concept of academic objectives. Krathwohl (one of the coauthors of Bloom’s taxonomy) and Payne, for instance, made distinctions between three levels or types of objectives: global objectives, educational objectives, and instructional objective (Krathwohl & Payne, 1971). According to Krathwohl and Payne, the second type of objectives, namely educational objectives, are the ones that meet Tyler’s requirements for educational objectives. They possess the double structure of a content object and a behavioral object and the relationship between them mentioned above. In the following example of a student expectation from a 5th grade reading TEKS, Taylor’s double structure of the objective is evident.
The student is expected to use the text’s structure or progression of ideas such as cause and effect or chronology to locate and recall information. (Reading TEKS 5.10(E))

The specific type of knowledge (text structure or progression of ideas in two forms, in the form of cause/effect and chronological relationships) is linked with a behavior that a student would have to perform to demonstrate learning (use, locate and recall). Educational objectives are the most common objectives today; they are commonly referred to as learning goals and constitute the prototypes of academic standards present in all educational curricula across the nation and in the common core standards (CCSS, n.d.; Marzano, 2009).

Instructional objectives, on the other hand, are the most specific of the three types of objectives. Mager (1975) is credited with having clearly defined the specific characteristics of instructional objectives with his widely accepted three-layer concept of instructional objectives. According to this, instructional objectives include, in addition to the content aspect and the behavioral aspect of educational objectives, a performance indicator, conditions under which the performance occurs, and a criterion for acceptable performance (1975, p. 4). This is the most specific type of objectives whose ultimate function is to frame the field of student performance for instructional tasks.

Finally, as described by Marzano (2009), global objectives are the most general. They are broad, represent complex areas, and may be the outcome of sophisticated generalizations. Marzano and Kendal bring this example of a classical global objective: “Students will be able to apply basic properties of probability” (2007, p. 117). Global objectives differ from topics in that they indicate the content and the behavior to which they are related. Yet the content is formulated in such general terms as to be associated with specific models of performance. Global objectives give justification to abstract and theoretically complex educational objectives.
and require and depend on educational or instructional objectives to be carried out (Anderson & Krathwohl, 2001, Chapter 1).

This is the level of TAKS objectives. In TAKS Objective 4, “The student will be able to apply critical-thinking skills to analyze culturally diverse written text” (TEA, 2004, p.16). Even though both the content aspect (critical thinking skills and culturally diverse written texts) and the behavioral aspect (apply – analyze) are present, they are so generally formulated in this TAKS objective that there are no shortcuts to determine their specificity, as through the formulation of additional and more specific academic standards.

_TAKS Objective 4 description._ TAKS objectives are considered unified academic objectives, designed to be identical across grade levels and completely vertically aligned. In the case of the reading TEKS, the vertical alignment was methodically split into two systems: Elementary and middle school system (grades third through eighth) and high school system (grades ninth through twelfth). Consequently, the inference that there are two conceptions of critical thinking, or two levels of the same critical thinking model in Texas schools could be substantiated. I will limit the findings of this research to the elementary-middle school system and will be able to validate the findings for the elementary portion of that system only.

All TAKS objectives were typically divided in four sections. Section 1 contained a description of the general purpose that particular TAKS objective served. Section 2 stated the TAKS objective statement as such. Section three set forth the corresponding TEKS (the knowledge and skill statements) and all student expectations, selected to represent most significantly the core content of that TAKS objective and to yield the most significant intended and desirable learning outcomes from that content domain. Section four communicated some
information about general item characteristics regarding the inclusion of some skills under that particular objective.63

While section 1 is identical for all elementary grades and useful to answer Research Question 4, all other sections of TAKS Objective 4 will be indispensable to answer Research Questions 1, 2, and 3.

Critical thinking curriculum description. As mentioned above, section two of TAKS Objective 4 contains the critical thinking statement which provides the rationale for the Texas model of critical thinking. This objective states the following:

The student will apply critical thinking skills to analyze culturally diverse written texts.

As a result of the selection process mentioned above, Table 6 presents the three TEKS64 knowledge and skills statements, or strands, with their corresponding student expectations, that were found to best represent the content domain of the objective.

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63 It is important to note that these disclosed item information provided in the TAKS information booklets are not comparable in stringency and detail with the item specifications documentation and the item evidence tables or even with the item guidelines recently released to the public and elaborated for the common core tests (to roll out in 2014-2015.) See http://www.parcconline.org/assessment-blueprints-test-specs and http://www.parcconline.org/sites/parcc/files/Item%20Guidelines%202004%2025%202013%20Version%208_0.pdf. To my knowledge TEA has never disclosed item specifications beyond these few paragraphs from the TAKS booklets in the past and has not done it for the STAAR tests neither. In personal conversations with TEA officials I was told that test specifications are considered confidential. An equivalent of the TAKS information booklet has not been published for the STAAR tests after two years of test implementation.

64 As part of the vertical alignment framework, portions of the critical thinking curriculum become more rigorous and complex as students move to higher grades. Third grade shows only two strands for critical thinking: reading comprehension and literary response. The last strand text structure and literacy concepts is constitutive only for grades four through eight.
Table 6

**Critical Thinking Strands**

<table>
<thead>
<tr>
<th>TEKS Codes</th>
<th>Reading TEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.10 4.10 3.9</td>
<td>Reading Comprehension – Student comprehends selections using a variety of strategies.</td>
</tr>
<tr>
<td>5.11 4.11 3.10</td>
<td>Literary Response - Student expresses and supports responses to various types of texts.</td>
</tr>
<tr>
<td>5.12 4.12</td>
<td>Text Structure/Literary Concepts - Student analyzes the characteristics of various types of texts (genres).</td>
</tr>
</tbody>
</table>

Taken from http://www.tea.state.tx.us/index3.aspx?id=3693&menu_id=793.

As shown in Table 6, three knowledge and skill statements, or strands, make up the universe of critical thinking in the Texas elementary and middle school system. The numbers at the left side of the table indicated the TEA grade level designation codes (5th, 4th, and 3rd grade) and the number code assigned to the specific knowledge and skill statements.

What are the critical thinking skills that need to be applied for a student to be able to (critically) analyze texts? The student expectations transcribed in Table 7 show more in detail the corresponding knowledge basis and skills required to think critically in Texas schools.

Table 7

**Critical Thinking Objectives**

<table>
<thead>
<tr>
<th>CT Categories</th>
<th>Fifth Grade</th>
<th>Fourth Grade</th>
<th>Third Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Comprehension</td>
<td>• make-support inferences - conclusions - generalizations &amp; distinguish fact-opinion</td>
<td>• make-support inferences - conclusions - generalizations distinguish fact-opinion</td>
<td>• make-explain inferences - conclusions - generalizations distinguish fact-opinion</td>
</tr>
<tr>
<td>Literary Response</td>
<td>• support responses connect-compare/contrast ideas, issues, themes</td>
<td>• support responses connect-compare/contrast ideas, issues, themes</td>
<td>• support interpretations</td>
</tr>
<tr>
<td>Text Structure – Literacy Concepts</td>
<td>• authors organize info in specific ways</td>
<td>• authors organize info in specific ways</td>
<td></td>
</tr>
</tbody>
</table>

Taken from http://www.tea.state.tx.us/index3.aspx?id=3693&menu_id=793.
Table 8 shows the knowledge and skills statements broken down by content aspects and behavioral aspects of the critical thinking curriculum. The breakdown is important because both the complexity of the processes and the diversity of the concepts become more evident.

Table 8

*Content Aspect and Behavioral Aspect of Critical Thinking Curriculum*

<table>
<thead>
<tr>
<th></th>
<th>Inferences</th>
<th>Text Evidence</th>
<th>Fact/Opinion</th>
<th>Lit. Response</th>
<th>Ideas/Themes</th>
<th>Text Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinking</td>
<td>identify</td>
<td>identify</td>
<td>identify (facts)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>make</td>
<td>use/apply</td>
<td>identify (opinión)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>support</td>
<td>distinguish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responding</td>
<td></td>
<td></td>
<td>identify</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>express</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>connect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>comp/contrast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text types</td>
<td></td>
<td></td>
<td>recognize</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>organize</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The complexity of this cross section of the curriculum is demonstrated by the number of processes (horizontal view) and the cognitive complexity of the ideas involved (vertical view): 16 cognitive processes dealing with six high-order level ideas designed for teaching children between 8 and 11 years of age. The heaviest weight is laid upon inferential thinking involving eight cognitive processes followed by the cognitive task of responding to that inferential thinking. The level of responses is higher-order since it addresses such complex concepts as interpretations, principles, categories, and abstract issues.

Even though the last two tables displayed a more extended picture of the critical thinking curriculum for elementary education, the specific content of all critical thinking variables in the horizontal and vertical views is not clearly evident from these tables without further indication of content. So, it begs the questions: Why do these three reading strands qualify as critical? Why just *these* skills within each strand? Interestingly, Texas school authorities do not justify or
deliver any explanation or any indication of related research, in any of the available publications
regarding the crucial question why some skills are considered critical and others are not.

In order to contextualize the need for clarification expressed above, it is worth
mentioning that the original structure of the TEKS clustered all reading knowledge and skills
statements into four major categories at the elementary level, as shown in Table 9.

Table 9

*Reading TEKS - Knowledge and Skills Statements and SE*

<table>
<thead>
<tr>
<th>TEKS Categories</th>
<th>Fifth-Fourth Grade</th>
<th>Third Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word-Related TEKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• word identification</td>
<td>(6 SE)</td>
<td>(6 SE)</td>
</tr>
<tr>
<td>• fluency (6 SE)</td>
<td></td>
<td>(5 SE)</td>
</tr>
<tr>
<td>• variety of text (3 SE)</td>
<td></td>
<td>(3 SE)</td>
</tr>
<tr>
<td>• vocabulary development (5 SE)</td>
<td></td>
<td>(4 SE)</td>
</tr>
<tr>
<td>Reading Comprehension-Related TEKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• reading comprehension</td>
<td>(12 SE)</td>
<td>(11 SE)</td>
</tr>
<tr>
<td>• literary response (4 SE)</td>
<td></td>
<td>(4 SE)</td>
</tr>
<tr>
<td>• text structure/lit. concepts (10 SE)</td>
<td></td>
<td>(10 SE)</td>
</tr>
<tr>
<td>Research-Related TEKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• research (8 SE)</td>
<td></td>
<td>(10 SE)</td>
</tr>
<tr>
<td>• culture (3 SE)</td>
<td></td>
<td>(2 SE)</td>
</tr>
</tbody>
</table>

The information in this table is taken from the TEKS that were in force from 1999 to 2009. Retrieved from http://ritter.tea.state.tx.us/rules/tac/Chapter110/index.html.

Fifth and fourth grade are combined because the description and number of knowledge
and skills statements as well as the codes for the TEKS at these two grade levels are identical.

Third grade TEKS are slightly different. The term TEKS Categories in Table 9 is not an official
term. It is introduced here for illustration purposes only, in an attempt to cluster all existing
TEKS and thus to provide a big picture of the distribution of students’ expectations (SE) within
the curriculum. From Table 9 can first be observed that the majority of SEs in the reading
curriculum navigates around reading comprehension. Second, it also can be seen that the reading
comprehension section consists of 26 student expectations for grades 4th and 5th and 25 SE for 3rd
grade. Lastly, there are no major differences in the distribution of SEs between the third and
fourth/fifth grade reading curriculum.
From a comparison of Tables 7 and 9, it can be concluded that the critical thinking curriculum was built solely on some SEs taken from the TEKS category of reading comprehension, as follows: only two out of 12 (for 4th and 5th grade) and 11 (for 3rd grade) reading comprehension SEs are considered critical; two out of four literary responses SEs are critical thinking skills, and only one out of 10 text structure/literacy concepts SEs is regarded as critical.

Why? What are the criteria that qualify those SEs and no others as critical? The bare stipulation of curricular relevance does not grant any SE status qualification of any sort. The bare existence of a curricular framework does not say anything about the content of the standards and the conceptual or functional definitions of many of the terms, as seen in the literature review and the problem statements of this study. Standards like “use knowledge of word order (syntax) to support word identification” do not necessarily require a major conceptual definition to be operational. However, standards like “draw inferences such as conclusions and generalizations and support them with text evidence” requires conceptual work to be operational since there are, for instance, several schools of thoughts that claim different ways of defining and conceiving terms like inference. The concept of inference is completely different for the formal deductive logic tradition than it is for the argumentation theory. But this is the topic of the next research question, which is, - What are the specific contents of the critical thinking concepts and skills and how are they sustained?

Research Question 2

The second part of this chapter presents the narrative findings from the qualitative analysis of the critical thinking items elaborated to test critical thinking at the elementary level in Texas. Research Question 2 asks:
2. What are different types of critical thinking concepts and skills and what is their structure used in Texas elementary education?

This is the question about the content of the curriculum standards. From Tables 7 and 8 above, we know the number and statements about concepts and skills that make up the universe of critical thinking in elementary education in Texas. But we know nothing about the content. In absence of curricular specifications or definitions about content and coverage of every skill and concept, an analysis of the items was suggested as a way of filling all these critical thinking categories and skills (like inference, literary response, generalizations, etc.) with specific content.

This descriptive analysis of the items is based on the application of the second data collection instrument called the adequacy condition rubric, outlined by Govier (1987) and Johnson (2000). The concept of a rubric was proposed by Govier and was fully developed by Johnson as a framework to develop a minimum of theoretical requirements that any theory of arguments would have to satisfy in order to adequately address crucial issues that the deductive formal logic could not satisfactorily answer. I hold in this study the thesis that a shortened and adapted version of the rubric can be used as a tool for the analysis and evaluation of arguments. I used it as a framework for answering the remaining three research questions of this study. Adequacy condition 2 will help us descriptively analyze the content of every item written to test critical thinking skills. The guiding questions of adequacy condition 2 are:

1. What are the different types of arguments?

2. What are the components and structure of each type of argument?

Answers to these questions will allow lying bare conditions that will reveal the very nature of those skills. However, before I try to respond to the questions, I will first point to various aspects that will provide us with the data necessary to address the questions. First, I will
pinpoint the distinction between prescribed and tested curriculum. This difference between the skills statements of the curriculum outlined above and the factual content domain of the skills present in the test items is often very evident. Not all skills statements described in the curriculum were tested and item content often times differs from the prima facie reading of the statements. This difference helps characterize the additional distinction between the tested and the accessible curriculum. Second, this study accounts for all accessible items at the elementary level, by student expectations, grade level, and year of testing. Finally, a categorization of all items by item type enables me to satisfactorily answer Research Question 2. Table 10 shows the standards for which test items were developed. It shows the spectrum of all student expectations from which data are available in the form of test items. They build the basis for the analysis of this study.

Table 10

Tested Critical Thinking Curriculum in Elementary Education

<table>
<thead>
<tr>
<th>Standard</th>
<th>Third Grade</th>
<th>Fourth Grade</th>
<th>Fifth Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make-Support Inferences</td>
<td>3.9F</td>
<td>4.10H</td>
<td>5.10H</td>
</tr>
<tr>
<td>Support Interpretations</td>
<td>3.10C</td>
<td>4.11C</td>
<td>5.11C</td>
</tr>
<tr>
<td>Connect/Compare/Contrast Ideas/Themes/Issues Across Texts</td>
<td>4.11D</td>
<td>5.11D</td>
<td></td>
</tr>
<tr>
<td>Authors Organize Info in Different Ways</td>
<td></td>
<td>4.12B</td>
<td>5.12B</td>
</tr>
</tbody>
</table>


From Table 10 above, we can conclude that one standard in particular, the standard about distinguishing fact from opinion (3.9J in third and 4.10J/5.10J in fourth/fifth grade), was never released to the public in TAKS times. It was actually the only TEKS that was selected and
included in the content domain of critical thinking that was never released. Even though there is evidence that the standard on fact and opinion was tested in 2005 and 2007, the tests were not released to the public. As noted previously (see Table 5 above), the yearly test release schedule was changed by the Texas legislature to a two years cycle in 2004 and again to a three year cycle in 2006. Fact and opinion items (3.9J) appeared in two third grade tests in 2005 and 2007 with one item each, which means that they were not released to the public. Again, in a non-released 5th grade test from 2008, one item (item number 26) was coded 5.10J (distinguish fact from opinion). Since we do not have access to those items, we cannot say anything about their content and therefore they are not included in this research. I had the honor of being invited by the TEA several times to the item review committee meetings that analyze and recommend items for field and regular testing. I saw many versions of fact and opinion questions that never found the way to the public and I am not authorized to disclose here. Tables 11-13 display a map of all the available data of this study. It shows accessible items at the elementary level, by student expectations, grade level, and year of testing. Table 11 is broken down by grade level: Table 12 exhibits all data available for third grade. Table 13 shows it for fourth grade and Table 13 depicts it for fifth grade.

The data from Tables 11-13 are important because they show us the total sample of critical thinking items. The population of 217 critical thinking items is distributed in the three basic conceptual strands or categorical constructs, as follows: 132 items evaluated students’ ability to make and support inferences; 69 items dealt with students’ responses (In third grade, responses are called interpretations.); 16 items handled the authors’ use of organizational structure of texts.
Table 11

**TAKS Released Test Items for Critical Thinking 2003-2009 Third Grade**

<table>
<thead>
<tr>
<th>TEKS</th>
<th>total # items</th>
<th># items/year</th>
<th># releases</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.9 F</td>
<td>EN 71, SP 71</td>
<td>EN 19, SP 19</td>
<td>3</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>2009</td>
</tr>
<tr>
<td>3.10C</td>
<td>14, 14</td>
<td>5, 5</td>
<td>3</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>2004</td>
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<td></td>
<td>3, 3</td>
<td>3</td>
<td>2006</td>
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<td></td>
<td>1, 1</td>
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<td>2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1, 1</td>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>Total 3 GR</td>
<td>85, 85</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*EN* = English test. *SP* = Spanish Test. # items/year = Number of test in a year. # releases = number of released tests. year = year of the test administration. Taken from http://www.tea.state.tx.us

Table 12

**TAKS Released Test Items for Critical Thinking 2003-2009 Fourth Grade**

<table>
<thead>
<tr>
<th>TEKS</th>
<th>total # items</th>
<th># items/year</th>
<th># releases</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fourth Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.10H</td>
<td>EN 22, SP 22</td>
<td>EN 5, SP 5</td>
<td>1</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8, 8</td>
<td>1</td>
<td>2004</td>
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<tr>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>4.11C</td>
<td>11, 11</td>
<td>3, 3</td>
<td>1</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>3, 3</td>
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<td>3, 3</td>
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<td>2009</td>
</tr>
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<td>4.12B</td>
<td>6, 5</td>
<td>0, 0</td>
<td>1</td>
<td>2003</td>
</tr>
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<td>2, 2</td>
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<td></td>
<td>2008</td>
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<td></td>
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<td>2</td>
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<td>2009</td>
</tr>
<tr>
<td>Total 4 GR</td>
<td>47, 46</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*EN* = English test. *SP* = Spanish Test. # items/year = Number of test in a year. # releases = number of released tests. year = year of the test administration. Taken from http://www.tea.state.tx.us
Table 13

*TAKS Released Test Items for Critical Thinking 2003-2009 Fifth Grade*

<table>
<thead>
<tr>
<th>TEKS</th>
<th>total # items</th>
<th># items/year</th>
<th># releases</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fifth Grade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.10H</td>
<td>EN 39 SP 37</td>
<td>EN 8 8 SP 1</td>
<td>2003</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 6 1 2004</td>
<td>17 17 3</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 3 2008</td>
<td>5 3 1</td>
<td>2009</td>
</tr>
<tr>
<td>5.11C</td>
<td>EN 24 SP 24</td>
<td>EN 4 4 SP 1</td>
<td>2003</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 5 1 2004</td>
<td>10 10 3</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 2 2008</td>
<td>3 3 1</td>
<td>2009</td>
</tr>
<tr>
<td>5.11D</td>
<td>EN 12 SP 12</td>
<td>EN 1 1 SP 1</td>
<td>2003</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 2 2004</td>
<td>6 6 3 2006</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 1 2008</td>
<td>2 2 1</td>
<td>2009</td>
</tr>
<tr>
<td>5.12B</td>
<td>EN 10 SP 10</td>
<td>EN 0 0 SP 1</td>
<td>2003</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 0 2004</td>
<td>6 6 3 2006</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 1 2008</td>
<td>1 1 1</td>
<td>2009</td>
</tr>
<tr>
<td>Total 5 GR</td>
<td></td>
<td>85 83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total CT items</td>
<td>217 214</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*EN*= English test. *SP*= Spanish Test. *# items/year*: Number of test in a year. *# releases*: number of released tests. *year*: year of the test administration. Taken from [http://www.tea.state.tx.us](http://www.tea.state.tx.us)

Spanish test items do not contribute to the possible universe of the content domain for two reasons. First, from the beginning of the TAKS assessment program until the 2005, Spanish versions of the test were direct translations of English items\(^{65}\). The second reason is that, even after 2005, the item specifications and item types of the Spanish TAKS version were not impacted by the restructuring of the Spanish version of the TAKS tests which, from 2006 on,

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included genuine Spanish passages and items that were not translated but were trans-adapted into Spanish. In the TAKS Technical Digest, from 2007-2008, SBOE and TEA reassured users that the new methodology of trans-adapting and independently developed assessment items in Spanish to authentically assess Spanish-speaking students from grades three to six had not modified either the blueprint of the test nor the performance categories\textsuperscript{66} of the original English test. In summary, given the fact that there were no curriculum guidelines available, no conceptual or operational definitions of terms, no item specifications or item development guidelines, no evidence tables and no TEKS glossary (up to 2012\textsuperscript{67}), the only way possible to reconstruct the content domain of polemic or complex concepts or terms used in the TEKS was an in-depth study of test items developed to assess those standards. Table 10 gave us the spectrum of the tested curriculum and Table 11 the number of items available for each standard.

Now it is time to apply the adequacy conditions. Adequacy condition two will help us descriptively analyze the content of every item written to test critical thinking skills. The guiding questions of adequacy condition 2 are:

Adequacy Condition 2 – First Question

1. What are the different types of arguments?

Reading Comprehension Arguments

Table 14 shows the test item data for all arguments within the first critical thinking strand and Table 15 breaks down the items into the different types of inference arguments


\textsuperscript{67} The first TEKS glossary of terms published by TEA dated back from 2011. See the 2012 Spring update at http://www.englishspanishteks.net/files/standards/TEKS/Glossary.pdf. The glossary reflect the stand of the new TEKS and can only partially be used in conjunction with the old TEKS in effect from 1999 to 2009
Table 14

*Reading Comprehension Number of Items by SE*

<table>
<thead>
<tr>
<th>TEKS</th>
<th>Reading Comprehension Standard</th>
<th>Number of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.9F</td>
<td>make and explain inferences from text such as determining important ideas, causes and effects, making predictions and drawing conclusions</td>
<td>71</td>
</tr>
<tr>
<td>4.10H</td>
<td>draw inferences such as conclusions or generalizations and support them with text evidence</td>
<td>22</td>
</tr>
<tr>
<td>5.10H</td>
<td>draw inferences such as conclusions or generalizations and support them with text evidence</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>132</td>
</tr>
</tbody>
</table>


Table 15

*Inferences - Types of Inferences Tested*

<table>
<thead>
<tr>
<th></th>
<th>Implication</th>
<th>Probability</th>
<th>Predictions</th>
<th>Generalizations</th>
<th>Analogies</th>
<th>Causality</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th Grade</td>
<td>6</td>
<td>28</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5.10E (3)</td>
<td></td>
</tr>
<tr>
<td>4th Grade</td>
<td>0</td>
<td>20</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4.10E (3)</td>
<td></td>
</tr>
<tr>
<td>3rd Grade</td>
<td>1</td>
<td>23</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>71</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>Percentages</td>
<td>7%</td>
<td>76%</td>
<td>10%</td>
<td>3%</td>
<td>2%</td>
<td>38%</td>
<td>2%</td>
</tr>
</tbody>
</table>


Even though during TAKS times teachers had no TEKS glossary available to them, it can be concluded, based on the characteristics of the TEKS description 4.10H and 5.10H, that the term inference is an umbrella term under which other forms like conclusions and generalizations are subsumed. Note that there is a difference between the third grade and the fourth/fifth grade standard regarding the types of inferences. Third grade standards mentioned additional skills such as ideas, causes and effects, predictions and conclusions. However, the TAKS booklets
explained the specific meaning of the term “such as” that precedes the different inference forms. When used in the language of TEKS, “such as” means that the examples that follow it are just that – examples, “representative illustrations that help define the expectation for teachers” (TEA, 2004, p. 9). Items can include these but they may include other forms of inferences as well. The important difference, however, seems to be the inclusion of cause-effect items as inferences in the critical thinking standard for the first to third grades. Informal logicians and argument theorists do not consider cause-effect relationships as critical, inferential thinking but as belonging to scientific explanation or reasoning (Ennis, 1996; Fogelin & Sinnott-Armstrong, 2005; Pinto & Blair, 1993) and from fourth grade on, even TEA has assigned cause-effect items a different code (4.10E and 5.10E) and subsumed them under TAKS objective three.

In fourth and fifth grade, the terminology of the standard (inference, conclusion, and generalization) reminds us of the tradition of the classical Aristotelian logic. In fact, even a dictionary definition of inference, for instance the Encyclopedia Britannica’s or the Merriam-Webster’s, would bring up something like this as a standard definition; inference “is a derivation of conclusions from given information or premises by any acceptable form of reasoning” ("Inference," n.d., p. 9). By the same token, the classical logic tradition called argument, is a “set of statements (propositions, assertions, beliefs, and judgments), one of which, the conclusion, is supported by the others – the premises” (Johnson, 2000, p.146). Going from this common understanding, the 132 test items developed by the TEA to evaluate inference skills fit into this definition. Table 15 shows the different types of inferences tested from 2003 to 2009.

According to Table 15, TAKS explored six different types of arguments to build the content domain of inferential thinking: arguments from implication, arguments from probability, arguments from prediction, arguments from generalization, arguments from analogy, and
arguments from causality. Probability arguments make up the majority of the critical thinking model in elementary education in Texas (76%). Probability arguments, implications and predictions comprised 93% of the universe of all critical thinking items developed between 2003 and 2009 in Texas elementary education. The skills of identifying, making and supporting these specific types of arguments or mastering these specific types of reasoning constituted the heart of the reading comprehension portion of the critical thinking model.

I also point to the fact that the third grade standard for inferential thinking includes causality arguments. Authors distinguished between scientific causality and best-explanation/causal inference (Ennis, 1996; Fogelin & Sinnott-Armstrong, 2005; Johnson & Blair, 1983; Pinto & Blair, 1993). The first type of arguments is a special case of scientific reasoning; therefore, they are not part of the conception of inference (Explanations are not inferences). The second type of arguments – best explanation inferences – is integrated within the arguments of probability in this study. The 38 cause-effect items referred to in Table 15 are items about the cause of something whose answer is either specifically stated in the text or an inference is not needed to answer the question correctly. If we subtract the 38 third grade causality arguments, the population of inferential thinking items comes down to 94 items.

_Literary Response Arguments_

Students think critically not only by making inferences and supporting them with evidence (reading comprehension). As well, they think critically by expressing responses to various types of texts and supporting those responses with text evidence (3.10C- 4/5.11C). In addition to this, students in third and fourth grade are taught to respond to literature by identifying ideas, themes, and issues in texts and by connecting, comparing and contrasting them across text (4/5.11D). Table 16 presents the breakdown of the literary response items by SE.
Table 16

**Literary Response - Number of Items by SE**

<table>
<thead>
<tr>
<th>TEKS</th>
<th>Literary Response Standards</th>
<th>Number of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.10C</td>
<td>support interpretations or conclusions with examples drawn from text</td>
<td>14</td>
</tr>
<tr>
<td>4.11C</td>
<td>support responses by referring to relevant aspects of text</td>
<td>11</td>
</tr>
<tr>
<td>4.11D</td>
<td>connect, and compare/contrast ideas, themes and issues across text</td>
<td>8</td>
</tr>
<tr>
<td>5.11C</td>
<td>support responses by referring to relevant aspects of text</td>
<td>24</td>
</tr>
<tr>
<td>5.11D</td>
<td>connect, and compare/contrast ideas, themes and issues across text</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>69</td>
</tr>
</tbody>
</table>


The concept of literary response within a multiple-choice test framework is less intuitive than the notion of inference. There is only one type or class of responses or interpretations for third, fourth and fifth grade (3.10C – 4/5.11C). Not so for the second type of responses. Literary responses, where students have to identify important ideas, themes, and issues in texts and connect, compare and contrast them, are fourfold (4/5.11D). Table 17 shows the types of response items tested in TAKS.

Table 17

**Connect Literary Responses - Types of Responses Tested**

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.11D</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4.11D</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>


Type 1 responses to texts are those that require students to connect inferences made during the reading of the selection to find an idea or an issue that is important throughout the selection. Types 2, 3 and 4 responses, on the other hand, require students to compare and
contrast two selections (called paired selections). In type 2 responses, students will find ideas, themes, or issues that are supported in the two passages. Type 3 responses ask students to determine ideas that are present in one selection but not in the other, or are considered more important in one selection than in the other. Finally, type 4 responses focus on character descriptions and ask students to find common characteristics or values in characters from two different passages. The specific content for literary response arguments will be developed when we discuss the components and the structure of this type of arguments within the adequacy condition 2.

Author’s Organization of Information

Critical thinking in Texas elementary education requires students to think inferentially and support their thinking with evidence, and to respond to texts and back up the responses with evidence. Additionally, it requires students to determine the way authors organize their information in texts. In Table 9, I mentioned the fact that from all 10 different types of skills on characteristics of texts, only this one is considered critical thinking by Texas education authorities. We will see if we can figure out reasons why by studying the items developed to evaluate that skill. Table 18 shows the breakdown of that knowledge and skill statement by SE.
Table 18

*Authors’ Way of Organizing Information - Items by SE*

<table>
<thead>
<tr>
<th>TEKS</th>
<th>Authors’ ways of organizing information in texts</th>
<th>Number of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.12B</td>
<td>recognize that authors organize information in specific ways</td>
<td>6</td>
</tr>
<tr>
<td>5.12B</td>
<td>recognize that authors organize information in specific ways</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>


Two characteristics are important for this standard, in our context. First, the skill refers to what authors do and not what students construct based on their comprehension or interpretation of their reading. The skill deals with the external aspect of comprehension (author’s intention and text structure) rather than with elaboration. From that perspective, this SE would belong rather to TAKS objective three than to four. I will discuss this more in extenso in Chapter 5. The second characteristic of this standard is that it does not require building arguments in any way. Both the inferential and the response strands require students to be able to construct or recognize an argument or the elements of an argument as the basis for comprehension. Standard 5.12B requires only determining the form that text organization takes and does not compel students to mobilize their own thinking to produce an acceptable response.

Adequacy Condition 2 – Second Question

2. What are the components and what is the structure of each type of argument? [What holds the structure of arguments together?]

Table 15 showed the five most important types of inferences found in the TAKS test: Implication, arguments from probability, predictions, generalizations, and analogies. With the help of some examples from all three grade level items, I will point to the components and inner structure of each type. Due to the multiple types of arguments, it seems more meaningful to
answer the remaining questions for adequacy condition 2 together for every type of argument so that the unity of the inference type keeps visible and more comprehensible for the reader.

Furthermore, to be able to answer these questions, I would like to also remind the reader of one of the historical consequences of the paradigm shift toward the logical conception of critical thinking elaborated in the literature review of this study. I mentioned there that the main consequence resulting from a logical paradigm of critical reasoning – as opposed to a context-based approach a la Socrates - was the distinction between argument analysis and argument evaluation. Questions regarding components and structure of arguments are settled at the level of argument analysis (Research Question 2 – adequacy condition 2), while questions regarding the support of arguments, the strength of the support and also the validity of arguments, will be handled at the argument evaluation level (Research Questions 3 and 4 – Adequacy Condition 3).

Reading Comprehension - Arguments from Implication or Entailment

In the literature review of this study, while discussing the nature of the classical logical paradigm of critical thinking, it was acknowledged that the term argument nowadays has come to mean essentially what, since Aristotle, is called the logical model of critical reasoning, namely a set of premises that leads to a conclusion. It was also said that this understanding is symptomatic of the view popularly presented as formal deductive logic. Logic text books “generally agree that an argument is a group of propositions or statements, of which one [the conclusion] is claimed to follow from the others [the premises], which are alleged to provide grounds for the truth of that one” (Chittleborough, 1993, p. 189).

So, an argument of implication or entailment reinforces the deductive focus of arguments so that “the conclusive relevance to its conclusion is attributed to its premises” (Bowles, 1994, p. 160). In an implication statement, it is impossible for the conclusion to be false if the premises
are true. Drawing a conclusion is based on the logical form of handling premises and is rendered through inference rules or truth tables.

All items on all five types of arguments in the entire history of TAKS tests have the same basic structure. They ask the students to identify the conclusions. For the students to be able to identify the conclusions in arguments, they have to know how to make them. All items in the TAKS test used specific models of prompting students. The typical prompt says something like “the student can tell that,” or “the student can infer that,” or “the reader can conclude that,” etc. Let’s see now how a basic implication argument in a fifth grade test looks. In a typical implication item, the passage would bring relevant information (premises) necessary to answer the question (conclusion). In this particular example, the story relates the fact that the artist who created the Lincoln sculpture exposed in the Rotunda, Washington D.C., was working on the sculpture for a few years (Premise 1) while Lincoln had his midday rest (Premise 2) until Lincoln’s death (Premise 3). A prompt in the question would look like this: “Based on the information in the story, the reader can conclude that Lincoln…” The answer choices display the following scenarios: A) never got to see his statute in the Rotunda, B) was upset that the sculpture took so long to finish, C) never liked the sculpture Vinnie made, and D) was sad that Vinnie wasn’t coming to see him. The correct answer A, or the conclusion, is warranted through the use of a simple rule of inference called modus ponens (there is p if p⇒ q).

To analytically discuss the argument analysis protocol (Johnson, 2000a) of this type of item, questions like the following need to be answered: Do we have an argument here? We saw in the item description that we have an argument of implication. Why? What are the components? Three premises were recorded (Premises 1-3) that would be necessary for a conclusion (A) to exist, namely that Lincoln never got to see his statue. Are premises and
conclusion distinguishable? In that scenario, the premises are propositions clearly distinctive from each other. Proposition A (conclusion) is different from Propositions 1-3 (in that for Lincoln to be able to see his statue in the Rotunda, he needed to be alive) and (somewhat) implied in the relationships of the facts termed as premises.

To analytically discuss the argument structure protocol (Walton, 1996) of this type of items, two essential questions need to be answered. First question: Are premises acceptable propositions? (Johnson, 2000a; Pinto & Blair, 1993 Chapter 6). In a deductive, formal argument, the acceptability of the premises is a pre-condition for the viability and soundness of the conclusion. If the premises are false, the conclusion, even though valid, will not be true (sound). In other types of inferences, the acceptability of the premises is different from their truth. In a predictive argument, for instance, the prediction of a trustworthy physician could be acceptable but not necessarily true. Second question: Is there a link between premises and conclusions? In our example, the link between the conclusion and the premises is warranted by the entailment character of the conclusion. If we eliminate one premise, the conclusion is not sustainable any more since, in a deductive argument, false premises cannot yield true conclusions. If we eliminate premise three, for example (that the artist worked on the statute until Lincoln’s death), we would be able to assume that she could have finished the statute before Lincoln’s death and eventually relativize the validity or formality of the argument.

How does the conclusion follow from the premises? We also briefly stated that for the conclusion to be drawn, a modus ponens formal test was necessary (if \( p \rightarrow q \) or its negation, if \( \neg p \rightarrow \neg q \)). The syllogistic presentation of this formal argument shows more clearly its deductive nature.

P1: For every person to be able to see his/her own statue, he/she needs to be alive.
P2: Lincoln was not alive when the statute was finished.

C: Therefore, we conclude that Lincoln did not see his statute.

We can see that even a superficial analysis of arguments reveals the nature of what students in elementary classrooms are supposed to learn. There are only six arguments from implication in fifth grade and one in third grade. An argument from implication means a valid deductive argument. The importance of deductive arguments will be discussed in Chapter 5. Here it is enough to say that the significance of deductive arguments is surely not quantitative (only 7% of all arguments are deductive). The significance has to do with the fact that, despite the low number of deductive arguments in the tested critical thinking curriculum, TEA uses the classification scheme (conclusions, generalizations, inference) and vocabulary of the deductive logic for describing the nature of all inferential arguments. Important in this context is the fact that formal deductive thinking is included in the curriculum for critical thinking in elementary education in Texas (albeit in that modest proportion).

Reading Comprehension - Arguments from Probability

As noted in the literature review, the problem with the logic model of argumentation, or deductive type of logic, is the limited applicability to arguments as they occur in the real world. In most disciplines, and in most everyday disputes, we do not deal with premises that are absolute true (Johnson & Blair, 2006; Walton, 2008). We deal with statements that may be true or that we believe are probably true or acceptable. Deductive logicians know (Finocchiaro, 1996; Woods, 2002a) that the tools of symbolic and mathematical logic are limited to artificial and formalized languages that have nothing to do with the structure of natural, “real” arguments (Goddu, 2007). Even Aristotle recognized that logic (syllogistic) was not appropriate to analyze arguments on the hoof. He assigned this task to his Rhetoric. Modern logicians and authors who
have studied the nature of arguments as they occur in the real world comprise the fields of informal logic and argumentations theory.

Most of the data collected in this study (76% of all inference items) fall into this category. As mentioned above, all items on all five types of arguments in the entire history of TAKS tests have the same basic structure. They ask students to identify the conclusions. For students to be able to identify the conclusions of arguments, they have to know how to make conclusions. In a typical argument of probability at the elementary level, the passage would contain enough information to enable students to make an adequate inference and come to a reasonable conclusion. In the specific case of a third grade story called *The Marfa Lights*, students read about strange light signals, regarded by some as a paranormal phenomenon, observable in a West Texas town, called Marfa. The story describes eye-witness accounts of the lights without providing any scientific explanation of the source of the lights and the nature of them. The student is prompted to answer an inference question in this way:

“The reader can tell that the Marfa lights --
A) do not move around,  B) have been seen by many people, C) can be seen during the day, D) are only white.” Based on available evidence, the student has to make the determination about which of these four statements most likely fits the description given in the story. For which of these statements is the evidence in the story more appealing? Other prompts for probable arguments are more specific but have the same structure: “What is the most likely reason that Roberto takes pictures of things in Marfa?” Other types of arguments from probability include value judgments and judgments about norms since they share the same argument structure.

The first question at the argument analysis level is as follows: Do we have arguments here? Probability arguments have components similar to deductive types of arguments. Why?
What are the parts? As distinguished from a deductive inference, a conclusion in a probability argument is not a true statement not previously known. Instead, a conclusion in a probability argument is a claim or best possible answer to questions one is not sure of, along with a belief attached to it (answer B is the right inference – despite the strange nature of the lights they are visible to the eye under certain atmospheric and light conditions). In a deductive argument, the belief or attitude toward the conclusion is a property of the truth of the conclusion. I cannot say the proposition $p$ is true, but I don’t believe it. Belief is attached to conclusions in a probability argument, but it is dependent on the support given to it. It is always expressed in degrees of certainty.

A sentence like the following is a standard statement for a probable argument: I think there are reasons for $p$ but I am not certain about it. There are premises that, instead of being true, are only likely to be true. They function as reasons for claims (in this case, the most salient characteristics of the Marfa lights). Are premises and conclusions distinguishable? The conclusion in an argument of probability is likely to be the most significant component of the argument. It presents what I think or believe the claim to be. In the example above, a student can say $C$ is the correct answer and bring some reasons for its acceptance. In view of the different status of premises and conclusions in arguments from probability, as opposed to deductive arguments, modern logicians since Toulmin (1958) have tried to develop a different terminology and a new nomenclature for real arguments. I will come back to that in Chapter 5 again.

At the argument structure level, we will encounter distinctions that are very important for the understanding of modern models of critical thinking. Are the premises acceptable? As distinguished from deductive arguments, where the acceptability of the premises is a property of
their being true, the acceptability of premises in a probability argument does not depend on their truth but on their reasonableness. Premises are accepted on the basis of the “say-so of a credible source” (Pinto & Blair, 1993, p. 105) or on the general acceptability of their content (Pinto & Blair, 1993; Toulmin, 1958; Toulmin, Rieke, & Janik, 1984). Even though, as a constituent of a state-mandated test for elementary education, acceptability of premises might not be an issue, acceptability of premises is certainly an issue as part of a critical thinking curriculum that establishes and guides instructional content for all students.

Next question: Is there a link between premises and conclusions? Yes, there is a link between reasons and conclusions in probability arguments, but of a different nature than the link between them in deductive inferences. I previously indicated that the link between premises and conclusion in a deductive argument is embedded in the notion of entailment. The link between premises and conclusion in an argument of probability lies in the concept of support. Entailment and support are two different concepts. While entailment provides truth and certainty to our beliefs, support provides reasonableness to accept conclusions. And this reasonableness comes always in degrees. In a textbook example, we could say: Premise A) cool people are between 19-38 years old. Premise B) Juliette is 39 years old; therefore, Premise C) Juliette is not cool. The link between C and A/B is implicit in A/B. We know that Juliette is not cool because of what is said in A/B. A and B are not there to persuade me to believe C. I have to believe C if A+B. A and B are not supporting the belief in C; they warrant the truth of C. There is no support in entailment; there is truth (Fogelin & Sinnott-Armstrong, 2005; Pinto, 2003; Pinto & Blair, 1993). There is no truth in probability statements; there could be only certain strength - reasons to believe conclusions and accept claims. The link between premises and conclusions is the concept of support and the quality of the inference depends on the strength of the link.
Seventy-six percent of the universe of items ever created in the TAKS tests between 2003 and 2010 were probability arguments, and teachers and students were not provided with clear information at the curricular level to be able to respond adequately in the TAKS test.

Reading Comprehension - Arguments from Predictions

Predictions are a special case of arguments from probability. While probable claims try to establish reasons or estimations about what might be true about something or acceptable or reasonable, predictions do the same about how likely it is that something will happen in the future. The higher the degree of support, the more likely the event is to happen. A prediction draws a conclusion about a future event from a past sample. As mentioned in the literature review of this study (p. 48), predictions and generalizations are based on a pair of intuitions: the repeatability of the nature (human and physical) and the intuition that characteristics of observed data reflect with certain likelihood the characteristics of the population. Making predictions is a very popular skill in elementary education, and its value is attributed mainly to its role in formulating hypothesis.

As stated previously, all TAKS items on all five types of arguments have the same basic structure. They ask students to identify conclusions. For students to be able to identify the conclusions of arguments, they have to know how to draw conclusions. As seen in Table 13, the largest number of prediction items is encountered in third grade, and they are based on two principles. First, predictions teach how story characters are changed by past experiences, and, second, they teach how behaviors repeat themselves under similar circumstances. A typical prediction argument at the elementary level uses these prompts: “What will Lucy probably do the next time she thinks _____?” or “Which of these will probably happen in the future?” In the specific example of Lucy and the Chickens, the story is about an eight-year old girl who lives on
a farm. Her dad taught Lucy all about the chickens and warned her not to let the chickens get out of the henhouse. However, circumstances led Lucy to open the henhouse. What will Lucy probably do next time? A) realize that chickens don’t need much water, B) spray water on the henhouse, C) open the henhouse again, or D) ask her parents to help.

Argument analysis: Do we have arguments here? As reported above, predictions share the components and structure of probability arguments. Why? What are the components? As probability arguments, predictions consist of premises, conclusions and evidence. A reasonable conclusion in inferences of probability is based on the acceptability of the premises while, in predictions, the reasonableness of a conclusion rests on the transferability of past experiences, of behaviors that are expected, of values that are accepted, and on data that are transferable into the future. The most likely conclusion will be the one that emulates the learning in past experiences. The prompts for predictions have therefore this form: What will happen next? What would this person do in similar circumstances? What about the premises? At the same time that premises in probable arguments are reasons for the acceptance of the feasibility of thinking, in predictions, premises are reasons for the feasibility of a future behavior. In arguments from probability premises are the carriers of the trust that we put in conclusions, while in predictions, premises transfer the trust of available data into future outcomes. Are conclusions and premises distinguishable? Yes, in predictions, premises feed from the past and nourish the future. In our example, Lucy knows how her future chickens will drink water.

At the level of argument structure, the question about the link between premises and conclusion is the central one. Even though a link exists between premises and conclusions in predictions, it greatly differs in that regard from arguments from probability. In the latter, the conclusion is as strong as the trust we put in the premises. This trust is the basis for our belief in
the conclusion. Not so in predictions. The trust put in the premises is only partially projectable in a future conclusion. That is why predictions are harder to support unless they are formulated as forecasts. The difference between prediction and forecasts is not only that forecasts are more specific and are based solely on quantitative data and model theories – not subjective experiences. Forecasts cover a range of possible outcomes as well.

Reading Comprehension - Arguments from Generalizations

Arguments from generalizations and analogies are underrepresented in Texas elementary education. One of the reasons might have to do with following example Ennis brought up in his very popular Critical Thinking book (1996): “Do you believe the following generalizations?

1. A person in trouble is more likely to get help from a group of witnesses to the person’s problem than from a single individual.

2. Mental patients are usually not dangerous to other people.

3. The most successful women in what is pretty much a man’s world are most often those with older brothers.

4. Public opinion polls are often accurate within one or two percentage points.

5. Friendships are more likely to be formed between opposites than people who are similar to each other.

6. You are apt to forget more in the first few minutes after learning something than in the next several hours.” (Ennis, 1996, p. 264)

According to the original source of these examples Ennis (1996) discussed in his book, the odd-numbered generalizations are false and the even-numbered ones are true. Ennis himself went through the list of the criteria for credibility and still had doubts about some of them. Despite the difficulties of drawing a clear line between generalizations and other types of arguments, the concept of generalization is very important in other disciplines as well, like in science and mathematics.
In Ennis’ operational definition, a generalization is a statement about a number of cases (Ennis, 1996, 2003). This broad definition allows for a variety of classifications of generalizations types. I refer here only to two that help us understand the parameters of the kinds of specificity that goes into the curriculum for critical thinking in elementary education.

The most common types are the so called limited-to-the-data generalization and inferred generalization. The limited-to-the-data generalization does not go beyond the data provided for the group. As an example in this category, I would like to bring up a fifth-grade item from the reading test in 2009. In the passage, the author lets the reader know that the main character Carly and his sister enjoy skiing and actually compete semi-professionally. As part of the premises, other circumstances are mentioned, such as frequent trainings, contests, etc. “The reader can tell that other members of Carly’s family –
A) hope Carly focuses on cross-country skiing, B) want Alex to quit skiing, C) enjoy the sport of skiing, D) expect Carly to win the race. The question asks students to generalize Carly’s and his sister’s love for skiing to other members of their family.

One example of an inferred generalization looks like this. In a fifth-grade test from 2006, an item asks the following question: “The reader can conclude from the story that a good fisherman must –
A) have his own boat, B) watch for fish in the water, C) use a special fishing pole, D) react to fish movements. The item asks the student to generalize the characteristics of one specific fisherman in the story to the universal population of fishermen.

At the argument analysis level, it can be said that generalizations are inferences. As such they are composed of premises, conclusion and evidence like every other type of argument discussed here. The conclusion is, at the elementary level, often an inference from the sample to
a (general or less general) population. The premises should contain the general characteristics of the population but the characterization ought not to be so specific that the jump to the larger population or to the general principle becomes too difficult to support.

At the level of argument structure, the question about the link between premises and conclusions is given through the relationship between the sample and the population. The inference is permitted if the characterization of the individual holds for a larger group. As a rule, Ennis recommends “the more informative a generalization, the more difficult it is to defend; and the less informative, the less susceptible to defeat by counterexamples” (Ennis, 1996, p. 270).

Even though the principle and argument of generalization are crucial for elementary education, the size of the item sample available does not allow for diversification and is too small to make relevant conclusions on the subject.

Reading Comprehension - Arguments from Analogy

As stated in the previous section, arguments from analogy are, in the Texas critical thinking curriculum, actually negligible. With two items in the entire history of the TEA assessment program TAKS, its role is almost not worthwhile studying. However, the learning of analogies in another section of the TEKS curriculum, from fourth grade on (Reading TEKS 4.2C), makes it curricularly significant.

An analogy is a comparison between two objects that highlights respects in which they are thought to be similar (Bartha, 2013). An analogical argument is, on the other hand, a form of analogical reasoning that takes accepted similarities between two objects to support the conclusion that some further similarity exists. Analogical arguments move from the premise that two things are similar in some respects to a conclusion that they must also be similar or
analogous in a further respect. From an argument analysis standpoint, we could represent an analogical argument in this way:

- A has properties P, Q, R and so on
- B, C, D have properties P, Q, R,
- B, C, D have property X

Conclusion: A probably has property X as well (Fogelin & Sinnott-Armstrong, 2005).

A typical argument from analogy is this fifth-grade item from a test given in 2006: “Why does the author compare the fire to a hungry monster?” In the correct answer to the question (to emphasize the danger of the fire), the relationship from which the two objects (the fire and the monster) are being compared, is clear. Logicians speak from “source domain” and “target domain.” Domain is a set of objects, properties, and relations in which two correspondent premises are being brought together. Source domain characteristics are being referred to as characteristics in the target domain to support an assertion about the target domain.

At the argument structural level, the link between premises and conclusion is not deductive and reasons for the analogy are being brought to support a claim regarding the presence of some properties in two different objects. The link is present when reasons can be made explicit for the correspondence between a selected set of items by indicating the most significant similarities.

*Literary Response - Support Arguments*

Earlier in this chapter, as the different types of argument were discussed, I remarked that the critical thinking curriculum knew two types of arguments to respond to literature, namely arguments to respond (3.10C, 4/5.11C) and arguments to connect (compare/contrast) responses to literature (4/5.11D). Regarding the first, arguments to response to literature, I noted that those
responses were unified. What I meant by that is that there is only one *type* or *class* of responses or interpretations for third, fourth and fifth grade (3.10C – 4/5.11C). Not so for the second type of responses. Literary response types, where students have to identify important ideas, themes, and issues in texts and connect, compare and contrast them, are fourfold (4/5.11D).

Arguments as response to literature were different from the inferential arguments discussed earlier. In what way were they different? Did they constitute a different type of reasoning or posed a different level of comprehension? The difference between these two standards is simple. Literary response arguments were the reverse side of inferential arguments. While the latter used the premises to prompt the students to identify the inference or conclusion in an argument, the first used the inference or conclusion to prompt the students to find the support. Inferential arguments in all five types evaluated students’ ability to make inferences or draw conclusions. Literary response items evaluated students’ ability to understand the support for inferences. Whereas the focus in inferential arguments was the conclusion, the focus in literary response arguments was the support. The typical prompt for inferential arguments was “the reader can tell…” or “the reader can conclude…” or “what is the most difficult part of Aaron’s life style?” In the typical prompt for literary response questions, the item provided the reader with a conclusion or inference and asked the student to find appropriate support for that inference. “Which sentence from the article shows that Turnbull is concerned that his students be good citizens?” “Which of these shows that Rosie’s father is a dedicated firefighter?” “Which idea form the story shows that the lion is a good judge of character?” “Which detail from the story supports the idea that _______ is becoming a popular holiday in the US?”

Arguments from probability, conclusions, generalizations, analogies and predictions evaluated students’ abilities to identify the premises, and draw conclusions or inferences that best
suited the premises. Literary response arguments evaluated students’ ability to identify and understand the support that inferences and conclusions are required to be acceptable.

*Literary Response – Connect and Compare/Contrast Arguments*

Earlier, I said that while there was only one class of literary response arguments, there were four different types or ways of connecting literary responses. Type 1 responses connected inferences made during reading with the purpose of finding ideas or issues that were important throughout the selection. Type 2, 3 and 4 responses, on the other hand, required comparing and contrasting two selections. In type 2 responses, students would find ideas, themes or issues that are supported in the two passages. Type 3 responses asked students to determine ideas that were present in one selection but not in the other, or were more important in one selection than in the other. Finally, type 4 responses focused on how characters acted either in the same way in two different circumstances (passages) or differently in similar circumstances (passages).

Even though the arguments were of the same types discussed earlier, the link between the premises and conclusions was of different sorts. Obviously, literacy response arguments were found in all other type of arguments but deductive arguments. In type 1 questions (“a common idea throughout this article” or “an important message present throughout this article”), the important link is identifying the one idea that is being supported through the article. The students tracked the different reasons that supported that one idea and had an understanding of what it meant to support one idea – make it important in one passage. In type 2 responses, the link was more complex, identifying the support for one idea in each of the two passages with the intention of comparing the support (“one idea present in both selections is,” “which important message can be found in both selections”). In most cases, the selections were different genres. The idea was linking the same conclusion with two completely different premises (two different
genres) so students would understand that one and the same idea can be supported from many
different angles and with very dissimilar reasons. The structure of the responses in the type 3
arguments was linking similar premises with two different types of inferences or claims (“What
is one idea found in ____ that is not present in ___”, or “One concept that is important in *New
Life in Mount Saint Helens* but not in “*Moving On* is that of-”) to show students that it is not
about the premises and topics but about the ideas, inferences and claims we can make, based on
them.

To conclude, in type 4, responses linking premises and conclusions within the character’s
realm offer a separate way of constructing arguments – arguments not based on propositions but
in feelings, emotions, values, and individual perceptions (“One way that McJunkin and
Schwachheim were alike was that both _”). This special type of response arguments will lead us
to interesting conclusions in Chapter 5.

*Text Structure – Literary Concepts*

Earlier, as I discussed adequacy condition question 2 – types of arguments, I made the
remark that this reading strand or knowledge and skill statement has a different status. I outlined
it based on two characteristics. First, it deals with an external aspect of comprehension which is
not shared with the other two strands of the critical thinking curriculum, reading comprehension
and literary response. It deals with the external structure of a text and the author’s intention in
organizing information. Second, it is the only strand in the critical thinking curriculum that does
not deal with arguments of some sort. Both the inferential and the response strands require
students to be able to construct or recognize an argument or the elements of an argument and
find ways to support it with reasons as the basis for comprehension, but not this strand. All items
about text structure in fourth and fifth grade have the same format: “How does the author
organize this article?” “The author organizes this story by –.” “How does the author organize paragraphs three through six of this article?” These are the three most common prompts used to evaluate this skill. All answer choices describe the intended purpose of the author by explaining, showing, describing, comparing, presenting, telling, etc. Since, in this section I am discussing argument components and argument structure, there is nothing that can be said about this SE and its content. I will make some further characterization in Chapter 5 of this study.

Research Question 3

This section presents further narrative findings from the qualitative analysis of the critical thinking items elaborated to test critical thinking at the elementary level in Texas. Research Question 3 asks:

What does it mean to think critically in Texas’ elementary education?

If I had to say in a nutshell what is the content of the critical thinking concept is that I have unraveled so far, I would have to assert that thinking critically in Texas’ elementary education consists basically in applying a set of skills that enables students to make arguments about something and support them with reasons. However, to answer research question three, there are still a couple of questions from adequacy condition 3 to respond to.

3. How is an argument supported? And what constitutes a strong or weak argument?

4. How can we know that the support for an argument is weak or strong?

So far, a study of test items on critical thinking has giving us a moderate picture of what students in Texas elementary schools need to learn to gain a critical understanding of what they read. Nevertheless, giving reasons to support a claim does not seem enough to rightly understand the critical thinking model assessed in elementary schools in Texas. If one would hold this here, even though accurate, it would not do justice to the totality of the TEKS items,
and the real intention of the model. The basic idea that arguments are reasons in support of a view, even though correct, seems to be insufficient. Why? One can give reasons to give directions to somebody, or make an excuse, or explain a technical issue, or even to lie to somebody. The whole purpose of making a claim and giving reasons in support of what we think is to persuade somebody of the truth or correctness or acceptability of what we are saying. Giving reasons for a claim is a necessary but not a sufficient condition for an argument (Johnson, 2000a, pp. 146-148). There is more to the reasons than just to support a claim. The reasons I give are in support of what I think claim to be true or acceptable, as reasons not only for me but for all people I address the claim to. Reasons have the function of justifying truth claims (Habermas, 1986; Pinto, 2003). I think the Texas critical thinking model for elementary grades, even though not explicitly, brings this aspect to light. Therefore, there is another component of arguments that we did not discuss in research questions 1 and 2. Claims or conclusions need to be accepted or believed (Pinto & Blair, 1993) for an argument to exist.

The inferential thinking items reviewed here have shown us what needed to be learned for a student to make inferences of different kinds. We saw the components and the structure of those arguments. The literary response items discussed here, on the other hand, have shown us how to understand, connect, compare and contrast the support reasons given across texts. However, how do we know that the reasons are actually supporting the claim? How do we know how strong my reasons are in supporting my thinking? We asserted beforehand that all argument types other than the deductive one required the notion of support and that there are differences in the degree of such support. The link between the premises and conclusion may vary in strength, and the strength of support is a decisive element to determine the acceptability of claims.
When we draw an inference, we take for granted the belief in the information present in the premises. We think that the acceptability or truth of the premises justifies our taking some attitude toward our conclusion. The stronger our attitude toward the truth of the premises (the expectation that they are true), the stronger is the link between the premises and the conclusion (Pinto & Blair, 1993). According to this, scholars speak from degrees of strength in arguments (Johnson, 2000). Pinto and Blair (1993, p.108) described the levels of strength of conclusions in the following terms:

- If the premises should make a person *absolutely certain* that the conclusion is true, the inference link has *maximum strength*.
- If the premises should make a person *confident* that the conclusion is true, the inference link would be *strong*.
- If the premises should make a person only *inclined to think* the conclusion is true, the inference link might be said to have *moderate strength*.
- If, giving the premises, a person can only *suspect* that the conclusion might be true, the inference link could be described as *weak*.
- If the acceptability of the premises should *make no difference* at all to a person’s attitude toward the conclusion, then the strength of the inference is *zero* (Pinto & Blair, 1993, p. 108.)

In a multiple-choice test like the TAKS test, items did not reveal the strength of the support. Within the item construction techniques used in tests such as TAKS, the student knew about the support to the claim because there was only one conclusion (correct answer) that really was related to the premises. All other choices were not good candidates because they were not related to any of the relevant premises of the question. Therefore, all literary response items we referred to earlier only showed that claims were supported but not how they were supported by reasons. More about this in Research Question 4.
So, argument strength tells us about argument quality. Does it mean then that the strength of the support is the criterion to decide about the goodness of an argument? Is the degree of strength of an argument the determining criterion to justify conclusions? Are strong conclusions or inferences with maximum strength good arguments whereas other arguments are bad or unacceptable? Answers to these questions would lead us into a different terrain, into the domain of adequacy conditions for truth or validity that is not the subject of this research study.

However, before closing this chapter, I would like to attempt, by way of a summary, a response to Research Question 3. To think critically in Texas elementary education meant to be able to learn and apply two sets of complementary skills. First, a critical thinker should be able to learn and apply a series of skills necessary to draw conclusions, and to make many different types of inferences. Second, a critical thinker should be able to learn and understand the notion of inference support (interpretations) so that he/she would be in the position to respond to interpretations. Within the first set of skills, critical thinkers should be familiar with the components and structure of each type of argument. When responding to interpretations (inferred ideas, issues), a student should recognize an inference and the support that is needed to understand the inference, connect the support within a text, and compare and contrast reasons given for inferences across texts. However, the limitations of the model are evident in that the critical thinker would not know how to construct a response, how reasons really support inferences, when a support is stronger or weaker than others and why they are acceptable and others are not.

At an argument analysis level, the skill-based notion of critical thinking promoted in Texas critical thinking curricula largely responded to adequacy conditions that allow students to understand and identify different types of claims based on premises placed throughout passages.
At an argument structural level, the skill-based notion of critical thinking tested in Texas does not adequately respond to criteria which would enable students to understand the logic of argument support; to create argumentative responses on their own; or to explain how reasons support claims and when reasons given for conclusions are sometimes strong, sometimes weak, sometimes acceptable, and sometimes inexistent. The specific aspects of when an argument is good (justified), the degrees of goodness in arguments, argument rebuttals and criticisms, etc. are topics that don’t belong to the elementary level of critical thinking. In fact, the middle school-high school TEKS system had elaborated items (not only multiple-choice items but constructed-response items at this level).

**Research Question 4**

Research Question 4 asks: What are the elements of a definition of the standard critical thinking concepts in elementary education in Texas, its purpose and components?

Whenever the term critical thinking appears in official documents in the Texas education system, it is associated with superlatives like being the ultimate goal of all readers (TEA, 2002), most important task in education, most important factor for success in school and life (TEA, 2004), etc. Is that high view of critical thinking, after studying the scope and limitations of the model, justified? The expectation linked to critical thinking is, in fact, far reaching: Critical thinking is the tool to change the minds of students (TEA, 2004). The job of critical thinking is, according to TEA, to change the lives of students by molding the way they think.

That is the explicit function of arguments, according to Texas education authorities. Students, by creating their own interpretations of what they read, and supporting their own understanding with evidence, acquire a more complete picture of what they are learning (TEA,
2004). Inferential thinking helps students deepen their understanding and grow, both in school and real life.

Based on all the information provided here, I would like to answer research question 4 by reviewing the basic three elements of a definition, as reported in the findings. Critical thinking is a set of skills viewed as tools to enable students to go beyond the lines (TEA, 2004) of what they read by building their own interpretations of texts and supporting their thinking through solid evidence. Making different types of claims empowers students to gain a broad understanding of instructional materials and identify reasons that support these interpretations.

The second aspect of the definition refers to the response part of thinking, namely the fact that making and connecting inferences or interpretations in a text prepares students to identify and analyze issues, themes, and topics that interest and affect them. By learning to recognize the range of support given to a claim throughout a story, students would sense what it means to build a strong support for a claim and to see when the support seems to be strong or non-existent. Additionally, by comparing and contrasting two different sets of reasons (in two completely different passages) given in support of the same or a different conclusion, students will understand the same issue from a different point of view, the strengths or weaknesses of reasons for the same idea, and/or transfer the support from one passage to another and have an idea when an argument is stronger than others.

Finally, and by way of a corollary, in a reconstructed curriculum out of the critical thinking items administered in the history of TAKS, the critical thinking model implemented in elementary education in Texas teaches students that positions or claims, in what they read and in real life, ought to be supported. We do not have to accept what others want us to believe without a reason proving examination of the motives and of the strength of the reasons given for that.
CHAPTER 5

SUMMARY AND DISCUSSION

Educational research should fulfill one of four purposes: to describe, to predict, to improve, or to explain a natural or socially occurring phenomena (Gall, Borg & Gall, 2003). Explaining such social occurrences should be accomplished by applying appropriate methodological approaches that fit the data and the purpose of the research so that the phenomena in question will be better understood. The purpose of this descriptive analysis was to reconstruct the conceptual nature of a notion of critical thinking that has been implemented in Texas elementary education since 1999 and whose definition and theoretical background have not yet been unveiled.

This study addressed four specific research questions which were answered using a two-phase research design: (1) through a qualitative analysis of a critical thinking curriculum, and (2) through a qualitative descriptive analysis of the way critical thinking has been assessed in Texas elementary education system since 2003. Data generated by this research design resulted in descriptive information presented here, which leads to a set of conclusions for each of the four research questions.

Discussion of Research Question 1

1. What is the critical thinking curriculum and how is it structured in the Texas elementary education system?

There has not been, in the Texas education system, a curricular document that, in a unified and clear way, designates skills as critical thinking skills. However, the concept itself has been assessed systematically since 2003. The critical thinking curriculum has been reconstructed and described here according to TAKS Objective 4 data collected. The critical thinking curriculum can be described as follows:
• Data revealed that, based on the TEA notion of curriculum, the process of constructing academic objectives for assessments elevated those objectives (TAKS Objective 4 for instance) to the category of a curriculum.

• Data have shown that at least TAKS Objective 4 (and possibly all other TAKS objectives) constituted a general academic objective – different from the TEKS objectives but conceptually more general than the TEKS. That allowed TEA to create a parallel curriculum.

• Data revealed (as shown especially in Table 8) that the critical thinking curriculum in the Texas elementary education system was built around three thinking strands (inferential thinking, student response or interpretations, and text structure). It consisted of eight big ideas or concepts and 10 thinking skills. Criteria for the selection were not disclosed.

• Analysis of the data showed that the specific content of those eight big ideas or concepts and 10 critical thinking skills is not intuitively derivable from the description of the objectives. There are no conceptual or operational definitions available for any of them. The specificity of the content, however, can be obtained through an analysis of all items used to assess those concepts and skills.

The particular origin of the curricular structure of critical thinking concepts and skills in elementary education in the state of Texas led to posing the question about the criteria used for the selection of both the strands and the specific content of skills and concepts within each strand. Creation of assessment objectives without a curricular backup is not new in the history of education in Texas. The fact that the publication of the curriculum, in the form of assessment objectives, preceded a selection process in which many institutions and groups of experts participated, allows us to propose at least two points for discussion. (1) There must have been a principle that informed the selection of critical thinking skills and concepts, regardless of
whether or not the public discussion was productive or unproductive. Why not disclose it? Future researchers might want to dig into that process. Later in this chapter, I will suggest that the curriculum structure of critical thinking in the new and reformed TEKS and in the STAAR is very similar to the structure reported here in this study. Regardless of whether the process of selecting TEKS as critical was guided by one theory or several theories, of which many were mentioned in the literature review of this study, there was a principle guiding the selection. Inferred curriculum content might have a lesser value than one that has been positively built and expressly backed up by research. Knowing the criteria that make a skill critical and a process critical thinking would help us dig into the theoretical backbone of the model that was intended to be achieved from the beginning, and, in this way, unveil the mystery for educators at all levels, administrators, specialists, and publishers.

I suggested, in Chapter 4, while presenting the findings for Research Question 1, that TAKS objectives posed the question of possible parallel curricula. This idea was based on the TEA notion of curriculum as a set of academic standards. I insinuated in Chapter 4 of this report that grouping academic standards – even though cut-off from any instructional arrangement – carries the presumption of instruction. I also presented side by side the two distinct layouts of the TEKS, with their student expectations, as well as TAKS Objective 4 with its corresponding student expectations, to facilitate a conclusion that may spring into anybody’s eyes: that the relationship between TEKS and TAKS objectives that existed before is similar to what we have now between the new TEKS and STAAR, namely, the notion of “readiness and supporting

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68 I personally traveled to Austin in 2010 and spoke with many of the persons that were protagonists of the selection process within the curriculum and assessment divisions. Searched in the TEA library and read the minutes of all institutional meetings that happened around the time and could not find any backup documentation of it.

69 A similar situation is now emerging with the grouping of academic standards in what is now known as Figure 19. As more and new STAAR items are released, the presumption that Fig. 19 standards comprise a kind of a curriculum is becoming stronger. My suspicion is that Fig. 19 is what replaces TAKS objective 4: the hidden curriculum for high level thinking and a critical thinking model.
standards”, established by the STAAR test. The assumption that tested standards are more important than untested is too intuitive to deny. The original structural view of the old TEKS and the more functional view of the TAKS objectives were not much different than today’s view of readiness and supporting standards. I would even go a little further and pinpoint the similarity between the basic general structure of the TAKS objectives and the current general structure of the new TEKS.

Further research is desperately needed in this area, not only because of a critical thinking concept. Further research about specific content, logic or rationale, and structure of the TEKS curriculum, is badly needed. TEA has never published any curriculum guidelines or brochures with information on the history and background of the standards, or about the rationale for selection and promulgation of the standards the way they appear in the official document. There never has been published research on background information that would inform the public as to why these standards and no others, and to explain why the current arrangement of standards exists. Critical thinking is just the tip of the iceberg, not only because of the public interest in what is conceived to be the ultimate goal of education of our children, but also because of the perceived incidence and impact that critical reasoning exerts on the quality of all areas of education.

Discussion of Research Question 2

2. What are the different types of critical thinking concepts and skills and their structure used in Texas elementary education?

Research Question 2 addressed the topic of the specific content of concepts and skills selected to be critical thinking skills in Texas elementary education. Given the fact of the public inaccessibility of curriculum guidelines, conceptual or operational definitions of terms, item specifications or item development guidelines, evidence tables, and TEKS glossary, the only
possible way to reconstruct the content domain of polemic or complex concepts or terms used in the TEKS was an in-depth study of test items developed to assess those standards.

This content was reconstructed by means of an analysis, categorization, and evaluation of 217 English and 214 Spanish test items designed to assess critical thinking standards, using an adequacy conditions rubric. The application of the rubric revealed critical elements of every type of argument, such as types, components, structure, and appraisal of all arguments developed to test critical thinking competence of elementary students from 2003 to 2009. Argument types and argument structure were described as follows:

- Data revealed that the universe of items constructed to assess critical thinking abilities fits a basic model of argument as the development of reasons in support of a conclusion that claims to be true or acceptable.

- Data showed that there is a difference between formal (designated), tested, and accessible (released) critical thinking curriculum. Within the inferential thinking strand, the particular content of fact and opinion, both in third, and in fourth and fifth grade, is inaccessible. There is no positive indication of the extent of content coverage and therefore of the value of that differentiation among arguments, other than the conjecture that facts and opinion represent the two most important components of arguments, namely premises (facts) and conclusions (opinion).

- In accordance with the structure of the critical thinking curriculum (Research question 1), data showed that the critical thinking model in Texas elementary education consists basically of arguments and response to arguments. Data analyzed revealed five different types of arguments and four different ways of connecting responses to arguments. The overwhelming majority of arguments developed to evaluate critical thinking are arguments from probability
(76%), followed by arguments from predictions (10%), deductive arguments (7%) and arguments from generalizations (3%), and analogies (2%).

- Data showed that items coded as response to literature are arguments designed to evaluate the notion of argument support. Even though there is not a criterion for a concept of degree of support, there are four different levels of understanding support as reasons given for a claim. The two most relevant ones evaluated are 1) students’ ability to connect information in order to find support for an idea, issue or theme; and 2) students’ ability to find support for a claim present in two different passages.

- At the level of argument component, data revealed that all arguments share the basic components of premises and conclusions; in each of them, premises were perfectly distinguishable from conclusions. At an argument structure level, there are arguments that follow necessarily from the premises (deductive arguments) and arguments where the conclusion does not necessarily follow from the premises and therefore are only probable (rest of arguments). In the first type of argument (deductive argument), premises did not support the validity of a conclusion (they established the truth of conclusions). In the second type, premises just supported the probability of conclusions. Therefore, the notion of support requires the complementary notions of criteria and degrees of support.

I argue that there is an assumption valid for all types of arguments in this model, namely that arguments are reasons developed in support of a claim. I also suggest here that this assumption hides a very important distinction between two types of arguments, namely deductive arguments and arguments from probability. I also argue that clarifying this distinction will make clear a limitation of the model. The model calls for an extension of the concept of argument.
In a further suggestion, I would like to discuss some implications of this assumption, regarding TAKS Objective 2 items that might uncover some inconsistency in the critical thinking model subject of this study. First, the assumption that critical thinkers develop reasons to support claims hides the important distinction mentioned above about the different structure of the deductive arguments and arguments from probability. The fact that both share the same components (premises and conclusions) does not imply that the premises and conclusions are linked the same way. Conclusions in deductive arguments are entailed in the relationship of the premises, but this is not so in probability arguments. In a fifth-grade test, we read that if global warming is the gradual increase in the overall temperature of the earth (Premise 1) and global warming effects are observable in the Antarctic (Premise 2), then many animal species are in danger (C). This is a deductive argument because the truth of the conclusions is entrenched in the truth of the premises. Premise 1 in another argument tells about Celina (a 10 year old girl from Paraguay) who loves weaving lace. The second premise developed the idea that making lace is an old family tradition in Paraguay that was passed on to her by her grandmother. The probability of the conclusion that Celina will teach it to her daughter is subject to the strength (or strength degree) of the conclusion conferred by an additional factor that is not evident in the item itself. Critical thinking items in the TAKS tests did not differentiate between deductive and non-deductive arguments. Even though both types share the components, the structure differs. The same argument structure that explains the truth of the conclusion in a deductive inference does not explain the support in a non-deductive, real-life argument. This could explain the strange situation observable in classrooms where students can answer a support question in a test without knowing why the reasons support the claim. Test construction requirements, e.g. that only the correct answer will show any type of reference to the text, hides the fact that the link between
premises and conclusions in these two argument types configures two different theories of how to support an argument. Finding a reference in the text became and supplanted the notion of support in the TAKS test.

Alternative theories of arguments, like Toulmin’s (Toulmin, 1958; Toulmin et al., 1984), are elaborated to account for the diverse aspects of the non-deductive nature of real-life arguments, as briefly presented in the literature review of this study, considered a different model and structure of arguments. According to Toulmin (1958), every argument is composed of a claim (or conclusion), the reasons (or premises) brought up to support the claim, and the warrant that licenses the step from the reasons to the claim. At the argument structure level, a warrant is the instance that explains the link between premises and conclusions. In Toulmin’s words, warrants are the guarantors that reasons account for the probability of the claim to be accepted (Toulmin, 1958, Chapter 3). In Toulmin’s terms, the probability of the conclusion that Celina would teach her daughter the art of weaving lace depends not so much on the fact that making lace is a strong tradition in Paraguay (premise or data). It also depends on the particular fact (Toulmin calls it rule or principle) that Celina’s family is very traditional, which is not stated explicitly in the story but is implied in the description of the cultural setting of Celina’s family. So the warrant that allows the claim to flow out of the premises would be something along these lines: Families with strong cultural ties are more likely to pass traditions like making lace to the next generations than families that are not.

Thus, warrants in Toulmin’s (1958) theory of argument supply the missing link or force which the truth of the premises provides in deductive arguments. Whereas the data or premises are the basis for a person’s claim, “the warrant is the person’s justification for inferring the claim from those grounds” (Hitchcock, 2003, p. 69). The role of warrants is essential when somebody
challenges a conclusion in an argument. The data are the reason for the claim, but what justifies the step from grounds to claim is a general consideration that authorizes our step to the acceptability or generality of our conclusions. The warrants’ quality and force are essential ingredients in a theory of real, everyday arguments (Bermejo-Luque, 2004).

When applied to all non-deductive arguments in the TAKS test at the elementary level and subsequently in the STAAR test as well, the theory of warrants seems to have the potential of bringing the notion of argument support from the field of testing to the field of teaching and thus revolutionizing our understanding of critical thinking. Incorporating a theory of warrant in our concept of argumentative thinking would lay the foundation for the understanding and justification of the notion of support for our thinking. Therefore, it seems that, for the purpose of explaining the role and importance of support in our everyday conclusions, a different theory of argument – different than a formal theory of inference - is needed that would account for the uncertainty, instability, and relativism in which our daily arguments take place. Future researchers could study the viability of Toulmin’s theory of argument as a basis for a K-12 critical thinking model. Future researchers interested in a K-12 general model for critical thinking would be able to lay down the fundamentals of a non-deductive argument model capable of accounting for all discursive issues in the K-12 curricula, from argument analysis issues to much more complex themes like validity of general and modal arguments, rebuttals, counterarguments, etc. They would pave the road for the development of a viable curricula and corresponding instructional programs and assessments.

I also want to suggest an additional controversy around a second implication of the basic underlying notion of argument as deductive conclusion. The literature review presented two basic essential distinctions within the Aristotelian, or logical, model of critical reasoning that are
a key part of the architecture of the logical paradigm of critical thinking: the relationships between propositions and beliefs (pp. 35-36) and beliefs and actions (pp.36-37). Simplifying, they can be summarized as follows: In the classical theory of inference, premises are propositions. The literature review of this study defined propositions in the classical logical paradigm as statements that carry the attribute of being true or false (p.36). According to this, beliefs are attributes of (true) propositions. In the classical logic paradigm, true premises are reasons to believe the truth of the conclusion. We cannot say, this proposition is true but I don’t believe it. Conative sentences, on the other hand, are not propositions; they are comprised of cognitive elements and elements like desires, fears, feelings, intentions, preferences, etc., elements from which we cannot say something can be true or false (Pinto, 2003). Conative sentences, which largely make up the universe of everyday, real-life arguments, however, are part of probability arguments and therefore part of our beliefs or actions.

With that being said, I observed that items coded within TAKS Objective 2, “The student will apply knowledge of literary elements to understand culturally diverse written text” (TEA, 2004, p.13), are inferential in nature. All items developed for TAKS Objective 2 shared the components and structure of probability arguments, as described in Chapter 4 of this study and whose premises could be described as containing conative elements of all kind (feelings, desires, intentions, values and expectations of all kind). Some examples of item prompts show this clearly:

Third grade: How do Cory’s feelings change at the end of the story? Why does Cory probably have trouble sleeping the night before the roundup? How does Shannon change at the end of the story? Why did Angelina sigh when she looked at the calendar?

Fourth grade: Hastin worries about becoming a mahout because __, Orlando is irritated in paragraph 7 because __. What kind of relationship does Mateo have with his father? What is the most likely reason that Grandfather pauses for a long time? What would most likely have happened if the father had not asked his son…?
Fifth grade: Why was it important that Muir and Stickeen get back to camp? How do Anne and Jim probably feel about the time they spend with ____? Why does Grandpa say that it’s probably for the best that ____? Why does Jordan have doubts?...

Table 19 shows the general breakdown of inference types associated with TAKS objective 2 for third, fourth and fifth grades.

Table 19

TAKS Objective 2

<table>
<thead>
<tr>
<th>Standard</th>
<th>Third Grade</th>
<th>Fourth Grade</th>
<th>Fifth Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characters</td>
<td>53</td>
<td>29</td>
<td>35</td>
</tr>
<tr>
<td>(3.11H - 4.12H - 5.12H)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plot, Setting, Problem/Solution</td>
<td>22</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>(3.11I/J – 4.12I – 5.12I)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi Total</td>
<td>75</td>
<td>36</td>
<td>53</td>
</tr>
<tr>
<td>Total Objective 2 Items</td>
<td>164</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Developed from data available of TAKS releases for 3rd, 4th, and 5th grades from 2003-2009

The question I would like to suggest here for discussion and further research is why those 164 inferences are not critical thinking, or more precisely, why was TAKS Objective 2 not considered critical thinking? There has to be something, such as a criterion or principle, which would be able to disqualify this specific type of inference as not critical and the required reasoning behind it as not critical reasoning.

What is the fundamental difference between TAKS Objective 2 arguments and TAKS Objective 4 arguments described in Chapter 4 of this study? I want to suggest that the only evident difference is the fact that premises in TAKS objective four items – largely – are propositional. My hypothesis is that TAKS objective two inferences were discarded as critical thinking items because they do not share the structure of deductive arguments. Another evidence for this hypothesis is the fact that the TEA did not create response items for TAKS Objective 2.
inferences. TEA did not conceive a level for the evaluation of support of this type of inferences (TAKS Objective 2 inferences.)

However, as we had the opportunity to observe in Chapter 4, the majority of the TAKS objective four items were probability statements, meaning they share the same components and the same structure of arguments from probability. This suggests an inconsistency in the model that baffled and confused educators, students and the public in general. I would like to suggest that future research on critical thinking models for basic education, like the one implemented in Texas, consider the possibility of unifying and simplifying the model in a way that teachers and students can know exactly what critical reasoning is and what it looks like in a test, as it should be taught and assessed.

Discussion of Research Question 3

3. What does it specifically mean to think critically in Texas elementary education?

Research Question 3 dealt with an additional component of arguments. The findings regarding this question showed that, to think critically, it is not enough to just make a claim about something and mobilize reasons for its acceptance. In addition to that, it is important to note that reasons given for a claim have the function of transporting an expectation for the solution of the claim. This means that critical thinking implies the expectation of an interaction, based on a cognitive attitude towards the claim, a belief in the merits of the claim. But how do we understand the merits of the support for a claim? That is what research question three was all about.

To think critically in Texas elementary education means to be able to learn and apply two sets of complementary skills. First, critical thinkers should be familiar with the components and structure of each type of argument. Second, when responding to interpretations (inferred ideas,
issues), a critical thinker should be able to identify the support that is needed to understand the merits of a claim, connect all pieces of the support within a text, and compare and contrast reasons given for inferences across texts.

However, the limitations of the model are evident when one tries to answer questions about how we know that the reasons are actually supporting the claim. How do we know how strong my reasons are in supporting my thinking? According to the findings of this study, the critical thinker would be able to identify the reasons in support of a conclusion. However, the critical thinker would not know how to construct a response, how reasons really support inferences, when a support is stronger or weaker than others, and why some reasons are acceptable and others are not. Neither TAKS nor STAAR items would yield a positive criterion to determine what makes a support weak or strong.

How is it possible then that TAKS and STAAR tests systematically assessed and still assess the concept of argument support without a positive criterion of what supporting a probable conclusion is? How can the degree of support be tested without any conceptualization of the notion of support? Research Question 2 findings presented types, components and structure of non-deductive, real-life arguments that have been used in the state-mandated assessment program TAKS. It also showed that there was not a distinction between the truth of a conclusion and the support of a probability statement. However, four different kinds of connecting and comparing/contrasting support for claims were adopted.

I would like to discuss the thesis here that what these four types of items actually did was to configure scenarios to creatively evaluate some type of degree of support for claims without having to develop a criterion for it. In the first type, finding reference information, related to the claim, throughout the story made the student aware (first quantitatively) of what it takes to
support an idea about something. Students would gain the view that supporting an idea is broaching it with different information. The second type prompted students to compare the support for an idea in two different passages. Students would intuitively assimilate the notion that you can advance an idea from two different perspectives. In the third type, by asking students to find an idea in one text that is not supported in another selection, the student will intuitively know what is supported and what not. Finally, the last sort of prompts evaluated a student’s ability to differentiate two similar characters’ descriptions. Undoubtedly, those are remarkable ways of academically advancing the topic of argumentation support but the question still remains as to whether or not students would gain an understanding of the purpose of reasoning, of the virtue of reasons, the purpose of challenging and contradicting reasons, demanding explanations for reasons and the quality of arguments without a criterion for what argument support actually means.

A concluding remark hereof refers to the effect of all these findings on teachers’ attitudes and the quality of their instruction. In absence of knowledge of all these intricate, complex, and sometimes sophisticated distinctions and levels of reasoning, teachers have a hard time in their instructional practices replicating, at the instructional level, the rigor and complexity required by the test. The easiest and sometimes only way is using assessment materials for teaching purposes because there is not enough clarity of what is expected. Thus, teaching to the test?

Discussion of Research Question 4

4. What are the elements of a general definition of critical thinking in elementary education in Texas, its purpose and components?

The basic features of the model for critical thinking implemented in Texas elementary education has been clearly described and characterized in this study. The purpose of this section will be to discuss the assumption of Research Question 4. Is the development of the items for
critical thinking in the history of TAKS tests sustaining a clear and solid definition of critical thinking? Is this definition consistent with the purpose of the model?

So far, I can hold that the critical thinking model implemented in Texas elementary education is a variant of what we called in the literature review chapter a “skills-alone approach.” The idea was that there is a certain sort of reasoning skills that, once acquired, would change the learning of instructional materials into a reflective practice. The expectation is that this practice would change the lives of students by transforming the way they think and making them reflective citizens, accustomed to accept only rational reasons for beliefs and actions (TEA, 2004). How do students do that? Students would do this by acquiring two sets of complementary skills. First, applying those skills means training students in the ability to make many different types of inferences that would enable them to create a critical perception of the world around them. At this level, the model responds sufficiently well to adequacy conditions of arguments. Students will be familiar and versed in the nuances of how to make deductive conclusions, generalizations, predictions, and arguments from probability and analogies. They will learn their components and be able to analyze them.

However, there is a second component in the model. It refers to the ability of understanding and responding to inferences and arguments. To contextualize this second component, I would like to refer the reader to a section in the literature review where an important consequence of the logical paradigm of critical reasoning was made explicit: The difference between inference and argument (pp.43-44). I have been using those terms interchangeably but they carry a distinction that I need to point here to. While inference in logical terms is reduced to a psychological or logical ability of referring premises to each other and through a set of formal rules producing conclusions, arguments on the hoof or real-life
arguments absorb all information from contexts to render claims that reasoning produces in interactions. In TEA terms, when it comes to responding to inferences or claims, the critical thinker needs to understand the reasons adduced for the acceptability of the claims, to recognize the merits of the reasons to support the claim, to discern the degree of support reasons transport, to challenge the support, and to explain its merits.

The problem with this second component of the critical reasoning model implemented in elementary education in Texas schools is that items designed to assess those skills do not differentiate between deductive arguments and non-deductive arguments. TEA assumed the logical paradigm for all types of arguments and does not differentiate between the truth of claims (deductive arguments) and the acceptability of the support. The discussion of Research Question 2 suggested an extension of the model by integrating a theoretical perspective that explains a criterion for support – warrants (Toulmin, 1958; Toulmin, Rieke & Janik, 1984) and Chapter 4 suggested a simple rubric for determining the degrees of support of reasons (Pinto, 1993). As a consequence, a detailed study of argument response items does not yield a notion of support nor a criterion that would enable us to determine with clarity when an inference is sufficiently or insufficiently supported. Nevertheless, TEA developed a range of four types of items that test students’ ability to discern support for an argument but, due to a lack of a criterion to understand when a conclusion is supported, students would not be able to create an acceptable response to claims, identify an acceptable response to a claim (saying: yes, but), challenge the support (what about this), or deny it (definitely no).

Finally, the model of critical thinking implemented in Texas at the elementary level left out a whole range of inferences or arguments of probability that deal with conative elements (sentences that involve feelings, intentions, goals, preferences, etc.). At this point, I do not see
valid reasons to discard them as non-critical thinking items for they share the same structure and are subject to the same limitations of arguments from probability of TAKS Objective 4.

As a way of concluding, I would say that, although the descriptive analysis of critical thinking items that assessed the learning of critical reasoning skills meet adequacy conditions at the inference level or argument analysis level, they do not meet adequacy conditions at the argument structural level. In other words, although students would learn to make a variety of inferences and distinguish argument components, they would not be in the position of understanding the notion of argument support for a variety of inferences or interpretations; of distinguishing claims that are satisfactorily supported, from unsatisfactorily supported ones; or of challenging reasons for a claim or rejecting claims in virtue of the reasons adduced for it. Therefore, I do not really think that the critical thinking model would satisfy the expectations that have been placed on it.

Recommendations

Recommendations for State Agencies

After centuries of intense debate, the research base on critical thinking concepts and skills is still extremely diversified and polarized. Opinions still diverge as to what defines critical thinking. State agencies should take a clear position in the debate and disclose the research that has informed the curriculum and the critical thinking test development process.

The panel of recognized experts that meets in Austin every year to critically review the content of the assessed standards at the high school level, called content validation review, should include elementary education. Clarification is highly needed in regard to those polemic concepts that require conceptual agreement and a theoretical foundation such as critical thinking concepts.
Since test items sometimes constitute the only access to the content of central curricular concepts such as critical thinking concepts and skills, state agencies should make available to the public all relevant documentation on item development, such as item content specifications, item guidelines, evidence tables, etc. That would allow the public in general and educators in particular to have a better knowledge about the content on which Texas children are being assessed.

Since test items are sometimes the only way to reconstruct the content domain of such highly polemic concepts and skills, state agencies should do a better job at releasing the state-mandated tests more often. The practice of yearly releases of state-mandate tests – leading by other states in the nation such as Florida, Virginia and other – is a sound public policy that gives not only the testing process but the overall educational world transparency and legitimation.

Recommendations for Future Research

The outcomes of this research resulted in a variety of additional questions that suggest areas worthy of future research. This study was restricted to the analytical description of the content domain of critical thinking via a reconstruction of the item domain. Research is highly needed in the area of standards-oriented analysis of critical thinking. Research on basic critical thinking content for elementary students is, in my opinion, priority number one.

A second area of intense need for further research is the possibility of exploring alternative critical thinking models for elementary education. Interesting to explore will be models that go beyond the classical skills-based approaches and include critical thinking dispositions.

A third area of future research would welcome studies that explore the viability of Toulmin’s theory of argument as the basis for a non-deductive critical thinking model for all
argumentative needs in K-12 education. Toulmin’s intention of reconstructing reasoning as communicative argumentation is a very attractive possibility for basic education.

As long as reaching high levels of thinking and obtaining cognitive maturity and autonomy are linked in any way with the development of democratic values and with the strength of civil rights and individual freedom, critical thinking will remain the central piece in our educational landscape and the enterprise of looking for alternative avenues of developing it in children will stay always in high demand.

Summary

The purpose of this dissertation was to understand the critical thinking that has been imparted to elementary school children in the state of Texas since 2003. The scenario I started with, in order to open up the field to investigate, was characterized by an apparent dichotomy. Virtually everyone agrees that a primary, yet insufficiently met, goal of schooling is to enable students to think critically (Willingham, 2007), and yet, the task seems near impossible due to the indeterminacy of the concept swamped with a myriad of contradicting, excluding and not well-delimited approaches. This indeterminacy of the content of critical thinking is also the central characteristic of the curricular content of the field at the elementary level in the Texas education system.

The research process began by framing four research questions that would eventually help describe the specific curriculum and the specific content, as well as unveil the most central characteristics of the theoretical model used to teach and evaluate critical thinking in the Texas elementary education system. The specificities of the content put forth for discussion in this study are pieces of a puzzle assembled by means of an analysis of all critical thinking items created to assess critical thinking competence from 2003 to 2009.
This research found that the elementary critical thinking model implemented in the state of Texas is a particular version of an approach known by the epithet of a *skill-only approach*, common since Aristotle’s times. In the literature review, I referred to this as the logical paradigm of critical thinking. The Texas model basically consists of two sets of complementary skills. The first set of skills focuses on creating in students analytical abilities that enable them to critically perceive the world around them by making diverse types of inferences. Students would be able to make their own judgments of what they perceive. The second set of complementary skills targets students’ ability to understand reasons adduced for the acceptability of one’s own and somebody else’s claims. Understanding the support for an argument allows judging the strength of reasons against an objective criterion, recognizing the merits of reasons to support a claim, being able to discern the degree of support reasons attribute to claims, challenging the support, and explaining the merits of claims. This second set of claims teaches students to become *critical* consumers of reasons by applying an objective criterion that helps them to judge between legitimate and unsupported reasons for claims. Critical thinkers at the elementary level not only judge what they learn, they understand and see the strength of the reasons put forth for the acceptability of judgments. Unfortunately, the detailed study of the critical thinking items does not yield the existence of such an objective criterion that addresses understanding the concept of supporting claims. TEA does not provide an objective criterion with which we could determine the feasibility of reasons. At this point, I would like to at least point out two weaknesses of the model that pinpoint aspects of interest for further research. One is internal and addresses the internal coherence of the model; the second is more external and targets the whole skills-based approach to critical thinking. I will briefly flag the main points of this criticism and underline their importance for further research.
Within the discussion of Research Questions 2 and 3, I pointed to two major weaknesses of the model. The Texas model of critical thinking, at the elementary level, was incomplete. It depicted a wide spectrum of inferential thinking arguments, declaring arguments from probability as the most important in the field (with 76% of all inferences being of this sort). However, item construction techniques and theoretical categories used to describe arguments suggested no distinction between deductive and non-deductive arguments, between truth of conclusions and support of reasons. Educators and students are left with no indication as to what makes a supported claim or of how to distinguish supported from unsupported conclusions. The model lacked a concept of support and criteria to determine the degree of support. Additionally, the Texas model of critical thinking at the elementary level was inconsistent with its own premises. Arguments from probability are highlighted as the central ones but the approach leaves out a whole body of arguments from probability (TAKS Objective 2 arguments) that evidently partake of the same components and same structure as the critical thinking arguments. The model also included a variable in the critical thinking curriculum (items coded 4.12B and 5.12B dealing with text structure) that is not argumentative in nature and does not seem to fit in an argumentative framework, as a whole.

The second weakness refers to the skills-based approach, as a whole. All criticism against the logicism of skills-based approaches hit the Texas approach at the elementary level as well. These criticisms range from generic objections as being uncritical approaches to critical thinking (Paul, 1992; Weinstein, 2003; Wright, 2002) to positivism critiques (Johnson, 1992a; Paul & Elder, 2006; Siegel, 1990). The most common objection conveys the idea that such approaches promote the teaching and learning of isolated skills with no criteria to differentiate between arguments and opinion or a good inference from an unacceptable one. As Wright
(2002) said, teaching isolated skills is asking students “to infer or generalize without teaching them what would qualify as plausible inference or sound generalization” (p. 141). The most demolishing criticism against the pure skills approaches, however, was presented in the literature review of this study (see section critique on Ennis’ pure skill conception of critical thinking, pp. 53-56). Siegel objected to all skills-based approaches that have the tendency to conceive critical thinking as abstract entities, regardless of the people that learn them. This important point is evident in the assumption of the central idea of the pure skills approaches. They hold the existence of a certain sort of reasoning skills that, once acquired, would change the learning of any instructional material into a reflective, reasons-based practice. Skills-alone approaches assume the idea that we just need to acquire those skills and they will mobilize every human disposition in the right place at the right time. The literature chapter reviewed in extenso the research on dispositions to make clear that a sustainable concept of critical thinking is not possible without the idea of human dispositions. It is not possible to expect a reflective social practice of reasoning by students without teaching and learning the dispositions of seeking the truth of arguments, respecting the persons that offer insights, considering seriously all points of view, seeking and offering reasons, reflecting on our own beliefs, accepting other’s reasons as better, being concerned about the welfare of the disputants, etc.

This study reconstructed the curriculum, content, scope, and definition of the model of critical thinking that has been implemented in elementary schools in Texas since 2003. It also pointed to some limitations and some criticism that are at the root of the system. The rationale for this study was the idea that, due to the lack of curricular specificity, the content domain of critical thinking could be reconstructed by first analyzing all available test items created to evaluate critical thinking skills since 2003 and, secondly, by applying adequacy criteria extracted
from two major and research-leading argumentation theories and scholars. However, the implications of this study for today’s educational landscape are undeniable. After a couple of years into a new TEKS curriculum and the new state-mandated test, the STARR, the parallel with today’s concept of critical thinking is striking. The new map of critical thinking skills, under the new TEKS, is basically the same as the old one. There are no additional elements, no critical thinking dispositions in either of the two systems (elementary-middle school and high school system), and no drastic changes in the basic notion of the two complementary sets of skills that constituted the heart of critical thinking in TAKS times. With only one STAAR released test available so far and just a few released critical thinking items, however, it is too early to make definite conclusions about the present and near future status of critical thinking in Texas elementary schools.
APPENDIX A

TAKS OBJECTIVE 4
To be successful in school, students must have the ability to bring different levels of understanding to the texts they read. Good readers can do more than “read the lines.” They ask themselves questions, make initial predictions, and create meanings as they move through a text. Good readers also know that as they read, they will likely change their mind about some of their early ideas and assumptions.

Why? Because as they read and acquire a more complete “picture” of the text, their understanding deepens and grows. They are able to answer their own questions, think critically about what they’ve read, develop their own interpretations, and use relevant parts of the text to support these interpretations. In essence, good readers understand that reading is a complex process that requires them not only to read “between the lines” but also to read “beyond the lines,” relating what they’ve read to what they already know. In this way reading becomes an important tool for thinking and learning, both in school and in real life.

TAKS Objectives and TEKS Student Expectations

Objective 4

The student will apply critical-thinking skills to analyze culturally diverse written texts.

(3.9) Reading/comprehension. The student uses a variety of strategies to comprehend selections read aloud and selections read independently. The student is expected to

(F) make and explain inferences from texts such as determining important ideas, causes and effects, making predictions, and drawing conclusions (1–3); and

(J) distinguish fact from opinion in various texts, including news stories and advertisements (3).

(3.10) Reading/literary response. The student responds to various texts. The student is expected to

(C) support interpretations or conclusions with examples drawn from text (2–3).

Objective 4—For Your Information

Items that assess the ability to read and think inferentially will require students to move beyond their basic understanding of a text to demonstrate a deeper, more complete understanding of what they’ve read. These types of items can take many forms; for example, they may ask students to draw a conclusion, make a reasonable prediction, understand the relationship between two parts of a text, understand how a text relates to their own lives, or understand the deeper meanings implied by a text.

To distinguish a fact from an opinion, students must be able to recognize when an author is using opinions or persuasive techniques to influence the thinking or actions of readers or when an author is merely presenting facts. Fact/opinion items will be assessed only in expository or mixed selections in which it is clear that the author’s intent is to persuade.
Students will be required to support interpretations or conclusions with evidence from the text. Answer choices for items of this type will include either paraphrased ideas or sentences taken verbatim from the text. However, an individual item will never mix these answer-choice options; that is, paraphrased ideas and verbatim quotes will not be combined in the same item. Answer choices using words, phrases, or sentences taken verbatim from the text will be italicized.

**Grade 4 TAKS Reading—Objective 4**

To be successful in school, students must have the ability to bring different levels of understanding to the texts they read. Good readers can do more than “read the lines.” They ask themselves questions, create meanings, and make initial predictions as they move through a text. Good readers also know that as they read, they will likely change their minds about some of their early ideas and assumptions. Why? Because as they read and acquire a more complete “picture” of the text, their understanding deepens and grows. They are able to answer their own questions, think critically about what they’ve read, develop their own interpretations, and use relevant parts of the text to support these interpretations. In essence, reading is a complex process that requires students not only to read “between the lines” but also to read “beyond the lines,” relating what they’ve read to what they already know. In this way reading becomes an important tool for thinking and learning, both in school and in real life.

**TAKS Objectives and TEKS Student Expectations**

Objective 4

The student will apply critical-thinking skills to analyze culturally diverse written texts.

(4.10) Reading/comprehension. The student comprehends selections using a variety of strategies. The student is expected to

(H) draw inferences such as conclusions or generalizations and support them with text evidence [and experience] (4–8); and

(J) distinguish fact and opinion in various texts (4–8).

(4.11) Reading/literary response. The student expresses and supports responses to various types of texts. The student is expected to

(C) support responses by referring to relevant aspects of text [and his/her own experiences] (4–8); and

(D) connect, compare, and contrast ideas, themes, and issues across text (4–8).

(4.12) Reading/text structures/literary concepts. The student analyzes the characteristics of
various types of texts (genres). The student is expected to

(B) recognize that authors organize information in specific ways (4–5).

Objective 4—For Your Information
Items that assess the ability to read and think inferentially will require students to move beyond their basic understanding of a text to demonstrate a deeper, more complete understanding of what they’ve read. These types of items can take many forms; for example, items may require students to draw a conclusion, make a reasonable prediction, understand the relationship between two parts of a text, understand how a text relates to their own lives, or understand the deeper meanings implied by a text.

Items that assess the ability to distinguish between fact and opinion will require students to recognize when an author uses opinions or persuasive techniques to influence the thinking or actions of readers or when an author is merely presenting facts. Fact/opinion items will be assessed only in expository or mixed selections in which it is clear that the author’s intent is to persuade.

Items that require students to support interpretations or conclusions with evidence from the text will include paraphrased ideas or sentences taken verbatim from the text. However, an individual item will never mix these answer-choice options; that is, paraphrased ideas and verbatim quotes will not be combined in the same item. Answer choices using words, phrases, or sentences taken verbatim from the text will be italicized.

Items that test a student’s ability to connect, compare, and contrast ideas, themes, or issues will most commonly be developed for paired selections. However, this item type may also be developed for a single selection if it includes multiple ideas, themes, or issues that can be clearly linked.

Items that assess a student’s ability to recognize that authors organize information in specific ways will focus on the organizational patterns authors choose to arrange and link ideas. It is important for students to know that authors organize ideas in various ways, depending upon how they want the reader to understand those ideas. Familiarity with common organizational patterns—for example, sequencing, description, comparison/contrast, cause/effect, and problem/solution—helps students learn how these patterns can affect the meaning of a text. If students are able to recognize this connection, they will develop their ability to comprehend, evaluate, and appreciate a wide variety of texts. For items of this type, students will be expected to identify general patterns rather than use specific terminology. For example, for an item assessing an understanding of an author’s use of sequencing, the student might be required to know that the author has presented ideas in the order in which they occur. However, the student would not be required to know the term *chronological.*
Grade 5 TAKS Reading—Objective 4

To be successful in school, students must have the ability to bring different levels of understanding to the texts they read. Good readers can do more than “read the lines.” They ask themselves questions, create meanings, and make initial predictions as they move through a text. Good readers also know that as they read, they will likely change their minds about some of their early ideas and assumptions. Why? Because as they read and acquire a more complete “picture” of the text, their understanding deepens and grows. They are able to answer their own questions, think critically about what they’ve read, develop their own interpretations, and use relevant parts of the text to support these interpretations. In essence, reading is a complex process that requires students not only to read “between the lines” but also to read “beyond the lines,” relating what they’ve read to what they already know. In this way reading becomes an important tool for thinking and learning, both in school and in real life.

TAKS Objectives and TEKS Student Expectations

Objective 4

The student will apply critical-thinking skills to analyze culturally diverse written texts.

(5.10) Reading/comprehension. The student comprehends selections using a variety of strategies. The student is expected to

(H) draw inferences such as conclusions or generalizations and support them with text evidence [and experience] (4–8); and

(J) distinguish fact and opinion in various texts (4–8).

(5.11) Reading/literary response. The student expresses and supports responses to various types of texts. The student is expected to

(C) support responses by referring to relevant aspects of text [and his/her own experiences] (4–8); and

(D) connect, compare, and contrast ideas, themes, and issues across text (4–8).

(5.12) Reading/text structures/literary concepts. The student analyzes the characteristics of various types of texts (genres). The student is expected to

(B) recognize that authors organize information in specific ways (4–5).
Objective 4—For Your Information
Items that assess the ability to read and think inferentially will require students to move beyond their basic understanding of a text to demonstrate a deeper, more complete understanding of what they’ve read. These types of items can take many forms; for example, items may require students to draw a conclusion, make a reasonable prediction, understand the relationship between two parts of a text, understand how a text relates to their own lives, or understand the deeper meanings implied by a text.

Items that assess the ability to distinguish between fact and opinion will require students to recognize when an author uses opinions or persuasive techniques to influence the thinking or actions of readers or when an author is merely presenting facts. Fact/opinion items will be assessed only in expository or mixed selections in which it is clear that the author’s intent is to persuade.

Items that require students to support interpretations or conclusions with evidence from the text will include paraphrased ideas or sentences taken verbatim from the text. However, an individual item will never mix these answer-choice options; that is, paraphrased ideas and verbatim quotes will not be combined in the same item. Answer choices using words, phrases, or sentences taken verbatim from the text will be italicized.

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APPENDIX B

ADEQUACY CONDITIONS RUBRIC
Any theory of argument that seeks to apply to argumentative discourse and to play an instrumental role in addressing the tasks that arise in the practice of rationally conducted argumentation must accommodate the following adequacy conditions (Govier, 1987; Johnson, 2000).

Adequacy condition 1

The theory of argument must contain a definition of argument and the elements that constitute an argument.

Justification. A theory of argument must begin and operate with an understanding of what argument is and what the elements or components of an argument are. This work falls to the theory of analysis.

1. What is the nature and purpose of an argument?

2. What are the elements or components of an argument and their relationships?

Adequacy condition 2

The theory must contain an account of how to understand the structure of arguments and how that structure may be analyzed (in its parts), and displayed in a clear and precise manner.

Justification. We can not adequately evaluate, appraise, or criticize an argument unless we understand its structure. If there are various types of arguments, they must be defined, and represented. These conditions likewise fall to the theory of argument analysis.

3. What are the different types of arguments?

4. What is the structure of each of the different types of arguments?

5. How can we understand (represent-restate) the argument?
6. How is the argument supported?

Adequacy condition 3

The theory must recognize that an argument exists in a continuum from strong to weak with various points in between. To put it slightly differently, there are degrees of logical virtue in arguments and the theory must reflect this. These conditions belong to the theory of argument appraisal.

Justification. Arguments are a human product and as such produced in ordinary language (not formalized, symbolic language). Therefore, they are expected to run the same range as other natural language constructs, that is, from strong to weak.

7. What constitutes a strong or weak argument?

8. How can we know that the support for an argument is strong or weak?

Adequacy condition 4

The theory must be able to recognize that there can be good arguments for a given position as well as good arguments against it. This adequacy condition is part of the theory of argument appraisal.

Justification. In human affairs there are often good arguments for a given conclusion and also good argument against it. Validity is a problematic notion with respect to natural language argumentations. This condition falls to the theory of argument appraisal.

9. What are the qualities that make an argument a good argument?
Adequacy condition 5

The theory of argument must be such as to allow for fruitful criticism. This falls to a theory of argument appraisal.

Justification. In appraising an argument we want to provide the arguer with good criticism so that he or she can make changes to his argument

10. What constitutes profitable criticism of an argument?
APPENDIX C

A KEY TO UNDERSTANDING THE TEKS INCLUDED IN TAKS GRADE 5 READING
Example from Objective 4

A

(5.11) Reading/literary response. The student expresses and supports responses to various types of texts.

The student is expected to

B \rightarrow (C) support responses by referring to relevant aspects of text [and his/her own experiences] (4–8).

KEY

<table>
<thead>
<tr>
<th>A. Knowledge and Skills Statement</th>
</tr>
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<tbody>
<tr>
<td>This broad statement describes what students should know and be able to do for fifth grade reading. The number preceding the statement identifies the grade level and number of the knowledge and skills statement.</td>
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<tr>
<th>B. Student Expectation</th>
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<tbody>
<tr>
<td>This specific statement describes what students should be able to do to demonstrate proficiency in what is described in the knowledge and skills statement. Students will be tested on skills outlined in the student expectation statement.</td>
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</tbody>
</table>

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<tr>
<th>C. [bracketed text]</th>
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</thead>
<tbody>
<tr>
<td>Although the entire student expectation has been provided for reference, text in brackets indicates that this portion of the student expectation will not be tested on TAKS.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. (4–8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student expectation is taught from fourth grade through eighth grade.</td>
</tr>
</tbody>
</table>

NOTE: The full TEKS curriculum can be found at http://www.tea.state.tx.us/teks/.
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