THE EFFICACY OF LEADERSHIP DEVELOPMENT, CRITICAL THINKING DISPOSITIONS, AND STUDENT ACADEMIC PERFORMANCE ON THE CRITICAL THINKING SKILLS OF SELECTED YOUTH LEADERS

By

JOHN C. RICKETTS

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This document is dedicated to my best friend, Jennifer.

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CRITICAL THINKING SKILLS OF SELECTED YOUTH LEADERS: THE EFFICACY OF LEADERSHIP DEVELOPMENT, CRITICAL THINKING DISPOSITIONS, AND STUDENT ACADEMIC PERFORMANCE

By

John C. Ricketts

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The primary purpose of this study was to identify and predict the critical thinking skills of selected youth leaders in the National FFA Organization. Voluntary participants in the study included 212 youth leaders from 50 states. To identify and predict critical thinking skills, we used researcher-developed measures of critical thinking skills in a leadership context, critical thinking dispositions, leadership training and experience, and demographics. The dependent variables were total critical thinking skill level and the specific skills of analysis, inference, and evaluation. The independent variables were age; gender; GPA; leadership training score; leadership experience score; total critical thinking disposition score; and scores on the specific critical thinking dispositions of innovativeness, maturity, and engagement.

Participants scored in the upper range of possible scores on critical thinking skills. Participants were most competent at analysis, followed by inference, and then evaluation.

Though not statistically significant, scores for critical thinking were higher for females than males. Age was not a predictor of competence in critical thinking, and critical thinking skills were associated with student academic performance. We found some correlation between leadership variables (training and experience) and critical thinking skill scores. We also found some correlation between critical thinking skills and critical thinking dispositions. The best predictive models of critical thinking skill scores included the variables GPA, leadership training score, innovativeness sum, age, and gender. Recommendations for educators included continued support of leadership development activities and formal leadership learning opportunities; and a call for strategies that promote critical thinking in agricultural education. Recommendations for further research are also included in the study.

CHAPTER 1
INTRODUCTION

Our study examines the critical thinking skills of selected youth leaders (leaders within a youth organization) in the National FFA Organization. Just what is critical thinking? Critical thinking, as defined by Glaser (1941), is the "attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences; knowledge of the methods of logical inquiry and reasoning; and some skill in applying those methods" (p. 5-6).

Richard Paul (1995) defined critical thinking as “A unique and purposeful thinking in which the thinker systematically and habitually imposes criteria and intellectual standards upon the thinking, taking charge of the construction of thinking, guiding the construction of the thinking according to [critical thinking] standards, and assessing the effectiveness of the thinking according to the purpose, criteria, and the standards [of thinking] (p. 21).

Peter Facione (1990), who conducted a national Delphi study of experts to define critical thinking, came up with the following definition: "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” (p.2). Facione went on to describe good critical thinkers as “habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to

reconsider, clear about issues, orderly in complex matters, diligent is 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 circumstances will permit . . ." (p. 3).

Why is all of this important to youth leaders in the FFA or to anyone else? First, The Committee on Agricultural Education in Secondary Schools (National Research Council, 1988) concluded that redirecting agricultural education programs was in order if graduates of those programs were going to be successful in college or the workforce. One of the key points of the committee's report was their conclusion that ample opportunities should exist for practicing critical thinking skills with increasing variety and frequency. Additionally, critical thinking has a purpose. Paul (1995) believed that critical thinking mastery would help students take command of their lives by continually improving the quality of their life experiences. A report by the United States Department of Labor (1991) identified critical thinking as one of the foundational competencies in the Commission on Achieving Necessary Skills in What Work Requires of Schools: A SCANS Report for America 2000. Could critical thinking also be a foundational competency required in a youth leader?

Harvey Siegel (1988) provided the following rationale for including the concepts of critical thinking in youth education. Siegel believed critical thinking should be a part of the educational system because youth deserve to be able to think critically, because critical thinking is becoming a necessary component of living life, and because today's youth are tomorrow's leaders. Siegel believes that the first reason to include critical thinking as an educational component is the moral obligation administrators and

educators have to treat students (and everyone else) with respect. He felt that not giving students the ability to critically think was disrespecting their right to freedom from oppression in the educational system and society. Additionally, he supported critical thinking as an educational component because of the competence it provides for living a productive life, which involves being able to think and reason about many different areas, for one cannot know all of the content that they should know at the start of a task. Finally, Siegel believed that critical thinking was necessary for democratic living. Most critical theorists (Ennis, 1985; Facione, Facione, & Giancarlo, 1997) agree that people in power and leadership positions should make decisions that consider all people, situations, and options.

The primary purpose of our study was to identify and predict the critical thinking ability of selected youth leaders in the National FFA Organization. Specifically, we sought

- To determine the critical thinking skill level of selected leaders in the FFA,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA),
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions, and
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

Background

Although critical thinking was the focus of the study, we evaluated critical thinking in the context of youth leadership development as a part of a larger effort to develop curriculum for formal leadership training among youth in agricultural education.

Leadership development has been a long-time claim and goal of agriculture education programs (Brannon, Holley, & Key, 1989). The National FFA Organization is accredited with developing leadership in youth in several research studies over the years (Ricketts, 1982; Townsend & Carter, 1983; Wingenbach & Kahler, 1997). The FFA positively influences leadership development of youth. How well can the FFA develop leadership in all students enrolled in agricultural education, when only a handful of FFA members seem to participate in leadership development activities? This problem led us to study leadership development curriculum for youth in agricultural education.

A comprehensive leadership curriculum was needed to teach all students leadership development, whether students were FFA members or not. The Model of Youth Leadership Development (a meta-analytical review of leadership curricula, textbooks, and research pieces) was used to begin developing the curriculum (Ricketts & Rudd, 2002). The model is explained in Chapter Two, and is comprised of five major constructs:

- Leadership knowledge and information
- Leadership attitude, will, and desire
- Intrapersonal and interpersonal skills
- Oral and written communication skills
- Decision-making, reasoning, and critical thinking skills.

The last construct, which dealt with critical thinking, was chosen for our study. This dimension of leadership development was the least addressed in agricultural education curricula and other youth leadership development studies. This study could immediately contribute to leadership development curricula.

Problem Statement

Edwards (2003) concluded the student behavior of critical thinking "ought to be occurring in secondary-level agricultural education classrooms and laboratories" (p. 189). But is it occurring in these settings? If critical thinking is occurring, to what extent is it occurring, and does it help students in any way? Although critical thinking studies (Cillizza, 1970; Vygotsky, 1978; Wilson, 1989; Torres, 1993; Rudd, Baker, & Hoover, 2000) have been numerous in previous years, limited research related to critical thinking and youth was identified, especially in the fields of agricultural education and leadership development. Calls for further critical thinking research have been made by agricultural education (Cano & Martinez, 1991; National Research Council, 1988; Ware & Kahler, 1988), but few answers to those calls have been provided. Since research in the specific contexts of youth, leadership, and agricultural education was limited, ways of evaluating critical thinking in these contexts were not available.

The lack of research and evaluation procedures for measuring critical thinking seems ironic since several state and federal bodies have mandated critical thinking be a component of education programs. One example of such a mandate is from the state of Florida and the Department of Education. *Standard 4, Creative and Critical Thinkers* mandates that Florida students use creative thinking skills to generate new ideas, make the best decision, recognize and solve problems through reasoning, interpret symbolic data, and develop efficient techniques for lifelong learning (Florida Department of Education, 1995).

According to the report from the Florida Department of Education, educators are called to develop students as information managers, effective communicators, numeric problem solvers, critical thinkers, responsible and ethical workers, resource managers,

systems managers, cooperative workers, effective leaders, and as multiculturally sensitive citizens (Florida Department of Education, 1995). The report mandated that each of the aforementioned goals be included in every subject area, but the measures (i.e., *Florida Comprehensive Assessment Test*) currently used are generalized, non-specific tools for assessing critical thinking. Not everyone agrees that critical thinking is subject specific (Paul, 1995). However, if critical thinking is subject-specific (Ennis, 1989; Facione, 1990; Tindal & Nolet, 1995; Angeli, 1999; Halliday, 2000), and if it is believed that leadership development and agricultural education are subjects which require learners and workers who are critical thinkers, as the National FFA Organization believes (National FFA Task Force on Leadership and Personal Success, 2002); then there seems to be a need for a study that would explain the critical thinking ability of youth leaders in agricultural education.

Significance

Our study has the potential to impact the research participants themselves, and also the population of young leaders they represent. Being able to explain critical thinking skill in terms of the independent variables used in the study could help curriculum developers, educators, and administrators to develop the critical thinking evaluation and implementation procedures necessary to increase the overall critical thinking skills and dispositions of students. Knowledge about the effectiveness of critical thinking training in the context of leadership and agricultural education could also influence the leadership training programs offered by youth organizations such as the National FFA Organization.

The National FFA Organization has, as part of its mission, a primary goal of leadership development. If, as has been argued, critical thinking is a key component of leadership development (National FFA Task Force on Leadership and Personal Success,

2002), then our study could be key to the programmatic mission of the National FFA Organization. Additionally, other organizations, which care about young people's development of their leadership skills and abilities in order to succeed in agricultural education or other business and industry, could use the findings of our study in the development of those youth.

If development of critical thinking ability can be explained, the pedagogy of critical thinking instruction could become more relevant and effective. What better reason to conduct a piece of research than to be able to say, "This subject can be taught better as a result of our findings?"

Our study is significant because previous studies have failed to examine the critical thinking of young people in a contextual manner (Cillizza, 1970; Vygotsky, 1978; Wilson, 1989; Torres, 1993; Rudd, et al., 2000). Although our study is in the specific context of agricultural education and leadership of youth, the scope of its influence in the critical thinking body of literature should be significant. The substantial additions our study will make to the body of knowledge include

- Discipline specific critical thinking research for youth
- Critical thinking research in the context of leadership development, and
- Critical thinking research in the context of agricultural education

Purpose

As stated above, the primary purpose of our study was to identify and predict the critical thinking skills of selected youth leaders in the National FFA Organization. Specifically, our study sought

- To determine the critical thinking skill level of selected leaders in the FFA
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA)

- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

The specific objectives of the research, stated as research questions, were as follows:

- What is the critical thinking skill level of selected youth leaders in the FFA?
- What is the relationship between critical thinking skill level of selected youth leaders in the FFA and age, gender, and GPA?
- What is the relationship between critical thinking skill level of selected youth leaders in the FFA and level of leadership experience and training?
- What is the relationship between critical thinking skill level of selected youth leaders in the FFA and their critical thinking disposition?
- What variables can be used to predict the critical thinking skill level of youth leaders using age, gender, GPA, leadership, and critical thinking dispositions?

Limitations

The conclusions and implications drawn from this study were subject to the following limitations. Data were limited to those obtained from the accessible population of outstanding leaders who served as delegates for the National FFA Convention in 2002. Therefore, generalization of the results of this study to other youth is limited to the degree to which those youth leaders are similar to the population and sample used in this study.

Developers of sound educational instruments use thousands of subjects to test the reliability of their instruments. The low number of subjects available for pilot testing of the instrument could have caused the instrument to be less reliable than optimum. The newness of the instrument naturally causes it to be less reliable. This lack of reliability can cause an attenuation effect, masking possible relationships a study.

Definitions

For the purposes of our study the following items were defined operationally:

- **Age***:* a variable not usually found to be associated with critical thinking was included in the study to help account for the leadership experience level of students. The ages for the studied ranged from 16 to 21 years.

- **Agricultural education**: a term used to represent the profession of teaching students about all areas of agriculture from production to consumption. Many times it is used in our study to denote any agricultural situation, occurrence, or topic where a student may learn something as an outcome, whether an agricultural educator is present or not.

- **Critical thinking**: the definition developed by a national panel of experts using Delphi inquiry is "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"(Facione, 1990). More simply, "critical thinking is thinking that has a purpose..." (Facione, et al., 1998b).

- **Critical thinking skill/ability:** the competency level of utilizing the components of critical thinking. Three of Facione's (1990) skills (Analysis, Inference, and Evaluation), which were believed to be possible to measure and representative of all of the critical thinking skills outlined by the Facione Delphi study were used to depict critical thinking skill in our study.

- **Critical thinking disposition:** the pre-disposed attitude one innately possesses regarding critical thinking. The conceptualization used in our study was adapted from Facione's (1990) Delphi report. Facione developed six subscales (truth-seeking, open-mindedness, systematicity, self-confidence, inquisitiveness, and analyticity) of critical thinking disposition, which were discovered by Moore, Rudd, and Penfield (submitted for publication) to be lacking in discrimination power. The Delphi report was re-evaluated for our study, and three subscales (Engagement, Maturity, and Innovativeness) were generated to more effectively determine the specific factors of critical thinking disposition.

- **Efficacy:** "the power to produce an effect" (Woolf, 1977, p. 362)

- **FFA:** formerly the Future Farmers of America, it is a youth organization of individuals enrolled in agricultural education courses. It is intended to supplement the agricultural education process with opportunities for students to develop their leadership, personal growth, and success in their future careers.

- **Gender**: variable that has been found to be associated with critical thinking skill and disposition. The variable is of particular interest because of the recent preponderance of females in leadership roles in the FFA.

- **Grade point average:** GPA was self-reported in our study. This measure of student academic performance has been a strong predictor of critical thinking skill and disposition throughout the literature.

- **Leadership Training score:** the leadership training score was derived from the leadership training activities in (i.e., FFA leadership conferences, FFA leadership training camps) and out (i.e., leadership courses) of the FFA that were coded by the researcher as a formal leadership training (learning) experience.

- **Leadership Experience score:** the leadership experience score was derived from a checklist provided by the researcher by open-ended questions, which asked participants to list the experiences they perceived as beneficial to their own personal leadership development. (i.e., being an officer, FFA Career Development Events, athletics).

- **Leadership score:** the leadership score was derived from the number of FFA leadership activities the subjects checked off on the demographic part of the critical thinking instrument, the additional activities they listed, which added to their leadership, and whether or not students have taken a course in leadership development. The *leadership training score* plus the *leadership experience score* comprised the *leadership score*.

- **Subject and/or context-specific:** adjective used to explain that critical thinking measurement should be precisely related to the particular discipline or area about which one is engaging in critical thinking. Our study in set within the specific contexts of leadership development and critical thinking.

- **Youth:** young people in secondary education and even into their first year of college. Youth in our study ranged from ages 16 to 21 years.

- **Youth leader:** youth enrolled in the National FFA Organization that are active participants in the opportunities provided by the FFA; hold some type of leadership position within each respective state; and were either elected or nominated to be a National FFA Convention Delegate.

Chapter Summary

The primary purpose of our study was to identify and predict the critical thinking skills of selected youth leaders in the National FFA Organization. This chapter provided an explanation and background for the research study. A brief description of critical thinking was presented, and reasoning for studying critical thinking within the context of leadership development was discussed. Critical thinking is a component of youth

leadership development, and competence in critical thinking gives students the opportunity to take control of their lives, be successful in the dynamic world or work, and excel as leaders.

The significance and justification of the research was also described. Primarily information concerning contextually specific critical thinking, which had not been evaluated before our study, could help curriculum developers, educators, and administrators to develop the critical thinking evaluation and implementation procedures necessary to increase the overall critical thinking skills and dispositions of students. Additionally, our study was described as important because of its potential value to leadership development and critical thinking. Understanding critical thinking skill allows it to be taught and assessed more easily, especially within the context of leadership development.

The research objectives were also included. They were

- To determine the critical thinking skill level of selected leaders in the FFA
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA)
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

Chapter 2 details and reiterates many of the claims made in this chapter with empirical evidence; and introduces the reader to the theoretical framework of the study.

CHAPTER 2
REVIEW OF THE LITERATURE

Chapter 1 described the rationale for evaluating and explaining critical thinking in youth leaders in the FFA. The primary purpose of this study was to identify and predict the critical thinking skills of selected youth leaders in the National FFA Organization. Specifically, this study sought to

- To determine the critical thinking skill level of selected leaders in the FFA,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA),
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions, and
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

This chapter describes the theoretical and conceptual frameworks, and the empirical research relevant to this study. A large body of critical thinking literature was examined in the following areas:

- Youth leadership development
- General knowledge in critical thinking
- Critical thinking skill and its relationship to critical thinking disposition, age, gender, experience, and prior knowledge.

The review of the literature focused on refereed and nonrefereed publications in the education, business, and industry literature; doctoral dissertations; proceedings from

educational research meetings; articles appearing in the ERIC Documentation Reproduction Service; textbooks; and governmental publications.

Youth Leadership Development

Our study concentrated on a specific group (which was youth leaders in the FFA) and a specific context (leadership development). We examined youth leadership literature and reported on the studies specific critical thinking in leadership.

Studies that address leadership and youth specifically, while incorporating some measure of critical thinking in their conceptualization of leadership development were found to be limited. DesMaria, Yang, and Farzenhkia (2000) indicated certain elements which were necessary in the development of youth leadership. They listed the critical elements as

- Youth/adult partnerships
- Granting young people decision making power and responsibility for consequences
- A broad context for learning and service, and
- Recognition of young people's experience, knowledge and skills (p. 3).

VanLinden and Fertman (1998) said, "Leaders are people who think for themselves, communicate their thoughts and feelings, and help others understand and act on their own beliefs; they influence others in an ethical and socially responsible way." Research by vanLinden and Fertman on leadership development in youth was the theoretical framework prompting the development of the *Model of Youth Leadership Development* (Ricketts & Rudd, 2002).

To understand the group and context being studied, Ricketts and Rudd's (2002) *Model of Youth Leadership Development* was examined (Figure 2-1). Based on the research of Fertman and Long (1990; Fertman and Chubb (1993); Wald and Pringle (1995); Long, Wald, and Graff (1996); and Kolb (1984); the model demonstrated a way

of fostering leadership in youth in career and technical education programs, such as agricultural education, general secondary education curricula, agricultural extension programs, and even post secondary undergraduate study. Each construct of the conceptual model of youth leadership development suggested a curricular unit for each stage (Awareness, Interaction, and Integration). The model recommended that the constructs be taught on three different hierarchical levels that engage higher order of thinking. The stages are conceptually aligned with the experiential learning theory of Kolb (1984), who purported that learning should come from a holistic integrative activity that combines experience, perception, cognition, and behavior. The stages seek to build on the experience and perception of students in order to enhance cognition and behavior in leadership development.

The five constructs or dimensions of youth leadership development in the model are:

- Leadership knowledge and information: The dimension of leadership knowledge and information represents what youth need to know about leaders and leadership before they can proceed with their application of leadership concepts.
- Leadership attitude, will, and desire: Leadership attitude, will, and desire is the dimension designed to stress the importance of disposition, motivation, self-realization, and health in fulfilling a student's leadership capacity.
- Intrapersonal and interpersonal skills: Conflict resolution, stress-management, teamwork, and ethics combined with knowledge regarding diversity, personality types, communication styles, leadership styles, and other human relations abilities all fall into the final dimension. This human relation dimension prepares students to look inward and to work with others in the most optimum ways possible.
- Oral and written communication skills: Oral and written communication skills are the media for sharing knowledge, interests, attitudes, opinions, feelings, and ideas in order to influence and ultimately lead others (vanLinden and Fertman, 1998).
- Decision-making, reasoning, and critical thinking skills: Critical thinking is a reasoned, purposive, and introspective approach to solving problems or addressing

questions with incomplete evidence and information, and for which an incontrovertible solution is unlikely.

Decision-making, reasoning, and critical thinking skills represented the construct, which was evaluated in our study. Critical thinking research was very limited in agricultural education, and findings in this area will provide the most immediate and direct benefit to agricultural education.

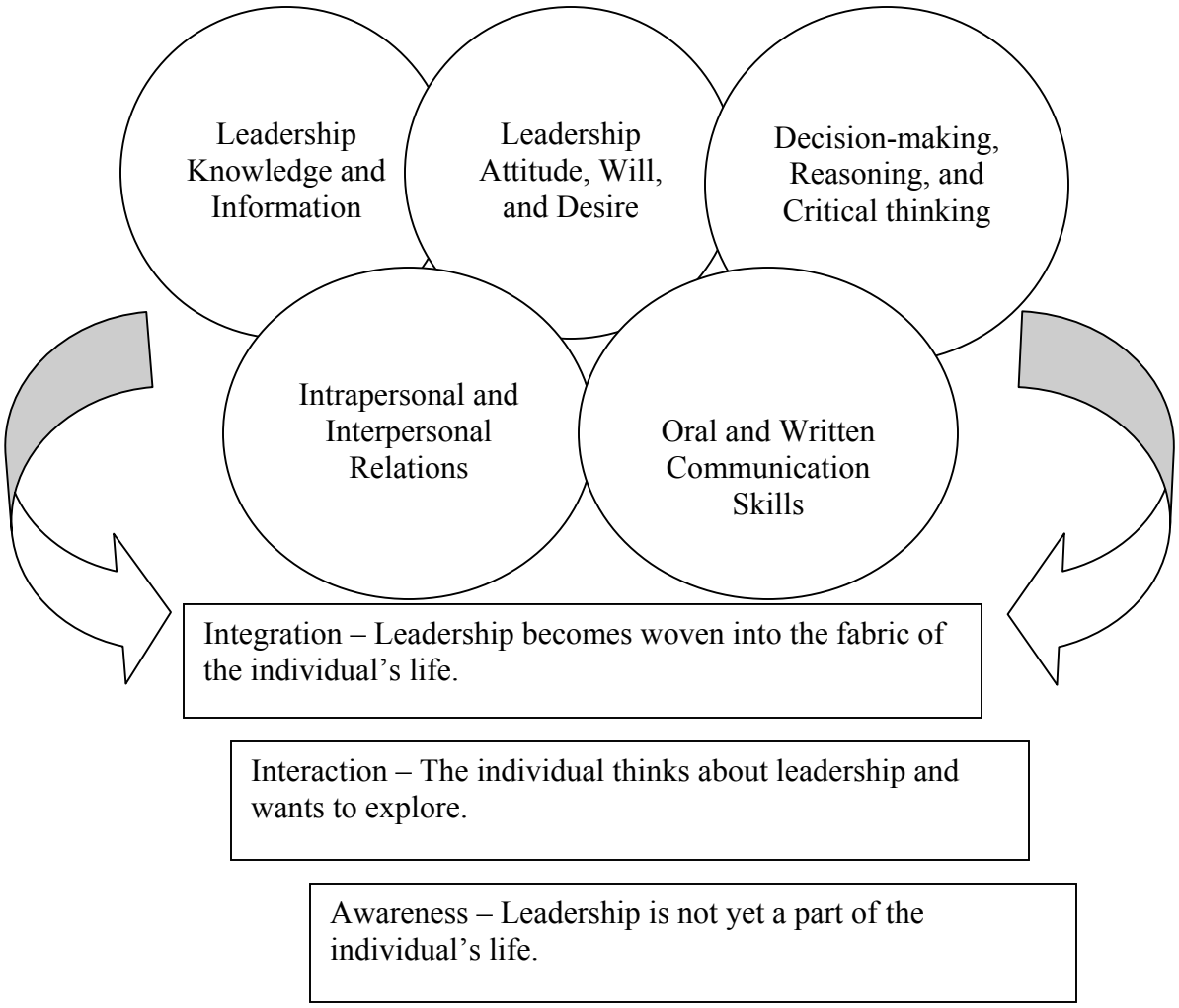


Figure 2-1. Model of youth leadership development. From Ricketts, J. C., & Rudd, R. D. (2002). A comprehensive leadership education model to train, teach, and develop leadership in youth. *Journal of Career and Technical Education, 19* (1), 7-17.

Critical Thinking

Misrepresentations of Critical Thinking

Critical thinking seems to be a construct of pedagogical processing that is looked at and viewed in many different ways. To gain a more complete understanding of critical thinking, what critical thinking "is not" is reported in the following paragraphs.

Critical thinking is not about being better than someone else, it is not problem-solving, and it is not higher order thinking or cognitive processing. Many scholars engage what Richard Paul refers to as "pseudo critical thinking," which is a form of "intellectual arrogance masked in self-delusion or deception, in which thinking is deeply flawed" (1995, p. 49). Other well-meaning educators simply use the term critical thinking in place of other types of information processing that are very similar to, but at the same time different from critical thinking, such as problem solving.

Dr. Lowell Hedges (1991) was one researcher who understood the difference between problem solving and critical thinking. He constructed a dichotomous breakdown of critical thinking and problem solving. Note that according to Hedges (1991), problem solving is a linear process of evaluation, while critical thinking is an overlying set of abilities that allow the inquirer to properly facilitate each stage of the linear problem-solving process. (Table 2-1)

Some have also confused critical thinking with the cognitive processing or higher order thinking, supported by Bloom, et al. (1956) and Anderson and Krathwol (2001). Although this type of pedagogy does not necessarily entail hierarchical or linear processing, it does involve operation at a particular level: knowledge, comprehension, application, analysis, synthesis, or evaluation.

Table 2-1. Hedges views on critical thinking and problem solving

Critical Thinking	Problem-Solving
Identifying, formulating, and solving problems	Recognizing a problem situation
Recognizing and using inductive reasoning; and solving problems	Defining the problem
Drawing reasonable conclusions from information found in various sources (whether written, spoken, tabular, or graphic) and defending one's conclusions rationally	Comprehending, developing, and using concepts and generalizations
Comprehending, developing, and using concepts and generalizations	Testing hypotheses and gathering data
Distinguish between fact and opinion	Revising hypotheses and testing revised or new hypotheses
	Forming a conclusion

Definitions of Critical Thinking

Numerous definitions of critical thinking have been used in education over the years. Sometimes the term was used to represent a conceptualization different from the one being studied here. Many researchers and philosophers, though, have defined critical thinking as this study imagines it. A sampling of the most pertinent and useful definitions used in this study follows.

Chafee (1988) defined critical thinking as "our active, purposeful, and organized efforts to make sense of our world by carefully examining our thinking, and the thinking of others, in order to clarify and improve our understanding" (p.29).

According to Halpern (1989) critical thinking is "thinking that is purposeful, reasoned and goal directed. It is the kind of thinking involved, in solving problems, formulating inferences, calculating likelihoods, and making decisions" (p. 5).

Norris and Ennis (1989) provided one of the simplest definitions of critical thinking. They declared that critical thinking is the "reasonable and reflective thinking that is focused on deciding what to believe or do" (p. 18).

Peter Facione (1990) conducted a Delphi study, which will be described in the next section. In it a group of critical thinking experts drafted the following definition of critical thinking. They concluded

> 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 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 is 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 circumstances will 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 (p. 3).

Richard Paul (1995), a recent scholar in critical thinking, defined it as, “A unique and purposeful thinking in which the thinker systematically and habitually imposes criteria and intellectual standards upon the thinking, taking charge of the construction of thinking, guiding the construction of the thinking according to [critical thinking] standards, and assessing the effectiveness of the thinking according to the purpose, criteria, and the standards [of thinking]” (p. 21).

Using each of the aforementioned definitions of critical thinking, Rudd, Baker, and Hoover (2000) drafted a definition of critical thinking that was comprehensive and succinct in describing critical thinking as it is conceptualized in this study. They wrote

"Critical thinking is a reasoned, purposive, and introspective approach to solving problems or addressing questions with incomplete evidence and information and for which an incontrovertible solution is unlikely" (p. 5).

Developing a Conceptualization of Critical Thinking

To come up with the most functional conceptualization of critical thinking, the work of several critical thinking researchers was reviewed. For this section of the review, only significant contributors to the current theoretical framework of critical thinking used in our study were reported. Socrates, Plato, and Aristotle spawned some of the first forms of critical thinking, known as reasoning, logic, and questioning. Political and religious issues of the Renaissance and Enlightenment time periods also helped initiate critical theory in the time periods of Machiavelli and Thomas Paine. Other contributors to the present interpretation of critical thinking include Kohler, the famous Gestalt theorist, Marx, the economic philosopher, and eventually Paulo Freire, the father of the concept of the “pedagogy of the oppressed” (Borup, B. L., 2000).

Formal educational philosophy and epistemic origins of critical thinking in the United States can be traced back to Dewey (1933), who believed that there were three attitudes necessary to reflective action (critical thinking); open mindedness, responsibility, and wholeheartedness. Dewey's open mindedness required listening to more than one side of any issue. He felt that responsibility meant carefully evaluating the consequences of a potential action, and he felt that wholeheartedness demanded that critical thinkers be intentional in their search for the truth (Cheak, 1999). He also believed that critical thinking or reflective action as he called it was a combination of skills and attitudes with the methods of critical thought. The next few researchers mentioned held the same belief.

Glaser (1941), who would eventually develop the widely used Watson-Glaser Critical Thinking Appraisal, defined critical thinking as the

- attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences,
- knowledge of the methods of logical inquiry and reasoning, and
- some skill in applying those methods (p. 5-6).

Ennis (1989), who developed the Cornell Critical Thinking Tests, was a strong proponent of researching methods of assessment and teaching in critical thinking, which was context specific. According to him, "Critical thinking is reasonable and reflective thinking focused on deciding what to believe or do" (p. 18). Taube (1997) was a later researcher who also reported statistical and empirical evidence of two distinct factors of critical thinking, which are skills and dispositions.

Each of the aforementioned critical thinking researchers making major contributions to the development of critical thinking believed that critical thinking consisted of a dispositional and ability or skill dimension just as Dewey (1933) did. The final critical thinking researcher who found that critical thinking consisted of the skill and disposition dimension of critical thinking was Peter Facione (1990). He conducted a nationwide Delphi study to describe critical thinking. His contributions to critical thinking research through the Delphi study described below provided the major theoretical foundation for this study on critical thinking of youth leaders in the FFA.

The Delphi study

The multiple definitions of critical thinking and confusion concerning its specificity led to the need for further refinement of the composition of the critical thinking construct. Facione (1990) assembled a group of forty individuals (52% from Philosophy, 22% from

Education, 20% from Social Sciences, 6% from Physical Sciences) recognized by their colleagues as having special experience and expertise in critical thinking instruction, assessment, or theory. Facione (1990) employed the qualitative research methodology known as the Delphi Method to develop the theoretical framework used for this study. The Delphi study which ran from February of 1988 until November of 1989 consisted of six rounds of questions and responses. The findings of the Delphi Report are as follows:

- Critical thinking includes the dimensions of skill and disposition.
- There was consensus that critical thinking could be improved in several ways. The experts agreed that a person could critically examine and evaluate one's own reasoning processes, that they could learn how to think more objectively and logically, that they could expand their repertoire of those more specialized procedures and criteria used in different areas of human thought and inquiry, and that they could increase their base of information and life experience (p. 4).
- While critical thinking skills themselves transcend specific subjects or disciplines, exercising them successfully in certain contexts demands domain-specific knowledge, some of which may concern specific methods and techniques used to make reasonable judgments in those specific contexts (p. 5).
- 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. . . the affective dispositions are necessary for the critical thinking skills identified to take root and to flourish in students (p. 11).
- It is inappropriate use of the term to deny that someone is engaged in critical thinking on the grounds that one disapproves ethically of what the person is doing. What 'critical thinking' means, why it is of value, and the ethics of its use are best regarded as three distinct concerns (p. 12).
- A good critical thinker . . . is habitually disposed to engage in, and to encourage others to engage in a wide range of contexts and for a wide variety of purposes. Although perhaps not always uppermost in mind, the rational justification for cultivating those affective dispositions which characterize the paradigm critical thinker are soundly grounded in critical thinking's personal and civic value. Critical thinking is known to contribute to the fair-minded analysis and resolution of questions. Critical thinking is a powerful tool in the search for knowledge. Critical thinking can help people overcome the blind, sophistic, or irrational defense of intellectually defective or biased opinions. Critical thinking promotes rational autonomy, intellectual freedom and the objective, reasoned and evidence-

> based investigation of a very wide range of personal and social issues and concerns (p. 13).

Many of the findings of the Delphi study are addressed in one way or another in this investigation. The first finding as stated above indicated that critical thinking includes the dimensions of skill and disposition. This consensual agreement among the experts was a reiterated point of critical thinking scholars preceding them (Dewey, 1933; Norris & Ennis, 1989), but Facione (1990) and his group of experts went a step further. They identified a set of specific skills and subskills for the skill dimension and a specific set of attitudes for the disposition dimension (Facione, 1990).

Critical thinking skills

The critical thinking skills identified by the panel of experts were Interpretation, Analysis, Evaluation, Inference, Explanation, and Self-regulation. Interpretation is about comprehending and expressing meaning about a wide variety of experiences, beliefs, procedures, rules, etc. Analysis was found to be about identifying the relationship between statements, questions, concepts or descriptions to express beliefs, judgments or reasons. The experts thought that Evaluation was about assessing credibility of statements and representations of others and assessing the logical strength of statements, descriptions or questions. Inference was found to be the ability to draw reasonable conclusions and/or hypotheses based on facts, judgments, beliefs, principles, concepts or other forms of representation. The experts in the Delphi study found explanation to be about stating and justifying the results of one's reasoning using each of the aforementioned abilities. Self-regulation, the last skill was found to be the ability of an individual to monitor their own personal cognitive activities to make sure that they are engaged in critical thinking.

Following the lead of Peter Facione (2000) and the *Test for Everyday Reasoning (TER)*, three critical thinking skills, Analysis, Evaluation, and Inference were the skills measured in this study. After the *California Critical Thinking Skills Test (CCTST)* was administered to large samples of individuals, Facione created the TER to test critical thinking skills. The TER did not specifically try to measure interpretation, explanation, and self-regulation. The skills used in this study (Analysis, Evaluation, and Inference) were selected to represent critical thinking skill because of their orientation to objective measurement; because they closely matched the definition of critical thinking that was adopted for this study, which was "Critical thinking is a reasoned, purposive, and introspective approach to solving problems or addressing questions with incomplete evidence and information and for which an incontrovertible solution is unlikely" (Rudd, Baker et al., 2000, p. 5); and because subsequent studies have been conducted to validate their usage (Facione 1990; Jones, et al., 1994; Jones, et al., 1995; Giancarlo 1996a; Giancarlo 1996b).

Several studies have been conducted to confirm the Delphi consensus statement. The 1990 Delphi report describing the ideal critical thinker was put to the test by Giancarlo (1996b), using the California-Q sort method. A national expert panel concerning critical thinking sorted 100 Q-sort items to achieve a result that would characterize the ideal critical thinker. The results validate the critical thinking skills identified in the theoretical framework in our study.

Jones, Hoffman, Moore, Ratcliff, Tibetts, and Click (1995; 1994) further validated the use of critical thinking skills through a 1993/1994 national survey and replication study conducted by the National Center for Higher Education Teaching, Learning and

Assessment at The Pennsylvania State University. As a result of this study skills, along with dispositions became recommended outcomes of post-secondary education.

Critical thinking dispositions

In addition to a complete list of critical thinking skills, the Delphi study identified a list of critical thinking dispositions that are needed for critical thinking. Facione (1998c) has occasionally referred to the dispositions as approaches to life that characterize critical thinking. They are as follows:

> inquisitiveness with regard to a wide range of ideas, concern to become and remain well-informed, alertness to opportunities to use critical thinking, trust in the process of reasoned inquiry, self-confidence in one's own abilities to reason, open-mindedness regarding divergent world views, flexibility in considering alternatives and opinions, understanding of the opinions of other people, fair-mindedness in appraising reasoning, honesty in facing one's own biases, prejudices, stereotypes, or egocentric tendencies, prudence in suspending, making, or altering judgments, willingness to reconsider and revise views where hones reflection suggests that change is warranted (p. 8).

In the California Critical Thinking Disposition Inventory (CCTDI), which has been standardized instrument used to measure the above approaches to life, the scales, Truth-Seeking, Open-mindedness, Analyticity, Systematicity, Self-confidence, Inquisitiveness, and Maturity are used (Facione, et al., 2001). This study used a researcher-developed instrument that measured those same approaches to life. The researcher-developed instrument contained three scales (Innovativeness, Maturity, and Engagement); as opposed to seven that were also developed using the Facione (1990) Delphi study as the theoretical basis. A description of the researcher-developed critical thinking dispositions (scales) follow.

- The Engagement disposition measured students' predisposition to looking for opportunities to use reasoning; anticipating situations that require reasoning; and confidence in reasoning ability.

- The Innovativeness disposition measured students' predisposition to be intellectually curious and wanting to know the truth.
- The Cognitive Maturity (Maturity) disposition measured students' predisposition to being aware of the complexity of real problems; being open to other points of view; and being aware of their own and others biases and predispositions.

Research concerning critical thinking skills and critical thinking dispositions as conceptualized by Facione (1990) and the Delphi study will be referred to again in this chapter. The next section demonstrates the need for domain specific critical thinking.

Domain Specificity

Some philosophers (Paul, 1997) felt that critical thinking may have been an interdisciplinary skill, but critical thinking has been determined to be needed in a domain specific fashion. Glaser (1941) constructed a definition of critical thinking that may have been one of the first indications of the domain specific nature of critical thinking. The first part of Glaser's (1941) three part definition describes critical thinking as, "attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences" (p. 5-6). Over 40 years later, Glaser (1984) went so far as to question the possibility of transferring critical thinking skills from one domain to the next, and suggest that much practice is needed if it is to be done.

According to Ennis (1989) empirical inquiry is needed to determine how certain aspects of critical thinking apply to a particular content area. He supported the need for contextual, domain, or subject specific critical thinking based on three observations:

- background knowledge is essential for making justified critical thinking judgments,
- critical thinking varies from field to field, and
- a full understanding of a field requires the ability to think critically in the field (Ennis,1990, p.14).

Ennis (1993) also stressed the need for critical thinking assessments that evaluated critical thinking in specific subjects. Kintsch (1994) empirically evaluated his assumptions and found that, indeed higher knowledge students scored 200 percent better in levels of processing and understanding than did low knowledge students. This could validate the need for a contextual measure of critical thinking because there seems to be difference in critical thinking skill when a student knows about the subject as opposed to when they do not.

Tindal and Nolet (1995) found that, "Domain-specific knowledge is required for efficient and effective utilization of strategic knowledge. To develop effective arguments and solve problems, students need specific information represented in their arguments and solutions. As students' content and domain knowledge increases, improvements in strategies also are likely to improve" (p. 3).

As a result of her literature review, Cheak (1999) recommended, the development and use of critical thinking skills within specific domains, and that there was a need for a domain specific instrument for assessing critical thinking skills.

Halliday (2000) made the argument that critical thinking should not be used as an inter-disciplinary "cure-all" because it is vocational specific. He quotes Dunne and Morgan from their article in *Irish Educational Studies*.

> Critical thinking is best developed through an engagement with different areas of knowledge rather than as an autonomous skill to be taught in itself. It is through cutting its teeth on actual topics, themes, an issues and problems as these arise within diverse content domains that thinking can acquire the kind of differentiation subtlety and sense of relevance that help to make it truly critical (Dunne & Morgan, 1995, p. 115).

Even though the national Delphi study on critical thinking yielded an interdisciplinary conceptualization of critical thinking, one of its findings suggested that in order for people to exercise critical thinking skills in certain contexts they had to have a certain amount of "domain-specific knowledge, some of which may concern specific methods and techniques used to make reasonable judgments in those specific contexts" (Facione, 1990, p. 5).

The literature reviewed and reported tends to suggest the need for critical thinking instruction and assessment that is context or domain specific. One of the outcomes of this study is an assessment of critical thinking of youth in the domain of leadership development and agricultural education.

Conceptual Model of Behavior

Although there are a number of theories of behavior in the literature (Bandura, 1986; Becker, 1974; Fishbein & Ajzen, 1975; Fishbein, Bandura et al., 1991; Triandis, 1979), the Triandis (1979) Model of Human Behavior was selected because of the assumption it makes that thinking is a type of behavior. Triandis also thought behavior or skill was a function of habits and intentions and certain facilitating factors. Expressed as a formula, the behavioral model which guided this study is as follows:

Behavior = Habits + Intentions + Facilitating factors

Figure 2-2. Conceptual model of behavior

Behavior "refers to a broad class of reactions by an organism to any stimuli (internal or external to the organism)" (Triandis 1979). According to Fishbein, Bandura, Triandis, Kanfer, Becker, Middlestadt (1991), before a person performs any given

behavior, one or more of the following situations regarding internal or external stimuli must be true:

- The person has formed a strong positive intention to perform the behavior.
- There are no environmental barriers making it impossible for the behavior to occur.
- The person has the skills necessary to perform the behavior.
- The person believes that the advantages of performing the behavior outweigh the disadvantages.
- The person perceives more social pressure to perform the behavior than to not perform the behavior.
- The person perceives that performance of the behavior is more consistent than inconsistent with his or her self-image, or that its performance does not violate personal standards that activate negative self-sanctions.
- The person's emotional reaction to performing the behavior is more positive than negative.
- The person perceives that he or she has the capabilities to perform the behavior under a number of different circumstances.

The intentions, attitude, and emotions stimuli may be measured by participants' critical thinking dispositions. Aside from self-efficacy, which seems to be independent of leadership behavior (Wingenbach & Kahler, 1997), the remaining stimuli can be controlled for in a modified version of the Triandis (1979) Model of Human Behavior. For the purposes of our study, Triandis's (1979) Model of Human Behavior was adjusted to the form shown in Figure 2-3.

Predictors and Correlates of Critical Thinking Skill

One of the primary objectives of this study was to explain the variance in leadership specific critical thinking skills in relation to other variables that have been found influential on other types of critical thinking skills tests. The adjusted Triandis (1979) Model of Human Behavior, serves as a conceptual framework for predicting the

behavior of critical thinking (Figure 2-3). An expanded version of this conceptual model of the theoretical framework is shown in Figure 2-4. Figure 2-4 provides a pictorial view of the variables associated with youth leadership, critical thinking skills, and critical thinking dispositions. The design, testing, and relationship of each of the concepts are also depicted in Figure 2-4.

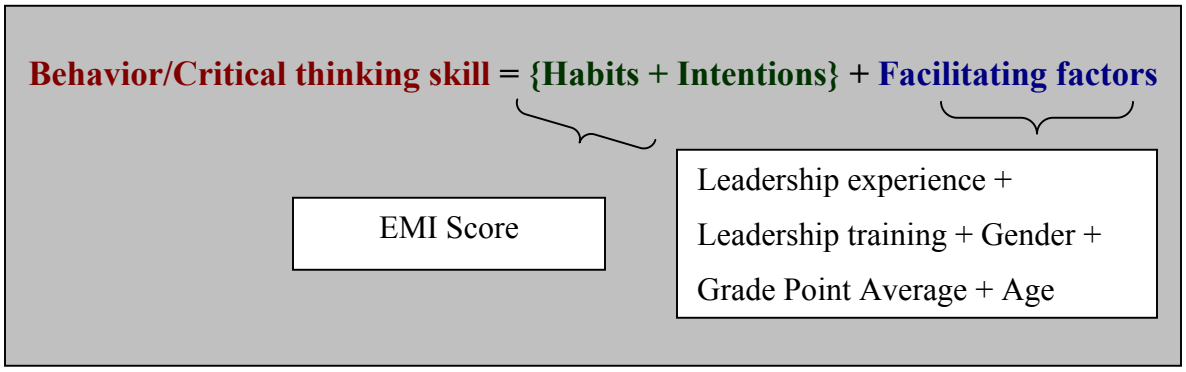


Figure 2-3. Conceptual model of critical thinking skills (behavior)

Critical Thinking Dispositions

Literature outlining critical thinking dispositions and their relationship to critical thinking skills were reviewed. Facione (1998a) reported on several studies (Facione, Facione, & Giancarlo, 1996; Jones, Ratliff, Tibbetts, & Glick, 1994; Giancarlo & Facione, N., 1994; Facione & Facione, 1997) that determined a significant, but relatively low relationship between critical thinking skills and dispositions. The research indicated that there is a need for both skills and dispositions in curriculum models. Facione described the disposition toward critical thinking as the "consistent internal motivation to engage problems and make decisions by using critical thinking" (p. 5). Facione (1998a) concluded, "Educational and professional success required nurturing one's consistent internal motivation to think as well as developing one's thinking skills" (p. 16).

Facione (1998a) also reported on a study of 193 tenth grade students in the Southwestern United States. A positive correlation (r =0.41) was found between CCTDI scores and CCTST total scores. It was statistically significant at the P <. 05 level, which might suggest that there is a positive correlation between critical thinking skill and critical thinking disposition. This finding would suggest that critical thinking skill accounts for 16.8% of the variance in critical thinking disposition and vice versa.

In the largest known study to identify relationships between critical thinking skill and disposition, and other demographic factors, Facione and Facione (1997) conducted a five-year longitudinal investigation of 7,926 students from 50 different college level programs. Positive correlations were found between overall disposition and strength of critical thinking. Examples of the types of analyses run with the large data set were a sample of 1557 students that showed weak positive correlations (r =0.201, P <.001) and a sample of 793 students who again had similar results (r= 0.169, P <.001).

Rapps, Riegel, et al., (2001) conducted a study to test a model of cognitive development which sought to determine which of the four variables, knowledge base, critical thinking skills, critical thinking dispositions, and experience were used to predict cognitive development. Critical thinking dispositions contributed to all of the levels of Perry's scheme of intellectual development (dualism, relativism, and commitment) and experience only predicted the commitment stage.

Age

When the study was designed age was entered into the regression equation as a variable that may have significant influence on the critical thinking skill level of youth leaders, but after an extensive review of the literature only one report placed age in the predictor category. Torres and Cano (1995a) conducted a study of 92 agriculture seniors

while testing for the relationship of learning style to critical thinking. They combined age, gender, and GPA into one score, and found that they accounted for 13% of the critical thinking variance.

The majority of the studies in the literature show age as having no significant difference or no relationship to critical thinking (Cillizza 1970; Feely 1975; Facione 1990; Facione 1991; Claytor 1997; Jenkins 1998; Rodriquez 2000; Rudd, Baker, et al., 2000; Thompson 2001). Age was not taken out of the regression equation, as a variable that could explain critical thinking leadership skill because of the assumed association age would have with leadership experience for the sample.

Gender

Gender as a predictor of critical thinking skills or dispositions, was a variable that has been evaluated by nearly all of the critical thinking studies. One of the first to consider gender in their critical thinking research was Wilson (1989). He studied the critical thinking ability of (n =203) entering college freshmen using the Watson-Glaser test and ACT College Reports. He found that ACT standard scores significantly accounted for 28.41% of the variance in WGCTA raw scores, but also that gender was a significant predictor or critical thinking skill.

Costa and McCrae's and Sanchez's study (as cited in Facione, Giancarlo, et al., 1995) examined the relationship of personality. Both studies looked at gender's influence on critical thinking in addition to personality and found that females were more open-minded and mature in their thinking, while males were more analytical.

Walsh (1996) conducted a study of 499 male and female undergrads. Along with highest eventual degree and major, gender was a variable predicting variance in critical thinking disposition.

In a study of College of Agricultural and Life Sciences undergraduates at the University of Florida that evaluated learning style and critical thinking disposition, Rudd, Baker, et al. (2000) found significant gender differences for scores of the CCTDI. Males scored an average of 288.1 while females at the university scored 297.8.

Another studied trying to ascertain learning style influence on critical thinking combined gender with age and GPA to achieve a significant variance (13%) in critical thinking (Torres & Cano, 1995a). Since GPA is seemingly consistently related to critical thinking, this finding fails to indicate gender's influence.

There have been just as many studies indicating the null nature of the gender effect on critical thinking. Using the Watson-Glaser Critical Thinking Appraisal, critical thinking was found to be independent of gender, neurotic and rigid personality types, and introvert and extrovert measurements (Hoogstraten & Christiaans, 1975). The Watson Glaser Critical Thinking Appraisal was also used by Jenkins (1998) when he also found that gender was not a predictor of critical thinking.

Other studies using assessments from CCTST to CCTDI to author-developed instruments have also found that gender is not related to or a predictor of critical thinking. In developing and validating an instrument to evaluate critical thinking skills of nurses, gender and ethnicity were found to be independent of critical thinking skills (Claytor 1997).

Rodriquez (2000) studied the critical thinking of (n=60) registered nurses. None of the individual predictors (age, degree, career path, years of experience, personality type, or gender) were statistically significant. Thompson (2001) was another researcher who also found that gender had no predictive value of critical thinking or learning style.

Pienaar (2000) conducted a South African study of adolescents' critical thinking in the context of political issues, and found that gender, had no significant relationship with critical thinking ability.

The inconclusive nature of the aforementioned studies indicated that gender, as a predictor of critical thinking is still a variable that should be included in the explanation of critical thinking skill.

Leadership Experience Level

Since the FFA claimed leadership as a core value, and the students being studied in this project were members of the FFA, the literature regarding level of leadership experience was reviewed. Very little was found indicating a relationship between leadership experience level and critical thinking. One of the only studies that outlined leadership experience level and its relationship to leadership experience level was conducted by Rollins (1990).

The main purpose of the Rollins (1990) study was to determine the critical thinking of high school agriculture students in Iowa. Comparisons to other populations were made and determination of variance was conducted. Agriculture students (n=668) in 18 schools participated in the study represented approximately six percent of the agriculture students in the Iowa. Rollins (1990) found that senior high school agriculture students were better critical thinkers than sophomores; reading score accounted for 28 percent of the variance in critical thinking; and GPA and leadership positions held accounted for the other two percent. Rollins discovered only two percent of the variance was accounted for by leadership position in the FFA, but he used the Cornell Critical Thinking Test, which is not subject specific (Sormunen & Chalupa 1994).

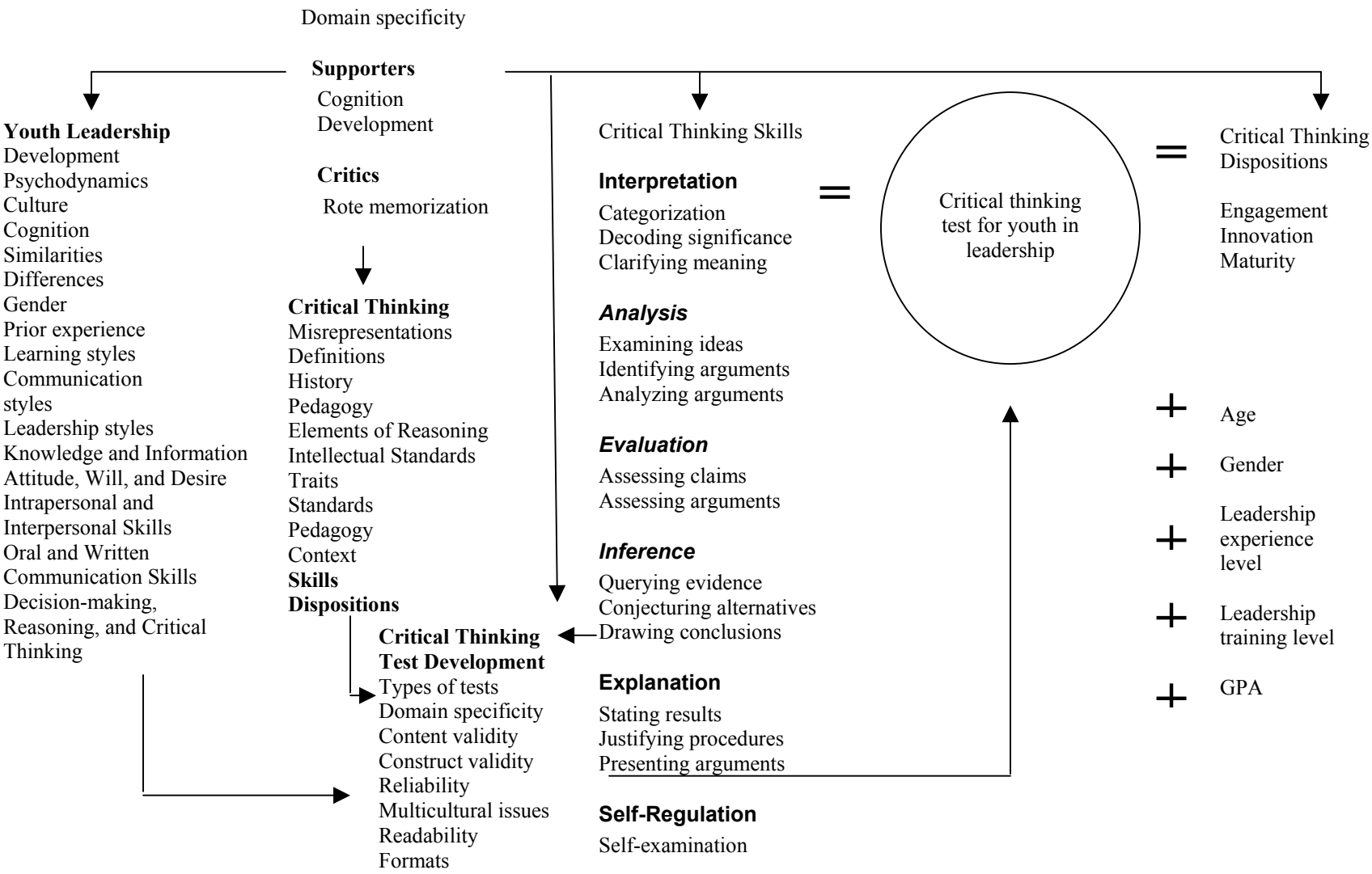


Figure 2-4. Conceptual framework for assessing and explaining critical thinking in youth leaders

One other study that may have indicated the value of leadership for explaining critical thinking skills was done by Duchesne (1996). He studied (n=119) organizational leaders. The only significant predictor of critical thinking in the leaders was the years of education and developmental leadership learning experiences, which is really in the realm of the next variable, Leadership training.

Leadership Training

Leadership training is the variable representing the amount of formal leadership training participants would receive. The literature related to leadership training and critical thinking was limited. Several sources dealing with the contextual nature of critical thinking that may give credence to formal leadership instruction were reviewed (Ennis 1989; Kintsch 1994; Anderson, Howe et al., 2001). Only one study dealt with a specific aspect of leadership training.(Thompson, 2001).

Garcia and Pintrich (1992) conducted a study to identify correlations between critical thinking and motivation, learning strategies, and classroom experiences. College students (n=758) in 12 different classrooms in three different universities in Biology, English, and Social Science classes were studied. Intrinsic goals and critical thinking were positively related.

Student Academic Performance

At the beginning of the study GPA was not a variable that was included in the preliminary review of literature. But after a thorough review of the literature, it was decided that any study trying to explain critical thinking skill level would have to include a variable for student academic performance, and GPA was the tool most researchers used to describe the GPA variable.

Report #2 of the validation studies done for the *California Critical Thinking Skills Test* (CCTST) used 1196 subjects and found that critical thinking skills can be predicted by a combination of SAT verbal ($r = 0.55$, $P < 0.001$), SAT math ($r = 0.44$, $P < 0.000$), and GPA ($r = 0.20$, $P < 0.000$) data with a R-square of 0.71 (Facione,1990b).

Torres (1993) surveyed all seniors in the College of Agriculture at The Ohio State University, and the only thing he found predictive of critical thinking was a student's cumulative GPA while in college. In a later study by Torres and Cano (1995a), where learning styles' relationship to critical thinking was being researched, GPA combined with gender and age accounted for 13% of the variance in critical thinking skill.

In one of the only studies involving minority students, Giancarlo (1996a) found Latino secondary education students (n=393) in Southern California to have critical thinking dispositions that were positively correlated to GPA.

In a study by Claytor (1997), which assessed the critical thinking of nurses using an researcher-developed instrument, the Adult Medical Nursing Critical Thinking Instrument (AMNCT), significant, positive relationships were found between critical thinking skills and GPA for each of the subscales of the AMNCT; knowledge ($r = 0.36$, $P < 0.05$), support of answer ($r = 0.34$, $P < 0.05$), explanation/justification ($r = 0.37$, $P < 0.05$), and breadth/depth ($r = 0.33$, $P < 0.05$).

In several studies, GPA was the only predictor of critical thinking. Ninety-six business education students in an auditing class were tested and GPA was found to be the only significant predictor of critical thinking skill. Age and gender were not predictors of critical thinking using the Watson Glaser Critical Thinking Appraisal (Jenkins, 1998). Thompson (2001) was another researcher to find GPA to be the only variable with a

relationship to critical thinking. His students (n=105) exhibited a statistically significant relationship between cumulative GPA and critical thinking ability, while age, gender, and degree program had none.

Sometimes the studies did not use GPA as sole predictor of academic performance as with the last reported case. A large class (N=292) was evaluated on critical thinking scores, attendance totals, and note-taking measures. After data were collected and multiple regression analyses were conducted, critical thinking was found to be a very strong predictor of course performance, especially for women and students who have succeeded formerly (Worth, 2000).

The GPA variable was entered into our study as a variable because of the aforementioned findings, but the assumption that many of the participants probably do well academically added to the decision to include it as well.

Chapter Summary

The purpose of this chapter was to review literature and research concerning youth leadership development, general knowledge in critical thinking, and critical thinking leadership skill and its relationship to critical thinking disposition, age, gender, leadership experience, and prior training in leadership. Within the review of literature, the context of youth leadership development and the Model for Youth Leadership Development (Ricketts & Rudd, 2002) was described as it gave way to the study of one of its constructs, *Decision-making, Reasoning, and Critical thinking.* The review also provided a conceptualization of critical thinking by explaining what critical thinking "is not," what it "is," and the theoretical framework used for our study. The review of literature also described the conceptual model and framework of the study by discussing each of the explanatory variables (critical thinking dispositions, gender, age, leadership experience,

leadership knowledge, and GPA) involved in the study and research related to their use in critical thinking concept construction and use.

CHAPTER 3
METHODS

Chapter 1 described the background for studying critical thinking and youth leadership in the FFA and detailed the significance of the study. The primary purpose of this study was to identify and predict the critical thinking skills of selected youth leaders in the National FFA Organization. Specifically, this study sought to

- To determine the critical thinking skill level of selected leaders in the FFA,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA),
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions, and
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

Chapter 2 provided a theoretical framework, and the empirical research relevant to this study. A large body of critical thinking literature was examined in youth leadership development, general knowledge in critical thinking, and critical thinking skill as it relates to critical thinking disposition, age, gender, student academic performance, leadership training, leadership experience, and prior knowledge.

In this chapter, methods used to address the research questions are discussed. Specifically, this chapter reports the context of the study, the research design, and information about the subjects, instrumentation, procedures, and analysis of data in the study.

The independent variables in the study were age, gender, student academic performance (GPA), level of leadership training, level of leadership experience, and critical thinking dispositions (Engagement, Maturity, Innovativeness – EMI). The dependent variables in the study were total critical thinking skill level as well as the specific critical thinking subskills, Analysis, Inference, and Evaluation. The quantitative research methods employed in this study included descriptive research, which used a correlational and causal-comparative design.

Context of the Study

Place

Prior to the Florida FFA convention, FFA chapters whose students had qualified for the state parliamentary procedure contest were mailed pilot critical thinking skills test instruments for each of their students attending the convention. Advisors of qualifying teams for the State FFA parliamentary procedure career development event distributed the instruments to their students and informed them about the workshop on decision-making in leadership, which would be provided by the researchers as an incentive for participating in the study. Pilot information was gathered and the first distribution of the researcher-developed instrument was collected at the Florida State FFA Convention in Kissimmee, FL.

Following the Florida FFA Convention, a researcher-developed critical thinking disposition test (EMI) was pilot tested in a secondary agricultural education program in Gallatin, Tennessee. The disposition test was taken by the students in an online format. Students took the test at a computer in Tennessee, and the pilot data were analyzed at the University of Florida the next day. Data analysis and instrument revisions were again conducted at the University of Florida.

For the final data collection with the actual participants of this study, mailings for participant recruitment, reminders, and replacement surveys were sent out through the mail from the University of Florida. An online survey was also constructed and facilitated at the University of Florida. A workshop designed to teach critical thinking and decision-making was delivered at the National FFA Convention in Louisville, KY as an incentive for participating in the study. Instruments that were not received by online submission through the mail were collected prior to the workshop. Data analysis and conclusions were completed at the University of Florida.

Time

The pilot test was administered on June 15, 2002. Data analysis from the pilot study and instrument revisions were completed by August 31, 2002. The first letter to recruit participants was mailed out on September 28, 2002. One week later a packet containing parental consent forms, the assent script, and the web address where the survey could be taken online were mailed. Two reminders were sent out from the University of Florida in the following consecutive weeks. A week after the second reminder a replacement paper version of the survey was sent to subjects by mail (Dillman, 2000). The workshop and final data collection was completed on November 2, 2002. No data were admitted in the data analysis following the workshop conducted in Louisville, KY. The total study was conducted from October 2001 to December 2002.

National FFA Organization

This study was also conducted under the auspices of the National FFA Organization. The study was conducted with youth leaders in the FFA. Data collection was conducted at FFA functions, and findings could benefit the National FFA and its members. The National FFA Organization claims the development of "premier

leadership" as one of the components of their overall mission, which is one of the reasons the particular sample was selected (National FFA Association, 1997, p. 4). The structure of the FFA includes membership at the local, state, and national level (National FFA Association, 1997). Some of the pilot information was collected at a state level event and the last round of final data were collected at a national level event. Delegates at the 2002 National FFA Convention served as the sample for the study and they came from each of the 50 states and Puerto Rico. They were selected at the state level as leaders to represent their respective states.

Research Design

This study was conducted using survey (descriptive) research and a correlational and causal comparative or *ex post facto* design (Campbell & Stanley, 1963). "Survey research studies large and small populations by selecting and studying samples … to discover the relative incidence, distribution, and interrelations of sociological and psychological variables" (Kerlinger, 1964, p. 410). "*Ex post facto* (causal comparative) research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables" (p. 379). In addition to *ex post facto* design, a correlational method was also used. According to Gravetter and Wallnau (2002), the "simplest way to look for relationships between variables is to make observations of the two variables as they exist naturally for a set of individuals" (p. 9). This is referred to as the correlational method.

The variables (critical thinking skill level, leadership training level, leadership experience level, critical thinking disposition, gender, GPA, age) used in this study are

actually attribute independent variables. According to Ary, Jacobs, and Razavieh (1996) an attribute variable is one that a subject possessed before the research study began. Since the variables in this study could not be manipulated, causal comparative methodology was employed, and because the variables were viewed in their "natural state," the correlational method was also in order (Gravetter & Wallnau, 2002, p. 9). Ary et al's (1996) *design 2*, where the investigator tests hypotheses concerning possible independent variables was employed in the study.

The independent variables in the study were age, gender, student academic performance measured by GPA, total and specific (Innovativeness, Maturity, Engagement) critical thinking disposition scores, leadership training, leadership experience, and total leadership score. The leadership variables, disposition scores, and age were continuous independent variables. The leadership variables were derived from the total amount of leadership activities students checked, the additional activities they listed, and whether or not they had ever had a course in leadership. The EMI score is a researcher-developed critical thinking disposition instrument that is described later in the chapter. Age, a continuous variable, ranged from 16 to 21. Gender was the only dichotomous independent variable. The dependent variables in the study were total and specific (Analysis, Inference, Evaluation) critical thinking skill scores. The specific critical thinking skill scores were achieved by determining the percentage correct out of possible score multiplied by 100. The total critical thinking skill score was additive of the three specific critical thinking scores.

Research Questions

The research documented the critical thinking skill of selected youth leaders in the National FFA Organization; the relationships between the critical thinking skills of those

youth leaders and their critical thinking dispositions, leadership scores, and demographics; and described the best model for the development of critical thinking skills of youth leaders in the FFA and agricultural education by answering the following research questions:

- What is the critical thinking skill level of selected youth leaders in the FFA?
- What is the relationship between critical thinking skill level of selected youth leaders in the FFA and age, gender, and GPA?
- What is the relationship between critical thinking skill level of selected youth leaders in the FFA and level of leadership experience and training?
- What is the relationship between critical thinking skill level of selected youth leaders in the FFA and their critical thinking disposition?
- What variables can be used to predict the critical thinking skill level of youth leaders using age, gender, GPA, leadership, and critical thinking dispositions?

Population

The population for the study was leaders in the National FFA Organization. The accessible population for the study was a list of 2002 National FFA Convention delegates specifically selected because of their leadership record at different levels of the structure of the FFA. The accessible population served as a purposively selected sample that was selected based on their being recognized as a leader in their respective states.

Subjects

For the pilot study, the number of subjects was not set before the data were collected, but the researcher secured 33 subjects for the critical thinking skills pilot conducted at the Florida FFA Convention and 60 subjects to pilot the EMI critical thinking disposition instrument in Tennessee. The pilot samples were purposively selected because of their similar interest in leadership and agricultural education to the National FFA Convention delegates. The pilot groups were assumed to be leaders

because the first group had qualified for the state parliamentary procedure contest and the second group was from a very strong FFA Chapter who had three teams qualify for National competition in FFA Career Development Events. No members of either pilot group served as a National FFA Convention delegate.

There were 212 subjects participating in the national study from the 50 states and Puerto Rico. The sample was 37.3% male (n = 79), 60.4% female (n = 128), and included n = 5 (2.4%) respondents who did not indicate their gender. Their ages ranged from 16 to 21, and their GPA's ranged from 2.0 to 5.0. (Table 3-1) The sample was purposively chosen because they represented the best, nationally representative frame of FFA leaders in agricultural education.

Table 3-1. Demographics of sample (N = 212)

Variable Grouping	Frequency	Percent
Gender		
Male	79	37.3
Female	128	60.4
No response	5	2.4
GPA		
2.0 – 3.0	21	9.9
3.01 – 3.49	25	11.8
3.50 – 3.74	58	27.4
3.75 – 3.99	59	27.8
4.0	37	17.5
4.01 – 5.0	12	5.7
Age		
16	17	8
17	63	29.7
18	84	39.6
19	32	15.1
20	11	5.2
21	1	0.5
No response	4	1.9

Instrumentation

Three tools represented the instrumentation for the study. The first instrument was used to measure the critical thinking skill level of youth leaders in the FFA and agricultural education. It was a researcher-developed instrument referred to as the *Youth Leadership Decision-Making Test*. The researcher-developed *Engagement, Maturity, and Innovativeness (EMI)* critical thinking disposition assessment was used to measure the critical thinking disposition of students and a demographic tool was attached to the end of the critical thinking skills test. Each of the instruments was pilot tested for validity and reliability. For the *Youth Leadership Decision Making Test,* Cronbach's alpha for each subskill was 0.83 for Analysis, 0.66 for Inference, and 0.63 for Evaluation. Analysis was measured with eight items; Inference was measured with five items; and Evaluation was measured with seven items. Cronbach's alpha for the subscales of the EMI critical thinking disposition assessment were 0.79 for Innovativeness, 0.75 for Maturity, and 0.89 for Engagement. Innovativeness was measured with 11 items; Maturity was measured with six items; and Engagement was measured with 13 items.

Critical Thinking Skills Test

The researcher-developed critical thinking instrument for youth leaders in the FFA and agricultural education was constructed because of the lack of an appropriate instrument to measure critical thinking skills of adolescents in the specific context of leadership and agricultural education. An instrument with such context specificity was deemed necessary, as several researchers (Ennis, 1989; Tindal & Nolet, 1995; Halliday, 2000; Stapleton, 2001) have empirically proven the worth of a subject specific measurement of critical thinking, and because such an instrument for the group of

students being studied in the context of leadership in the FFA and agricultural education did not exist.

A team of instrument developers took part in an initial effort to develop a set of general critical thinking skills questions that could be reformatted for a particular contextual area. From the initial instrument development process, a battery of critical thinking skills questions were generated, using the Test for Everyday Reasoning (Facione 2000) and The California Critical Thinking Skills Test (Facione, Facione et al., 1998) as a guide. Using the general questions generated by the test development team, the researcher refined the questions so that they were contextually specific to youth leaders in the FFA and agricultural education.

The contextually specific critical thinking skills instrument was evaluated by a panel of experts in test design, youth development, leadership development, agricultural education, and critical thinking at the University of Florida to check for face validity. Corrections were made after the panel of experts evaluated the instrument and made suggestions.

The researcher-developed instrument for measuring the critical thinking skill level of youth leaders in the FFA and agricultural education was given the name *The Youth Leadership Decision-Making Test,* and then pilot tested with students (n = 33) whose FFA chapter had qualified for the state parliamentary procedure contest to be held at the Florida State FFA Convention. The pilot critical thinking skills test consisted of 33 items, which measured the three (Analysis, Inference, Evaluation) critical thinking subskills that were determined possible to measure with multiple choice testing.

The pilot data were collected and factor analysis using SPSS was conducted. From the original 33 item critical thinking skills test, item and scale reliability analysis left the final test with 20 items. A copy of the instrument key can be found in Appendix-A.

As a result of the pilot study, the Analysis construct was represented by eight items and a standardized Cronbach's alpha of 0.83, the Inference construct was represented by five items and a standardized Cronbach's alpha of 0.66, and the Evaluation construct was represented by seven items and a standardized Cronbach's alpha of 0.63. (The standardized alpha was used because of the infancy of the instrument and a desire to capture the robustness reliability) These reliability ratings were deemed very high since Nunnally (1978) reported that dichotomously scored tests typically yielded low inter-item correlation, and because Norris and Ennis (1989) recommended reliability ratings 0.65 and 0.75 for instruments testing a variety of aspects of critical thinking. Additional statistics, such as each item's mean, standard deviation, corrected item-total correlation, and alpha if the item were deleted are reported in Table 3-2. Items were retained if they did not have extreme means; had what was considered to be enough variability in responses; had corrected item-total correlations over 0.2, and would make the reliability of the scale stronger.

EMI: Engagement, Maturity, and Innovativeness Critical Thinking Disposition Inventory

Subjects' affective attitudinal dimension of critical thinking was identified using the researcher-developed EMI critical thinking disposition inventory. After Moore, Rudd, and Penfield (submitted for publication) found problems with the California Critical Thinking Disposition Inventory (CCTDI), which was developed from the critical thinking dispositions identified by the popular critical thinking Delphi report, *Critical*

Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction (Facione, Facione et al., 2001) the researcher attempted to develop a shorter, more effective and reliable disposition instrument.

The Delphi report (Facione, 1990) was still the point of origin for the new disposition test. A team of researchers re-evaluated the findings of the Delphi report and identified three dispositions (Innovativeness, Maturity, Engagement) instead of the seven outlined by Facione. The team then developed a list of 60 items to pilot test.

Table 3-2. Table of critical thinking skills test item analysis

Item	M	SD	Corrected Item-total correlation	Alpha if item deleted
A2	0.56	0.50	0.53	0.80
A10	0.69	0.46	0.48	0.81
A11	0.63	0.48	0.47	0.81
A13	0.87	0.33	0.71	0.78
A14	0.58	0.49	0.55	0.80
A22	0.71	0.45	0.70	0.77
A32	0.93	0.24	0.53	0.81
A34	0.70	0.44	0.46	0.81
I4	0.81	0.39	0.39	0.57
I7	0.44	0.50	0.46	0.66
I21	0.77	0.41	0.43	0.58
I28	0.77	0.41	0.27	0.48
I30	0.67	0.46	0.23	0.64
E6	0.72	0.71	0.39	0.57
E23	0.51	0.51	0.46	0.55
E26	0.50	0.50	0.43	0.56
E29	0.67	0.67	0.27	0.61
E19	0.74	0.74	0.23	0.62
E27	0.13	0.13	0.33	0.60
E33	0.63	0.63	0.28	0.61

Note. A = Analysis, I = Inference, E = Evaluation

The pilot test was conducted online and 60 students in a secondary agricultural education program in Gallatin, Tennessee were recruited to take the disposition test. The students reported that the 60 item pilot test took from 5-10 minutes. The pilot data were downloaded from the Internet to a text file, and then imported into SPSS for analysis.

From the original 60 item critical thinking pilot disposition test, item and scale reliability analysis left a scale with 30 items and an overall Cronbach's alpha of 0.86. The Innovativeness construct was represented by seven items and a standardized Cronbach's alpha of 0.79, the Maturity construct was represented by six items and a standardized Cronbach's alpha of 0.75, and the Engagement construct was represented by 13 items and a standardized Cronbach's alpha of 0.89. These reliability estimates were deemed very high using the standard criteria (r = 0.65 to 0.75) of Norris and Ennis (1989). Additional statistics, such as each item's mean, standard deviation, corrected item-total correlation, and alpha if the item were deleted are reported in Table 3-3. Items were retained if they did not have extreme means; had what was considered to be enough variability in responses; had corrected item-total correlations over 0.2; and would make the reliability of the scale stronger.

After the pilot test scores were analyzed and the strongest scale was identified, the researcher added items to the Maturity construct to include a broader representation of aspects of the Maturity disposition. This left the new EMI instrument with 33 items. A copy of the instrument key can be found in Appendix B.

After the final data collection and during data analysis of the EMI scores, the consistency of subject responses were lower than the pilot test group. The researcher conducted item analysis and reliability estimates on the EMI scores of the National FFA delegates, and discovered that the reliability of the instrument had dropped. Innovativeness scale reliability dropped from 0.79 to 0.74, the Maturity scale dropped from 0.75 to 0.50, and the Engagement disposition dropped from 0.89 to 0.86. Before continuing the data analysis, researchers removed the following items to strengthen the

disposition instrument: I1, I24, I26, I28, M18, M31, and E13. Removing these items brought the Cronbach's alpha of each scale back to its strongest point. The new reliability estimates were as follows: 0.75 for Innovativeness with seven items; 0.57 for Maturity with four items; and 0.86 for Engagement with 12 items.

Table 3-3. Table of critical thinking disposition test analysis

Item	M	SD	Corrected Item-total correlation	Alpha if item deleted
I1	4.63	0.73	0.26	0.78
I13	3.97	1.07	0.29	0.78
I16	3.65	0.98	0.48	0.77
I25	4.38	0.95	0.54	0.78
I28	3.54	1.24	0.57	0.77
I31	4.01	1.08	0.47	0.77
I46	4.21	1.02	0.40	0.78
I49	4.04	0.97	0.48	0.76
I52	4.43	0.72	0.41	0.78
I58	3.78	1.18	0.47	0.78
I59	3.78	1.06	0.55	0.76
M2	2.38	1.01	0.53	0.71
M26	2.97	1.24	0.56	0.69
M29	2.67	1.20	0.44	0.72
M35	3.14	1.40	0.41	0.73
M44	2.28	1.36	0.51	0.70
M60	3.24	1.38	0.50	0.71
E3	3.41	1.20	0.52	0.89
E6	4.04	0.96	0.78	0.88
E15	3.69	0.94	0.56	0.89
E18	3.85	0.82	0.48	0.89
E21	4.04	0.90	0.75	0.88
E24	4.26	0.75	0.60	0.89
E27	4.26	0.95	0.57	0.89
E30	3.95	0.96	0.53	0.89
E33	3.74	1.02	0.50	0.89
E36	3.57	0.99	0.53	0.89
E39	4.00	0.94	0.72	0.88
E42	3.57	1.06	0.64	0.88
E57	3.17	0.96	0.56	0.89

Note. I = Innovativeness, M = Maturity, E = Engagement

Leadership/Demographic Instrument

The instrument used to collect data for the other variables; leadership training score, leadership experience score, total leadership score, age, gender, and GPA was developed by the researcher. Demographic information was gathered in conjunction with the leadership data. Participants were asked to list their grade point average, age, state, and gender. To measure leadership, participants were asked to write the number of times they had participated in a given list of leadership activities that are available in the FFA. Additionally, participants wrote responses to the following two questions:

- What other activities in the FFA, not listed above have contributed to your leadership development?
- What activities outside of the FFA have contributed to your leadership development?

The list of items and the responses were classified as either formal leadership training (i.e., leadership workshops, leadership conferences, or formal leadership courses) or as leadership experiences (i.e., public speaking, livestock judging, state FFA convention). The responses were also weighted. Local activities were given a value of one point, District or Area activities were given a value of two, Regional activities were given a value of three, State activities were given a value of four, and National and International activities were given a value of five. A formal leadership development course was also given a value of 5. The self-reported activities were added together to create a leadership training and experience score.

Procedures

Procedures, such as informing subjects, mailings, and data collection are included in this section of the chapter.

Pilot Study

To pilot the critical thinking skills test, subjects (n = 33) were recruited because their respective schools qualified for the state parliamentary procedure contest in the state of Florida. Teachers at the schools whose students had qualified for the state parliamentary procedure contest were contacted prior to the State FFA Convention where the contest is held. A packet including the first version of the critical thinking skills test for youth leaders, a demographic instrument, and parental consent forms was mailed to the teachers, who distributed the pilot instrument to the students. The instruments were collected from the students. The data were entered into SPSS, and means, variation, corrected item-total correlation, and reliability statistics were used to construct the newly revised critical thinking skills test.

Piloting testing of the EMI critical thinking disposition inventory took place with (n = 60) secondary agricultural education students in Gallatin, Tennessee through an online instrument. After the Tennessee students finished taking the disposition inventory, which they claimed took from 5-10 minutes the results were downloaded from the Internet to a text file. When the data were in the text file, it had to be checked to make sure there were no strange spaces and to make sure commas were delimiting the data properly. The data were then downloaded to SPSS for analysis. Means, variation, corrected item-total correlation, and reliability statistics were used to construct the newly revised critical thinking disposition inventory. Items were added to the newly revise inventory to increase the amount of Maturity items.

An Institutional Review Board (IRB) request to conduct the pilot study was requested and granted. Students under the age of 18 were required to either mail in their

parental consent forms or check the appropriate box indicating their parents had read the PDF parental consent letter, which was linked to the online test.

Data Collection Procedures

Survey implementation followed Dillman's (2000) system of five compatible contacts. The subjects were first informed of their invitation to participate in the study by a mailed pre-postcard, which explained the study and let them know they would be receiving subsequent mailings and instructions concerning the study. The second contact was an envelope with a form letter and a slip of paper. The form letter was dually responsible for informed consent and parental consent. The letter also contained the web address for the critical thinking skills test, more information regarding the study, and another invitation asking students to participate. The slip of paper asked students to give the enclosed letter to their parents to read and approve before they went to the website on the letter and informed students 18 and over that they could proceed with reading the letter and go to the web address. The third contact was a "Thank you" postcard that also served as a reminder to take the online test. The fourth contact was a paper version of the test along with additional parental consent forms, and a self-addressed stamped envelope to the University of Florida. This packet was sent to participants who had not responded thus far. The final contact was at the National FFA Convention, prior to the decision-making workshop that served as an incentive for participants of the study. There were 229 responses from a population frame of 462 possible participants for a response rate of 50%. Seventeen of those respondents were removed from the database because of missing or erroneous data, which left (N = 212) actual participants in the study.

Data Analysis

Electronic data was collected through the online instrument and automatically deposited in to a text file. The text file was transferred to Excel, and then the data collected from this study were analyzed using the SPSS® for Windows™ statistical package. Fifty-four paper versions were entered into the Excel file before being transferred to SPSS.

Approximately half of the target population frame responded to the contacts. According to Miller and Smith (1983), one way to control for nonresponse is by analyzing late respondents, since they are so similar to nonrespondents. Early respondents (n = 148), who had taken the tests online were compared to late respondents (n = 54), who returned the mailed replacement instruments. Independent sample t-tests were conducted on each variable of interests and no differences were found between early and late respondents.

Means and standard deviations of critical thinking scores were reported. Independent t-tests and one-way analysis of variance procedures were conducted to identify differences in critical thinking skill scores as a function of gender, age, and GPA. Pearson's product moment (r) statistics were conducted to identify the magnitude of relationship of critical thinking skills to the other variables in the study. R^2, omega (ω^2) and Cohen's *d* statistics were used as an index of the proportion of variance in critical thinking skills explained by the independent variables. Finally, backward elimination multiple regression procedures, which keeps only meaningful and significant predictors of the dependent variable in a model (Pedhazur, 1982), were used to predict total critical thinking skill scores and each of the individual constructs, for the purposes of better understanding what makes a young person a good critical thinker.

Summary

This chapter has explained the methods used in this quantitative study of the critical thinking skills of selected youth leaders in the National FFA Organization. This was a descriptive study utilizing causal comparative and correlational designs. This chapter reported the context of the study. Critical thinking was in the context of leadership development and agricultural education, and this study was conducted under the auspices of the National FFA Organization and the University of Florida. The creation, development, testing of the researcher-developed instrumentation, and reliability and validity of the measures were detailed. Online data collection and mailed instruments were used to collect data from 229 subjects hailing from 50 states and Puerto Rico for a response rate of 50%. Data analysis procedures, including the statistics (means, standard deviations, independent samples t-tests, analysis of variance, Pearson's product moment, coefficient of determination, omega-squared, Cohens d, and backward elimination multiple regression were also outlined in this chapter. The next chapter will report the findings of this study.

CHAPTER 4
RESULTS

Chapter 1 described the background for studying critical thinking and youth leadership in the FFA. Chapter 1 also explained the significance of the study and briefly described the research methodology. The primary purpose of this study was to identify and predict the critical thinking skill of selected youth leaders in the National FFA Organization. Specifically, this study sought to

- To determine the critical thinking skill level of selected leaders in the FFA,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA),
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions, and
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

Chapter 2 provided a theoretical framework, and the empirical research relevant to this study. A large body of critical thinking literature was examined in youth leadership development; general knowledge in critical thinking; and critical thinking skill and its relationship to critical thinking disposition, age, gender, experience, and prior knowledge.

Chapter 3 described the methods used to conduct the study. Specifically the context of the study, the research design, subjects, instrumentation, procedures, and analysis of data were discussed. The independent variables in the study were age, gender, student academic performance measured by grade point average (GPA),

leadership training score, leadership experience score, total leadership score, total critical thinking disposition, and the specific dispositions of Innovativeness, Maturity, and Engagement. The dependent variable in the study was critical thinking skill level of youth leaders in the FFA. The specific subskills of Analysis, Inference, and Evaluation also served as dependent variables. The quantitative research methods employed in the study were descriptive research and causal-comparative analysis.

Chapter 4 is organized in terms of the five specific research questions posed in Chapter 1. It first reports the total and specific subscale critical thinking skill scores, and it then determines relationships between critical thinking skill and gender, age, grade point average, leadership experience level, leadership training score, total leadership score, and EMI critical thinking disposition scores. Lastly this chapter focuses on the predictive nature of critical thinking skill level as the results of the prediction equations for Analysis, Inference, Evaluation, and total critical thinking score are reported.

Objective One: Determine the Critical Thinking Skill Level of Selected Leaders in the FFA

The mean critical thinking skill score was M = 227.86, SD = 37.91. Critical thinking skill scores ranged from a low score of 67.86 to a maximum score of 300. The scores for Analysis ranged from a low of 25 to the highest possible score of 100. Inference scores ranged from 0 to 100, and Evaluation scores ranged from 14.29 to 100. The highest scores were recorded for the Analysis (M =82.17, SD =15.12) construct. As indicated in Table 4-1, all of the scores were above 70 for the possible range of 0 to 100. Students also scored in the upper range for the Inference (M =73.40, SD =20.74) and Evaluation (M =71.50, SD =17.70) constructs.

Table 4-1. Mean subscale and total critical thinking skill scores (N = 212)

Skill	M	SD
Analysis	82.97	15.12
Inference	73.40	20.74
Evaluation	71.50	17.70
Total critical thinking	227.86	37.91

Objective Two: Determine the Relationship between Critical Thinking Skill Level of Youth Leaders in the FFA and Age, Gender, and Student Academic Performance (GPA)

Critical Thinking Skills and the Relationship to Gender

There were more females (n = 128), who participated in the study than males (n = 78). The range of critical thinking skill scores was 67.86 to 287.50 for males and 120.36 to 300 for females. According to Table 4-2, females scored higher on total critical thinking skill than males. Table 4-2 also shows females with higher scores than males in the specific critical thinking skills of Analysis and Inference, respectively. The female and male participants in this study scored very similarly on the critical thinking skill of Evaluation.

Table 4-2. Mean subscale and critical thinking skill score by gender (N = 207)

Skill	Gender	n	M	SD
Analysis	Male	79	80.54	16.95
	Female	128	84.45	14.00
Inference	Male	79	71.90	21.37
	Female	128	74.06	20.29
Evaluation	Male	79	71.64	17.52
	Female	128	71.63	17.59
Total critical thinking	Male	79	224.08	40.84
	Female	128	230.14	35.81

Note: Five respondents failed to indicate whether they were male or female.

Gender was not related to critical thinking skill in our study. Table 4-2 indicated females scored slightly higher in Analysis, Inference, and total critical thinking score, but a *t*-test measuring the association of gender and critical thinking skill revealed no statistical difference between males and females for Analysis, $t(205) = -1.80$, $P>0.05$, $d =$

0.28, Inference, $t(205) = -0.730$, P>.05, $d = 0.11$, Evaluation, $t(205) = .003$, P>0.05, $d = 0.00$, or total critical thinking skill score, $t(205) = -1.12$, P>0.05, $d = 0.17$ (Table 4-3).

Table 4-3. Independent groups t-test by gender for critical thinking skill (N = 207)

Skill	t	df	Sig.(2-sided)	SE	Cohen's *d*
Analysis	-1.80	205	0.07	2.18	0.28
Inference	-0.73	205	0.47	2.96	0.11
Evaluation	0.00	205	1.00	2.51	0.00
Total critical thinking skill	-1.12	205	0.26	5.41	0.17

Cohen's *d* was determined to be the most appropriate measure of effect size for an independent groups t-test. Using Cohen's (1977) statistic, 0.20 represents a small effect size; 0.50 represents a medium effect size; and 0.80 represents a large effect size. Although the difference between males and females failed to be statistically significant, gender did have a small effect on Analysis and total critical thinking skill. Additionally, it should be noted that Cohen purported that new areas of research inquiry will yield smaller effect sizes.

Critical Thinking Skills and the Relationship to Age

The average age of the participants was $M = 17.81$, $SD = .99$. The ages of the participants ranged from 16 to 21. Sixteen year-old participants' ($M = 237.25$, $SD = 37.04$) critical thinking skill scores ranged from 170.36 to 300 out of 300. Seventeen ($M = 216.26$, $SD = 43.43$), 18 ($M = 232.75$, $SD = 33.42$), 19 ($M = 233.25$, $SD = 33.26$), and 20 year old participants ($M = 228.99$, $SD = 42.44$) had scores ranging from 67.86 to 287.50, 152.14 to 285.71, 175.71 to 285.71, and 159.64 to 287.50, respectively.

According to Table 4-4, the average Analysis scores were $M = 80.78$, $SD = 14.01$ for 16-year olds, $M = 79.73$, $SD = 18.15$ for 17-year olds, $M = 86.01$, $SD = 13.36$ for 18-year olds, $M = 84.38$, $SD = 12.70$ for 19-year olds, and $M = 80.68$, $SD = 16.17$ for 20-year olds. The average Inference scores were $M = 80.00$, $SD = 23.45$ for 16-year olds, M

= 69.52, *SD* =23.24 for 17-year olds, *M* = 74.29, *SD* = 20.02 for 18-year olds, *M* = 73.75, *SD* = 16.41 for 19-year olds, and *M* = 78.18, *SD* = 16.62 for 20-year olds. The average Evaluation scores were *M* = 76.46, *SD* = 12.98 for 16-year olds, *M* = 67.01, *SD* =12.98 for 17-year olds, *M* = 72.45, *SD* = 17.15 for 18-year olds, *M* = 75.22, *SD* = 20.53 for 19-year olds, and *M* = 70.13, *SD* = 22.55 for 20-year olds.

Table 4-4. Mean subscale and critical thinking skill score by age (N = 208)

Age	n	Analysis M	Analysis SD
16	17	80.78	14.01
17	63	79.73	18.15
18	84	86.01	13.36
19	32	84.38	12.70
20	11	80.68	16.17
21	1	62.50	.
Age	n	Inference M	Inference SD
16	17	80.00	23.45
17	63	69.52	23.24
18	84	74.29	20.02
19	32	73.75	16.41
20	11	78.18	16.62
21	1	80.00	.
Age	n	Evaluation M	Evaluation SD
16	17	76.46	12.98
17	63	67.01	16.05
18	84	72.45	17.15
19	32	75.22	20.53
20	11	70.13	22.55
21	1	71.43	.
Age	n	Total CT Skill M	Total CT Skill SD
16	17	237.25	37.04
17	63	216.26	43.43
18	84	232.75	33.42
19	32	233.35	33.26
20	11	228.99	42.44
21	1	213.93	.

Note: Four respondents failed to list their age.

Every age group registered a high score of 100 out of a possible 100 points on each of the subskills, Analysis, Inference, and Evaluation. The lowest Analysis score was 25.00, which was registered by the 17 year-old group. The lowest Inference score was

zero, also registered by the 17 year-old group. The lowest Evaluation score was 28.57, and was registered by both the 17 and 18 year-old groups.

As indicated in Table 4-4, the 16-year-old participants (*M* = 237.25, *SD* = 37.04) scored the highest, and the 17-year-old participants (*M* = 216.26, *SD* = 43.43) scored lower than any of the other age groups, save the single 21-year-old (213.03). Additionally, the 18 and 19-year-old participants recorded higher scores in Analysis (*M* = 86.01, *SD* = 13.36; *M* =84.38, *SD* =12.70) than in any of the age groups.

One-way analysis of variance procedures revealed that critical thinking score is not dependent on age (Table 4-5.). Analysis, $F(6, 205) = 1.56$, $P>0.05$, $\omega^2 = 0.02$, Inference, $F(6, 205) = .809$, $P>0.05$, $\omega^2 = 0.01$, Evaluation, $F(6,205) = 1.22$, $P>0.05$, $\omega^2 = 0.01$, and total critical thinking skill scores, $F(6,205) = 1.56$, $P>0.05$, $\omega^2 = 0.02$, did not statistically differ as a function of age.

Table 4-5. One-way ANOVA of critical thinking differences by age (N = 208)

Skill		df	F	Sig.	ω^2
Analysis	Between Groups	6	1.56	0.16	.02
	Within Groups	205			
Inference	Between Groups	6	0.81	0.56	.01
	Within Groups	205			
Evaluation	Between Groups	6	1.22	0.30	.01
	Within Groups	205			
Total critical thinking	Between Groups	6	1.56	0.16	.02
	Within Groups	205			

As Table 4-4 indicated, the 16-year-old participants scored higher than any of the other age groupings, and the 17-year-old participants scored lower than any of the other age groups, but these findings were not significant. Table 4-5 details the results of the One-Way ANOVA, which found no statistical dependence between the critical thinking skill and age. However, age did have a small effect on critical thinking skills. According

to Keppel (1991, p. 66) an omega-squared (ω^2) value of 0.01 represents a small effect; 0.06 represents a medium effect; and 0.15 represents a large effect size.

Critical Thinking Skills and the Relationship to Grade Point Average (GPA)

The participants' GPAs ranged from 2.0 to 5.0 with an average of M = 3.67, SD = .39. Controlling for the GPA (2.0-3.0, 3.01-3.49, 3.50-3.74, 3.75-3.99, 4.0, 4.01-5.0), total critical thinking skill scores ranged from M = 213.26, SD = 48.94 to M = 244.27, SD = 27.17, and Analysis critical thinking skill scores ranged from M = 76.50, SD = 18.51 to 88.51, SD = 12.63. Inference skill scores ranged from M = 68.00 to SD = 19.15 to M = 83.33, SD = 14.36, and Evaluation critical thinking skill scores ranged from M = 65.76, SD = 16.54 to M = 76.83, SD = 15.83 (Table 4-6).

Total critical thinking skill scores consistently increased as grade point averages increased from 2.0-3.0 (M =213.26, SD =48.94) to 4.0 (M =244.27, SD =27.17). Participants with GPA's over 4.0 (M =238.10, SD =36.95) recorded lower total critical thinking skill scores than the 4.0 participants. Scores followed the same trend for Analysis and Evaluation, but the Inference scores continued to rise with the participants' GPA.

The specific critical thinking skills of Inference, $F(5, 206) = 1.89$, $P>0.05$, $\omega^2 = 0.02$, and Evaluation, $F(5, 206) = 1.47$, $P> 0.05$, $\omega^2 = 0.01$ were not associated with GPA, but a there was a small effect size. The increase in Analysis scores as GPA levels became higher, which was reported in Table 4-7 was statistically significant, $F(5, 206) = 3.36$, $P<0.05$, $\omega^2 = 0.05$, and approaching a medium effect size. The increase in overall critical thinking skill score as GPA increased was also significant and approaching a medium effect size, $F(5,206) = 3.11$, $P<0.05$, $\omega^2 = 0.05$.

Table 4-6. Mean critical thinking skill score by grade point average (N = 212)

GPA	n	Analysis M	Analysis SD
2.0-3.0	21	77.98	17.64
3.01-3.49	25	76.50	18.51
3.5-3.74	58	80.66	14.43
3.75-3.99	59	86.20	13.27
4.0	37	88.51	12.63
4.01-5.0	12	83.33	14.43
GPA	n	Inference M	Inference SD
2.0-3.0	21	69.52	26.55
3.01-3.49	25	68.00	19.15
3.5-3.74	58	70.34	23.17
3.75-3.99	59	74.58	18.13
4.0	37	78.92	18.23
4.01-5.0	12	83.33	14.36
GPA	n	Evaluation M	Evaluation SD
2.0-3.0	21	65.76	16.54
3.01-3.49	25	74.86	17.14
3.5-3.74	58	69.22	18.94
3.75-3.99	59	70.62	17.89
4.0	37	76.83	15.83
4.01-5.0	12	71.43	17.23
GPA	n	Total CT Skill M	Total CT Skill SD
2.0-3.0	21	213.26	48.94
3.01-3.49	25	219.36	39.26
3.5-3.74	58	220.63	40.34
3.75-3.99	59	231.40	32.88
4.0	37	244.27	27.17
4.01-5.0	12	238.10	36.95

Table 4-7. One-way ANOVA of critical thinking differences by GPA (N = 212)

Skill		df	F	Sig.	ω^2
Analysis subscale score	Between Groups	5	3.36	0.01	.05
	Within Groups	206			
Inference subscale score	Between Groups	5	1.89	0.10	.02
	Within Groups	206			
Evaluation subscale score	Between Groups	5	1.47	0.20	.01
	Within Groups	206			
Total critical thinking skill score	Between Groups	5	3.11	0.01	.05
	Within Groups	206			

Objective Three: Determine the Relationship between Critical Thinking Skill Level of Youth Leaders in the FFA and Levels of Leadership Training and Experience

Participants were asked to write the number of times they had participated in a given list of leadership activities that are available in the FFA. Additionally, participants wrote responses to the following two questions:

- What other activities in the FFA, not listed above have contributed to your leadership development?
- What activities outside of the FFA have contributed to your leadership development?

The list of items and the responses were classified as either formal leadership training (i.e., leadership workshops, leadership conferences, or formal leadership courses) or as leadership experiences (i.e., public speaking, livestock judging, state FFA convention). The responses were also weighted. Local activities were given a value of one point, District or Area activities were given a value of two, Regional activities were given a value of three, State activities were given a value of four, and National and International activities were given a value of five. A formal leadership development course was also given a value of five. The self-reported activities were added together to create a leadership training and experience score.

Critical Thinking Skills and the Relationship to Level of Leadership Training

Leadership training scores ranged from zero to 64, with an average score of M = 17.11, SD = 9.84. Table 4-8 displays critical thinking skill scores at six different levels of leadership training, in an effort to summarize the data. As categorized data total critical thinking skill scores ranged from M = 223.67, SD = 38.12 to M = 265.36, SD = 6.26, Analysis scores ranged from M = 81.25, SD = 13.87 to M = 95.83, SD = 7.22, Inference

scores ranged from *M* = 70.67, *SD* = 19.81 to *M* = 93.33, *SD* = 11.55, and Evaluation scores ranged from *M* = 68.66, *SD* = 19.75 to *M* = 90.48, *SD* = 16.50.

Table 4-8. Mean critical thinking skill score by leadership training (N = 210)

Leadership Training Score	n	Analysis M	Analysis SD
0-9	42	81.25	13.87
10-19	98	82.36	15.10
20-29	49	84.18	17.45
30-39	15	83.33	12.20
40-49	3	91.67	14.43
50+	3	95.83	7.22
Leadership Training Score	n	Inference M	Inference SD
0-9	42	76.19	20.36
10-19	98	72.65	20.98
20-29	49	71.02	21.63
30-39	15	70.67	19.81
40-49	3	80.00	.00
50+	3	93.33	11.55
Leadership Training Score	n	Evaluation M	Evaluation SD
0-9	42	72.45	15.18
10-19	98	68.66	18.75
20-29	49	73.47	16.50
30-39	15	76.19	18.44
40-49	3	90.48	16.50
50+	3	76.19	8.25
Leadership Training Score	n	Total CT Skill M	Total CT Skill SD
0-9	42	229.89	34.40
10-19	98	223.67	38.12
20-29	49	228.67	41.39
30-39	15	230.19	34.58
40-49	3	262.15	30.93
50+	3	265.36	6.26

Note: Leadership training scores ranged from zero to 64.

According to Miller (1998), a Pearson product moment correlation coefficient of 0.01 - 0.09 represents a negligible relationship; 0.10 - 0.29 represents a low relationship; and 0.30 to 0.49 represents a moderate relationship. Using Miller's terminology for magnitude of the relationship, there was a low relationship between leadership training score and each subskill and the total critical thinking skill score. However, the relationship was positive. Table 4-8 depicted a trend of higher critical thinking scores for

higher levels of leadership training. Table 4-9 indicates that this low and positive relationship with leadership training is significant for Evaluation, $r(209) = 0.14$, $P<0.05$, $R^2 = 0.02$ and total critical thinking skill score, $r(209) = .15$, $P<0.05$, $R^2 = 0.02$, explaining only two percent of the variance for each respective variable. The positive relationship was approaching significance with Analysis, $r(209) = 0.14$, $P>0.05$, and not significantly related to Inference, $r(209) = 0.06$, $P>0.05$. R^2 was reported for the statistically significant relationships because Miller (1998) claimed it was necessary for determining practical significance.

Table 4-9. Pearson product moment correlation between critical thinking skills and leadership training score (N = 210)

Skill	r	df	Sig.(2-tailed)
Analysis	0.14	209	0.06
Inference	0.06	209	0.41
Evaluation	0.14	209	0.04
Total critical thinking	0.15	209	0.03

Critical Thinking Skills and the Relationship to Leadership Experience

Leadership experience scores ranged from four to 87, with an average score of $M = 31.25$, $SD = 12.81$. According to Table 4-10, which displays the critical thinking skill scores by a categorized level of leadership experience, total critical thinking skill scores ranged from $M = 206.28$, $SD = 29.66$ to $M = 241.01$, $SD = 42.98$, Analysis scores ranged from $M = 76.55$, $SD = 11.43$ to $M = 86.98$, $SD = 13.02$, Inference scores ranged from $M = 60.00$, $SD = 23.09$ to $M = 76.77$, $SD = 17.06$, and Evaluation scores ranged from $M = 61.91$, $SD = 21.23$ to $M = 76.79$, $SD = 22.66$.

According to Table 4-10, the total critical thinking skill scores improved from $M = 206.28$, $SD = 29.56$ at the lowest level of leadership experience to $M = 241.01$, $SD = 42.98$ at the highest level of leadership experience.

There was also a low relationship between leadership experience score and critical thinking skills. However, the relationship was positive. Table 4-10 depicted a trend of higher critical thinking scores for higher levels of leadership experience. Table 4-11 shows that this relationship is significant for Analysis, $r(209) = 0.14$, $P>0.05$, $R^2 = 0.02$ and total critical thinking skill score $r(209) = 0.16$, $P<0.05$, $R^2 = 0.03$, explaining two percent and three percent of the respective variance in each critical thinking variable. The relationship was positive, but insignificant for Inference, $r(209) = 0.11$, $P>0.05$, and Evaluation, $r(209) = 0.08$, $P>0.05$, when alpha was set at 0.05.

Table 4-10. Mean critical thinking skill score by leadership experience (N = 210)

Leadership Experience Score	n	Analysis M	Analysis SD
0-9	4	84.38	6.25
10-19	23	76.55	11.43
20-29	81	81.92	17.67
30-39	62	84.07	13.42
40-49	24	86.98	13.02
50+	16	86.72	15.46
Leadership Experience Score	n	Inference M	Inference SD
0-9	4	60.00	23.09
10-19	23	71.30	22.42
20-29	81	70.37	23.90
30-39	62	76.77	17.06
40-49	24	75.00	16.94
50+	16	77.50	17.70
Leadership Experience Score	n	Evaluation M	Evaluation SD
0-9	4	61.91	12.90
10-19	23	67.50	13.05
20-29	81	71.96	18.52
30-39	62	71.66	17.45
40-49	24	71.43	15.19
50+	16	76.79	22.66
Leadership Experience Score	n	Total CT Skill M	Total CT Skill SD
0-9	4	206.28	29.56
10-19	23	215.35	36.24
20-29	81	224.25	42.06
30-39	62	232.51	33.10
40-49	24	233.41	30.40
50+	16	241.00	42.98

Note: Leadership experience scores ranged from four to 87.

Table 4-11. Pearson product moment correlation between critical thinking skills and leadership experience score (N = 210)

Skill	r	df	Sig.(2-tailed)
Analysis	0.14	209	0.05
Inference	0.11	209	0.10
Evaluation	0.08	209	0.23
Total critical thinking	0.16	209	0.03

Critical Thinking Skills and the Relationship to Total Leadership Score

The total leadership score is an additive result of the leadership training score and the leadership experience score. Total leadership scores ranged from four to 111 with an average score of M = 48.36, SD = 18.03. According to Table 4-12, which displays the critical thinking skill scores by level of total leadership score, total critical thinking skill scores ranged from M = 220.19, SD = 34.80 to M = 240.15, SD = 34.60, Analysis scores ranged from M = 79.49, SD = 17.87 to M = 87.50, SD = 12.01, Inference scores ranged from M = 68.57, SD = 22.43 to M = 77.14, SD = 15.41, and Evaluation scores ranged from M = 67.69, SD = 13.85 to M = 75.51, SD = 22.71.

Table 4-12 also shows an increase in critical thinking skill scores with increases in total leadership score. The lowest total critical thinking skill scores (M = 220.19, SD = 34.80) were at the 25-34 leadership score level. The highest critical thinking skill scores (M = 240.15, SD = 34.60) were at the 75+ leadership score level.

There was a low relationship between total leadership score and critical thinking skills. However, the relationship was positive. According to Table 4-13, this relationship was significant for Analysis, $r(209) = 0.17$, $P < 0.05$, $R^2 = .03$ explaining three percent of the variance; for Evaluation, $r(209) = 0.14$, $P < 0.05$, $R^2 = .02$, explaining two percent of the variance; and for total critical thinking skill score $r(209) = 0.19$, $P < 0.05$, $R^2 = 0.04$,

explaining four percent of the variance. This positive relationship was not statistically significant for Inference, $r(209) = 0.11$, $P > 0.05$ when alpha was set at 0.05.

Table 4-12. Mean critical thinking skill score by total leadership score (N = 210)

Total Leadership Score	n	Analysis M	Analysis SD
0-24	18	80.46	13.66
25-34	21	83.93	11.28
35-49	86	79.49	17.87
50-74	70	86.61	12.65
75+	14	87.50	12.01
Total Leadership Score	n	Inference M	Inference SD
0-24	18	72.22	25.80
25-34	21	68.71	22.43
35-49	86	71.86	21.56
50-74	70	76.00	18.84
75+	14	77.14	15.41
Total Leadership Score	n	Evaluation M	Evaluation SD
0-24	18	70.24	12.71
25-34	21	67.69	13.85
35-49	86	70.10	19.18
50-74	70	73.67	16.43
75+	14	75.51	22.71
Total Leadership Score	n	Total CT Skill M	Total CT Skill SD
0-24	18	222.92	38.32
25-34	21	220.19	34.80
35-49	86	221.45	40.47
50-74	70	236.28	34.87
75+	14	240.15	34.60

Note: Total Leadership scores ranged from four to 110.

Table 4-13. Pearson product moment correlation between critical thinking skills and leadership training score (N = 210)

Skill	r	df	Sig.(2-tailed)
Analysis	0.17	209	0.02
Inference	0.11	209	0.11
Evaluation	0.14	209	0.05
Total critical thinking	0.19	209	0.01

Objective Four: Determine the Relationship between Critical Thinking Skill Level of Youth Leaders in the FFA and their Critical Thinking Dispositions

Critical Thinking Skills and the Relationship to EMI Critical Thinking Disposition

EMI critical thinking disposition scores ranged from 76 to 117, with an average score of M = 96.68, SD = 7.60. There was a low relationship between critical thinking skills and total EMI scores. However, the relationship was always positive. According to Table 4-14, EMI score was significantly related to total critical thinking skill scores, $r(201) = 0.18$, $P < 0.05$, $R^2 = 0.03$, accounting for three percent of the variance; and the specific subskill, Inference, $r(201) = 0.20$, $P < 0.05$, $R^2 = 0.04$, accounting for four percent of the variance. The relationship was not significant for Analysis, $r(201) = 0.11$, $P > 0.05$ and Evaluation, $r(201) = 0.05$, $P > 0.05$.

Table 4-14. Pearson product moment correlation between critical thinking skills and total EMI scores (N = 202)

Skill	r	df	Sig.(2-tailed)
Analysis	0.11	201	0.12
Inference	0.20	201	0.00
Evaluation	0.05	201	0.47
Total critical thinking	0.18	201	0.01

Critical Thinking Skills and the Relationship to the Innovativeness Disposition

Innovativeness disposition scores ranged from 16 to 35, with an average score of M = 29.52, SD = 3.24. There was a low relationship between the Innovativeness disposition score and total critical thinking score. There was also a low relationship between the specific skills of Analysis and Inference and Innovativeness. (Table 4-15) However, the relationship was always positive. According to Table 4-15, the relationship between Innovativeness disposition and total critical thinking skill scores $r(201) = 0.26$, $P < 0.05$, $R^2 = 0.07$, which explained seven percent of the variance; Analysis $r(201) = 0.24$, $P < 0.05$, $R^2 = 0.06$, which explained six percent of the variance; and Inference,

$r(201) = 0.29$, $P < 0.05$, $R^2 = 0.08$, which explained eight percent of the variance, were statistically significant compared to Evaluation, $r(201) = 0.03$, $P > 0.05$.

Table 4-15. Pearson product moment correlation between critical thinking skills and Innovativeness disposition (N = 202)

Skill	r	df	Sig.(2-tailed)
Analysis	0.24	201	0.00
Inference	0.29	201	0.00
Evaluation	0.03	201	0.68
Total critical thinking	0.26	201	0.00

Critical Thinking Skills and the Relationship to the Maturity Disposition

Maturity scores ranged from 13.00 to 36.00 with a mean of $M = 21.73$, $SD = 4.12$. Critical thinking skills tended to decrease as the Maturity scores increased. The magnitude of the relationship between the Maturity disposition and critical thinking skill was low, but the direction of the relationship was negative. According to Table 4-16, this low, but negative relationship was significant for Analysis $r(201) = -0.19$, $P < 0.05$, $R^2 = 0.04$, Inference $r(201) = -0.14$, $P < 0.05$, $R^2 = 0.02$ and total critical thinking skill score $r(201) = -0.18$, $P < 0.05$, $R^2 = .03$, explaining four, two, and three percent of the variance, respectively. Though Evaluation, $r(201) = -0.07$, $P > 0.05$ depicted the same inverse relationship, it was not statistically significant at the 0.05 alpha level.

Table 4-16. Pearson product moment correlation between critical thinking skills and Maturity disposition (N = 202)

Skill	r	df	Sig.(2-tailed)
Analysis	-0.19	201	0.01
Inference	-0.14	201	0.05
Evaluation	-0.07	201	0.33
Total critical thinking	-0.18	201	0.01

Critical Thinking Skills and the Relationship to the Engagement Disposition

Engagement scores ranged from 29.00 to 55.00 with a mean of $M = 45.44$, $SD = 5.08$. The Engagement disposition score also had a low relationship with total critical

thinking score and the specific skill of Inference. The relationships were positive, as Analysis, Inference, Evaluation, and total critical thinking skill scores increased as Engagement disposition scores increased. According to Table 4-17, this relationship between critical thinking skill scores and Engagement was significant for Analysis, $r(201) = 0.17$, $P < 0.05$, $R^2 = 0.03$, which explained three percent of the variance; Inference $r(201) = 0.23$, $P < 0.05$, $R^2 = 0.05$, which explained five percent of the variance; and total critical thinking, $r(201) = 0.24$, $P < 0.05$, $R^2 = 0.06$, which explained six percent of the variance. Evaluation, $r(201) = 0.11$, $P > 0.05$ displayed the same trend, but was not significant at the 0.05 alpha level.

Table 4-17. Pearson product moment correlation between critical thinking skills and Engagement disposition (N = 202)

Skill	r	df	Sig.(2-tailed)
Analysis	0.17	201	0.02
Inference	0.23	201	0.00
Evaluation	0.11	201	0.11
Total critical thinking	0.24	201	0.00

Objective 5: Predict the Critical Thinking Skill Level of Selected Youth Leaders Using the Age, Gender, GPA, Leadership, and Critical Thinking Disposition Variables

Total critical thinking skill score and the specific skills of Inference, Analysis, and Evaluation are best predicted with models including each of the variables in this study. Backward multiple regression was performed between the dependent variables (total critical thinking skill, Analysis, Inference, and Evaluation) and the independent variables (age, gender, GPA, leadership training, leadership experience, Innovativeness, Maturity, and Engagement) in order to predict critical thinking skills using the full range of variability.

Total Critical Thinking Score

Grade point average of participants, leadership training score, and Innovativeness sum yield the model best predicting variance in total critical thinking skill. Regression analysis revealed that the model significantly predicted total critical thinking score, $F(3, 197) = 10.32$, $P < 0.05$. R^2 for the model was 0.14, and adjusted R^2 was 0.12. Table 4-18 displays the unstandardized regression coefficients (B), intercept, and standardized regression coefficients (β) for each variable. In terms of individual relationships between the independent variables and total critical thinking score, the Innovativeness disposition ($t = 2.807$, $P < 0.05$), leadership training score ($t = 2.32$, $P < 0.05$), and GPA ($t = 3.37$, $P < 0.05$) of participants significantly predicted total critical thinking score at the 0.05 alpha level. The three variables, Innovativeness disposition, GPA, and leadership training score contributed 12 percent in shared variability to total critical thinking skill.

Table 4-18. Backward elimination regression predicting total critical thinking skill score (N = 212)

	B	SE	Beta	T	Sig.
(Constant)	4.91	1.99		2.47	0.02
GPA	1.48	0.44	0.23	3.37	0.00
Leadership training score	0.03	0.02	0.16	2.32	0.02
Innovativeness disposition	0.15	0.05	0.19	2.81	0.01

Analysis

Grade point average, gender, age, and the Innovativeness sum score of participants yield the model best predicting variance in the specific subskill of Analysis. Regression analysis revealed that the model significantly predicted the Analysis subskill, $F(4, 196) = 10.36$, $P < 0.05$. R^2 for the model was 0.14 and adjusted R^2 was 0.13. Table 4-19 displays the unstandardized regression coefficients (B), intercept, and standardized regression coefficients (β) for each variable. In terms of individual relationships between the independent variables and the Analysis subskill, GPA ($t = 3.745$, $P < 0.05$),

Innovativeness sum (t = 2.69, P< 0.05), and age (t = 2.19, P< 0.05) significantly predicted the critical thinking subskill of Analysis. Gender of participant (t = 1.69, P> 0.05) contributed to the model, but was insignificant at the *a priori* alpha (0.05) level. The four variables, GPA, Innovativeness sum, gender, and age contributed 13 percent in shared variability to the Analysis subskill.

Table 4-19. Backward elimination regression predicting the Analysis subskill (N = 212)

	B	SE	Beta	T	Sig.
(Constant)	-2.09	1.89		-1.10	0.27
GPA	0.82	0.22	0.26	3.75	0.00
Innovativeness sum	0.01	0.03	0.18	2.69	0.01
Gender	0.29	0.17	0.12	1.69	0.09
Age	0.18	0.08	0.15	2.19	0.03

Inference

The Innovativeness disposition and participants' GPA were the variables in the model best predicting variance in the specific subskill of Inference. Regression analysis revealed the model significantly predicted the Inference subskill, F(2, 198) = 11.07, P< 0.05. R^2 for the model was 0.10, and adjusted R^2 was 0.09. Table 4-20 displays the unstandardized regression coefficients (B), intercept, and standardized regression coefficients (β) for each variable. In terms of individual relationships between the independent variables and the Inference subskill, the Innovativeness disposition (t = 3.83, P< 0.05) significantly predicted the Inference score, while GPA (t = 1.92, P > 0.05) contributed to the model without meeting the appropriate (0.05) alpha level. Together, the two variables contributed nine percent in shared variability to the Inference subskill.

Table 4-20. Backward elimination regression predicting the Inference subskill (N = 212)

	B	SE	Beta	T	Sig.
(Constant)	-0.09	0.84		-0.11	0.91
Innovativeness disposition	0.08	0.02	0.26	3.83	0.00
GPA	0.36	0.19	0.13	1.92	0.06

Evaluation

Multiple regressions with Evaluation skills dropped each of the variables except leadership training score. Regression analysis revealed that the best model for predicting the Evaluation subskill, $F(1, 199) = 3.62$, $P > 0.05$ failed to be significant at the 0.05 alpha level. R^2 for the model was 0.02, and adjusted R^2 was 0.01. Table 4-21 displays the unstandardized regression coefficients (B), intercept, and standardized regression coefficients (β) for each variable. In terms of individual relationship between the independent variable and the Evaluation subskill, leadership training score ($t = 1.96$, $P > 0.05$) was not significant. The best model of predicting leadership training accounted for one percent of the variability in the Evaluation subskill of critical thinking.

Table 4-21. Regression predicting the Evaluation subskill (N = 212)

	B	SE	Beta	T	Sig.
(Constant)	4.71	0.17		27.53	0.00
Leadership Training Score	0.02	0.01	0.13	1.90	0.06

Summary

This chapter was organized in terms of the five specific research objectives posed in Chapter 1. Specifically, this chapter reported the findings of the following objectives: determine the critical thinking skill level of selected leaders in the FFA; determine the relationship between critical thinking skill level of youth leaders in the FFA and age, gender, and student academic performance (GPA); determine the relationship between critical thinking skill level of youth leaders in the FFA and leadership experience level and leadership training level; determine the relationship between critical thinking skill level of youth leaders in the FFA and critical thinking dispositions; and predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking variables.

Chapter 5 will offer more detailed analysis and discussion of the results. Chapter 5 will also draw the conclusions of the study, and make recommendations from the results presented in this chapter.

CHAPTER 5
SUMMARY AND DISCUSSION

The primary purpose of this study was to identify and predict the critical thinking ability of selected youth leaders in the National FFA Organization. Specifically, this study sought to

- To determine the critical thinking skill level of selected leaders in the FFA,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their age, gender, and academic performance (GPA),
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their level of leadership experience and training,
- To determine the relationship between the critical thinking skill level of youth leaders in the FFA and their critical thinking dispositions, and
- To predict the critical thinking skill level of selected youth leaders using age, gender, GPA, leadership, and critical thinking disposition variables.

Chapter 1 described the background for studying critical thinking and youth leadership in the FFA, explained the significance of the study, and briefly described the research methodology used. Chapter 2 provided a theoretical framework, and the empirical research relevant to this study. Chapter 3 described the methods used to conduct the study, and Chapter 4 reported the results of the study. As an aid to the reader, this final chapter of the dissertation restates the research problem and reviews the major methods used in the study. The major sections of this chapter summarize the results and discuss their implications.

Problem Statement

Although critical thinking studies (Cillizza, 1970; Vygotsky, 1978; Wilson, 1989; Torres, 1993; Rudd, et al, 2000) have been numerous in previous years, limited research related to critical thinking and youth was identified, especially in the fields of agricultural education and leadership development. Since research in the specific contexts of youth, leadership, and agricultural education was limited, methods of evaluating critical thinking in these contexts did not exist.

The lack of research and evaluation procedures for measuring critical thinking seemed ironic since several state and federal bodies have mandated critical thinking. One example of such a mandate is from the state of Florida and the Department of Education. *Standard 4, Creative and Critical Thinkers* mandates that Florida students use creative thinking skills to generate new ideas, make the best decision, recognize and solve problems through reasoning, interpret symbolic data, and develop efficient techniques for lifelong learning (Florida Department of Education, 1995).

According to the report from the Florida Department of Education, educators are called to develop students as information managers, effective communicators, numeric problem solvers, critical thinkers, responsible and ethical workers, resource managers, systems managers, cooperative workers, effective leaders, and as multiculturally sensitive citizens (1995). The report mandated that each of the aforementioned goals be included in every subject area, but the measures (i.e., *Florida Comprehensive Assessment Test*) currently used are generalized, non-specific tools for assessing critical thinking.

Not everyone agrees that critical thinking is subject specific (Paul, 1995). If critical thinking is subject-specific (Ennis, 1989; Facione, 1990;Tindal, 1995; Angeli, 1999; Halliday, 2000), and if it is believed that leadership development and agricultural

education are subjects which require learners and workers who are critical thinkers (National FFA Task Force on Leadership and Personal Success, 2002), then there is a need to study and explain the critical thinking ability of youth leaders in agricultural education.

Review of Methods

The study reported here, was conducted using survey (descriptive) research and a causal comparative or *ex post facto* design. This research primarily used a quantitative perspective, attempting to measure, predict, and explain the critical thinking skills of selected youth leaders in the National FFA Organization. The dependent variables were total critical thinking skills and the specific subskills, Analysis, Inference, and Evaluation. The independent variables in the study were age, gender, student academic performance measured by GPA, critical thinking disposition scores, leadership training, and leadership experience. The descriptive study with subjects (n = 212) from 50 states and Puerto Rico used researcher-developed measures of critical thinking skills, dispositions, and leadership scores. Data were collected through online questionnaires, and also by mail for late respondents. Independent samples t-tests, one-way analysis of variance, Pearson's product moment, coefficient of determination, and backward elimination multiple regression procedures were used to analyze the data for interpretation.

Summary of Results

Chapter 2 reported that Analysis was about identifying the relationship between statements, questions, concepts, or descriptions to express beliefs, judgments or reasons. Also, Evaluation was about assessing credibility of statements and representations of others and assessing the logical strength of statements, descriptions or questions. Lastly,

Inference was found to be the ability to draw reasonable conclusions and/or hypotheses based on facts, judgments, beliefs, principles, concepts or other forms of representation. This section provides a summary of each objective pertaining to each of the critical thinking skills, Analysis, Inference, and Evaluation.

Objective One

Objective one sought to determine the critical thinking skill level of selected youth leaders in the FFA. As a whole, the National FFA delegates who participated in the study scored in the upper range of the critical thinking skills test, which measured the participants' skill level in the specific critical thinking constructs of Analysis, Inference, and Evaluation. All of the scores were above 70 for the possible range of 0 to 100, and students scored the highest on Analysis (M =82.17, SD =15.12), followed by Inference (M =73.40, SD =20.74) and Evaluation (M =71.50, SD =17.70) respectively. The mean total score for the participants was 227.86, SD =37.91 out of a possible 300.

Objective Two

Objective two sought to determine the relationship between the critical thinking skill level of youth leaders in the FFA and age, gender, and student academic performance (GPA). The demographic breakdown indicated little variety in critical thinking skill scores of participants. Though not statistically significant, females (n = 128) scored higher on critical thinking scores than the male (n = 78) subjects in our study. The females scored slightly higher in Analysis and Inference than the males, but were virtually the same as males in Evaluation. Older age did not mean higher scores in critical thinking skill assessment. As a matter of fact the youngest age group (16-year-olds) scored higher (M = 237.25, SD = 37.04) than any other age group on total critical thinking skills. Additionally, critical thinking scores tended to steadily rise as the

participants' GPA increased. However, when subjects reported a GPA higher than 4.0 their critical thinking scores decreased.

When analyzing the demographic variables with t-tests or analysis of variance procedures, gender $t(205) = -1.12$, P>.05 and age $F(6,205) = 1.56$, P>.05 had no actual association with critical thinking skill in this study. However, GPA tended to positively influence the critical thinking subskill of Analysis $F(5, 206) = 3.36$, P<.05 and the total critical thinking skill score $F(5,206) = 3.11$, P<.05.

Objective Three

Objective three sought to determine the relationship between critical thinking skill level of youth leaders in the FFA and leadership experience level and leadership training level. Leadership training and experience scores were positively (direction) related to higher critical thinking scores. This relationship became evident as the highest scores in leadership training were usually matched with higher critical thinking skill scores in most instances. Additionally, more leadership experiences seemed to be associated with higher critical thinking scores as well.

Pearson's product moment correlations indicated low (magnitude) relationships between Analysis, $r(209) = 0.14$, P> 0.05, Inference, $r(209) = 0.06$, P > 0.05, Evaluation, $r(209) = .14$, P< 0.05, $R^2 = .02$, and total critical thinking score $r(209) = 0.15$, P< 0.05, $R^2 = 0.02$ and leadership training (Table 5-1.) Similar relationships existed between Analysis, $r(209) = .14$, P>.05, $R^2 = .02$, Inference, $r(209) = .11$, P>.05, Evaluation, $r(209) = 0.08$, P> 0.05, and total critical thinking skill scores, $r(209) = 0.16$, P< 0.05, $R^2 = 0.03$ and leadership experience. Note that this relationship was always significant for total critical thinking skill scores and the leadership variables.

Table 5-1. Relationships between leadership and critical thinking skill scores.

Skill	r	df	Sig.(2-tailed)
Leadership training			
Analysis	0.14	209	0.06
Inference	0.06	209	0.41
Evaluation	0.14	209	0.04
Total critical thinking	0.15	209	0.03
Leadership experience			
Analysis	0.14	209	0.05
Inference	0.11	209	0.10
Evaluation	0.08	209	0.23
Total critical thinking	0.16	209	0.03

Objective Four

Objective four sought to determine the relationship between critical thinking skill level of youth leaders in the FFA and critical thinking dispositions. Total critical thinking skill scores improved slightly as the overall EMI critical thinking disposition scores increased. There was a low and positive relationship, $r(201) = .18$, $P<.05$, $R^2 = .03$, between critical thinking skills and total EMI scores. (Table 5.2) The critical thinking skills of the participants also increased with higher levels of the pre-disposition to the Innovativeness and Engagement sub-scales. This relationship to Innovativeness was significant for total critical thinking skill score, $r(201) = 0.26$, $P < 0.05$, $R^2 = 0.07$, Analysis, $r(201) = 0.24$, $P <0.05$, $R^2 = 0.06$ and Inference, $r(201) = 0.29$, $P < 0.05$, $R^2 = 0.08$. (Table 5.3) This relationship to Engagement was also significant for total critical thinking skill score, $r(201) = 0.24$, $P < 0.05$, $R^2 = 0.06$, Analysis, $r(201) = 0.17$, $P < 0.05$, $R^2 = 0.03$, and Inference, $r(201) = 0.23$, $P < 0.05$, $R^2 = 0.05$. (Table 5-4) Conversely, critical thinking skills tended to drop as the Maturity scores increased indicating a negative relationship between Maturity scores and Analysis, $r(201) = -0.19$, $P < 0.05$, R^2

= 0.04, Inference $r(201) = -0.14$, $P < 0.05$, $R^2 = 0.02$ and total critical thinking skill score $r(201) = -0.18$, $P < 0.05$. (Table 5-5)

Table 5-2. Relationships between Total EMI and critical thinking skill scores.

Skill	r	df	Sig.(2-tailed)	R^2
Analysis	0.11	201	0.10	0.01
Inference	0.20	201	0.00	0.04
Evaluation	0.15	201	0.47	0.02
Total critical thinking	0.18	201	0.01	0.03

Table 5-3. Relationship between Innovativeness and critical thinking skill scores

Skill	r	df	Sig.(2-tailed)	R^2
Analysis	0.24	201	0.00	0.06
Inference	0.29	201	0.00	0.08
Evaluation	0.03	201	0.68	0.00
Total critical thinking	0.26	201	0.00	0.07

Table 5-4. Relationship between Engagement and critical thinking skill scores

Skill	r	df	Sig.(2-tailed)	R^2
Analysis	0.17	201	0.02	0.03
Inference	0.23	201	0.00	0.05
Evaluation	0.11	201	0.11	0.01
Total critical thinking	0.24	201	0.00	0.06

Table 5-5. Relationship between Maturity and critical thinking skill scores

Skill	r	df	Sig.(2-tailed)	R^2
Analysis	-0.19	201	0.01	0.04
Inference	-0.14	201	0.05	0.02
Evaluation	-0.07	201	0.33	0.01
Total critical thinking	-0.18	201	0.01	0.03

Objective Five

The last objective was to predict the critical thinking skill scores of selected youth leaders in the National FFA Organization. Using the variables under investigation in this study, total critical thinking skill score is best predicted with the model including participants' GPA, leadership training score, and Innovativeness disposition, accounting for 14 percent of the variance in total critical thinking skill score.

This study also predicted the subskill scores of Analysis, Evaluation, and Inference. Grade point average, Innovativeness disposition, gender, and age were the variables in the model, which best predicted Analysis, accounting for 14 percent of the variance. The Innovativeness disposition and participants' GPA represented the best model predicting Inference, accounting for 10 percent of the variance. Lastly, leadership training score was the sole variable in the model best predicting the Evaluation subskill. This model only accounted for two percent of the variance in the Evaluation score.

Conclusions

Since this study purposively selected a sample of selected youth leaders in the National FFA Organization, one should carefully consider generalizing findings beyond the 2002 National FFA Convention delegate participants. With this limitation in mind, and based on the findings of this study, the following conclusions were drawn:

- Relatively, critical thinking skill scores of the National FFA delegates were high. Although, this was the first administration of the test, the scores were in the upper end of the range for each of the subskills.
- National FFA delegates were the most competent in the specific skill of Analysis, but more importantly, they were the least competent in Evaluation.
- Though not statistically significant, females scored higher than the males in terms of the critical thinking skill of Analysis, meaning females may be more adept at "identifying the intended and actual inferential relationships among statements, questions, concepts, descriptions of other forms of representation intended to express beliefs, judgments, experiences, reasons, information, or opinions" (Facione, 1998c, p. 7). They also scored higher than males in their ability to make inferences, meaning females were more able to "identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation" (p. 9).
- An increase in age did not translate into higher total critical thinking skill scores. The youngest age group scored the highest in critical thinking ability, and the group one year their senior scored the lowest. The reason for this finding may lie in the

exceptional nature of 16 year-old participants who were able to qualify for such a prestigious position.

- Student academic performance, measured by the participants' self-reported grade point average was related to total critical thinking skills and the specific skill of Analysis.
- There was a low (Miller, 1998) and positive relationship between critical thinking skills and leadership training. There was also a low positive relationship between critical thinking skills and level of leadership experience. Critical thinking is associated with total leadership score.
- Total critical thinking dispositions, measured by the EMI significantly correlate with critical thinking skill scores.
- There is a low, but positive relationship between the specific disposition of Innovativeness and critical thinking skills.
- There was a low, but negative relationship between the Maturity disposition and critical thinking skills.
- There was a low, but positive relationship between the Engagement disposition and critical thinking skills.
- GPA, leadership training score, and the specific disposition of Innovativeness provide the best predictive model for critical thinking skill.
- GPA, gender, age, and the specific critical thinking disposition of Innovativeness provide the best predictive model for the Analysis subskill.
- Innovativeness and GPA provide the best predictive model for the Inference subskill.
- Leadership training score was the only variable in the predictive model for the Evaluation subskill.

Discussion and Implications

Objective One: Determine the Critical Thinking Skill Level of Selected Leaders in the FFA

Critical thinking scores of the National FFA delegates were high

As could probably be expected with a sample of the best and brightest young people in agricultural education, the National FFA delegates who participated in the study scored (M = 227.86, SD = 37.91) in the upper range of the critical thinking skills

test. Scores ranged from a low score of 67.86 to a maximum score of 300, but if possible scores on the test were divided into thirds, the majority of the students in this study easily scored in the top third. The assumption that scores were in the upper range and presumably high is applied to the individual constructs, Analysis , Inference, and Evaluation.

Because the sample consisted of National FFA delegates, the relatively high scores on critical thinking is probably the result of a sample that has proven their competence as leaders and as academicians just by qualifying for the delegate process. It is also highly likely that many of the delegates have gone through training sessions in their home state concerning their conduct, attitude, and expectations at the National FFA Convention. Undoubtedly, this sample made a greater effort to think through the questions than most, as they felt they were going to be held accountable in some way.

However, it could be that these students scored high on critical thinking because they were agricultural education students, as some studies have indicated that agricultural education students score higher on critical thinking than students not enrolled in agricultural education (Cano & Martinez, 1991; Cano, 1993). The majority of this sample consisted of agricultural education students who were near the end or have completed their secondary agricultural education career. Rollins (1988) found that students with more semesters of agricultural education, as the participants in this study, were more adept at critical thinking.

Although a single study cannot provide a sound basis for educational and leadership practice, the high scores in critical thinking for this study may be suggesting that experiences in the FFA and the agricultural education classroom are playing a part in

the development of critical thinking that the Florida Board of Education (1995) and the Department of Labor (1991) believes is so important. The relatively high critical thinking scores of participants in our study, which are some of agricultural education's and the National FFA's best students, may cause educational professionals to appreciate the potential of students who choose to enroll in agricultural education and/or the FFA. Certainly, one recommendation for further research will be the comparison of non-agricultural education students and non FFA delegates to the population in this study.

Analysis was the highest subskill of critical thinking

Participants were most skillful at the specific critical thinking skill of Analysis (*M* =82.17, *SD* =15.12). Recall from Chapter 2 that Analysis is about identifying the relationship between statements, questions, concepts or descriptions to express beliefs, judgments or reasons. Specifically, the critical thinking skills test measured Analysis by determining the students' ability to examine ideas, identify arguments, and analyze those arguments. According to this study, the National FFA delegates were very good at understanding concepts, issues, and situations. The participants were also able to dissect those concepts, issues, and situations to clarify meaning.

Because Analysis is the highest scored subskill, even when controlling for each of the independent variables, there is no way to truly know why participants scored so high in this construct. Other possible reasons for the high Analysis scores include the curricula and/or teaching strategies students are exposed to in agricultural education; the Career Development Events and other FFA activities students have available to them in agricultural education; and the leadership experiences, to which this particular population had been exposed. Under the assumption that these students came from agricultural education programs of the highest quality, it would also reason that quality class/lab

instruction, CDE training, and leadership experiences were also available to the participants of this study. If reasons such as these could be empirically proven, then sound methodology of agricultural education could be touted as a vehicle for critical thinking (Analysis) development.

Evaluation was the lowest subskill of critical thinking

The lowest critical thinking skill score was Evaluation. Evaluation involves assessing the credibility of statements and representations of others and assessing the logical strength of statements, descriptions, or questions. Specifically, the researcher-developed critical thinking skills test measured participants' ability to assess or place a value on claims and arguments.

Many of the same reasons students scored the highest on Analysis may also explain the low scores on Evaluation. Additionally, the majority of the participants were excellent students, as evidenced by their GPA and their status as a National FFA delegate. Often being a good student means not questioning information that is presented as truth. Many times being a good student means memorizing the information, not critiquing it to see how true it is or if it is true at all (Freire, 1970). Freire referred to this phenomenon as the "pedagogy of the oppressed." Students are programmed to believe that information in a book, magazine, website, or newspaper is true. Agricultural education needs to focus on ridding and/or prohibiting the paradigm of the "pedagogy of the oppressed" if agricultural leaders that are products of agricultural education should be able to evaluate the credibility of statements and representations of others and the logical strength of statements, descriptions, or questions.

Objective Two: Determine the Relationship between Critical Thinking Skill Level of Youth Leaders in the FFA and Age, Gender, and Student Academic Performance (GPA)

Females scored higher in Analysis and Inference than males

Though the difference was not statistically significant when *t*-tests were conducted, there was a trend towards higher female scores in Analysis and Inference compared to males in respective constructs. Gender becomes a contributing variable in predicting the Analysis skill when the full range of scores is considered in this study. Although several researchers (Torres & Cano, 1995b; McBride, 2000; Corral-Verdugo, 1993) found no significant differences for the gender effect using categorical data analysis, other studies (Rudd, et al, 2000; Torres & Cano, 1995a; Walsh, 1996; Wilson, 1989), including this one, that use multivariate analyses have found that gender is a slight contributor to critical thinking skill and/or disposition.

Considering all of the other variables in the study, and breaking critical thinking skill in to subskills, females scored slightly higher on the critical thinking test than males, especially in Analysis and Inference. Given this finding from our study, anecdotally, female leaders are not only slightly more skillful at examining ideas, identifying arguments, and analyzing those arguments, but they also weigh all of the evidence, consider alternative solutions, and then make a decision. Professional educators and leadership trainers should be aware of such discrepancies as they try to prepare young people to be leaders who can solve problems and make decisions "with incomplete evidence" and when an "incontrovertible solution is unlikely" (Rudd, et al, 2000).

Older age did not translate into higher critical thinking skill scores

Sixteen-year-old participants were the most competent critical thinkers, while 17-year-old participants were the least competent. Eighteen, 19, and 20-year-old participants

were above the total critical thinking skill mean (*M* = 227.86, *SD* = 37.91). Analysis of variance procedures indicated that age was not related to critical thinking. This is supported by other researchers who looked at the effect age has on critical thinking (Claytor, 1997; Rudd, et al., 2000; Thompson, 2001; Cillizza, 1970 ; Feely, 1975; Jenkins, 1998; Rodriquez, 2000). Only one other study (Torres & Cano, 1995a) before this study found that age contributed to a model predicting some portion of critical thinking. In this study, age significantly contributed to the specific critical thinking skill of Analysis, which is perfectly logical since that study used the "Developing Cognitive Abilities Test" or DCAT, an instrument that measures only the Analysis construct.

According to our study, the extreme differences in scores are only one year apart. This finding is very perplexing and leads one to consider many questions. What could be the reason for such a dramatic drop in critical thinking scores from age 16 to age 17? Were students in this population exposed to more or less agricultural education curricula in the junior and senior year than in the sophomore year? Could it be that these students fell prey to the *Pedagogy of the Oppressed* ideal of Paulo Freire (1970), where they start to understand that a good student just remains silent and memorizes the presumably correct information that is dispersed daily? Why did participants seem to come out of the slump after they crossed the 17-year-old barrier? Is there some depression that adolescents go through at that time in their lives? All of these are questions, that if answered may help explain the strange drop in critical thinking skill for the 17-year-old participants in this study.

Teachers and leadership trainers interested in fostering critical thinking in youth should make an effort, to not only develop and teach critical thinking, but also to sustain

it. Encourage students to work through problems, query the evidence, and practice making the tough decisions with thorough and sound thought consistently and repeatedly. Lastly, instruments, such as the critical thinking skills test or disposition inventory used in this study should be used to track students' critical thinking progress.

Student academic performance was associated with total critical thinking skills and the specific skill of Analysis

Total critical thinking skill scores consistently increased as grade point averages increased from 2.0-3.0 to 4.0. This particular sample had a high average for GPA and managed to display significant gains in total critical thinking skill score, and Analysis as GPA increased. Had the sample not been such a homogeneous group of outstanding students with little variance, the other skills may have also been significant.

The fact that critical thinking was influenced by GPA is not new to the theoretical base of critical thinking (Bowles, 2000; Claytor, 1997; Facione, 1990; Giancarlo, 1996; Jenkins, 1998; Rollins, 1990; Thompson, 2001; Torres, 1993; Torres & Cano, 1995a; Wilson, 1989), but the significant relationship with the specific skill of Analysis would seem to be a new contribution to the theory base of critical thinking skills research. Additionally, GPA was found to be the strongest predictor in both of the models that predicted total critical thinking skill score and Analysis.

These findings concerning GPA and the specific skill of Analysis are important to practitioners because of the assumptions that could be made about a student with a sound grade point average. If a student has a 4.0, then we might reasonably expect that same student to be able to identify relationships between statements, questions, concepts or descriptions to express beliefs, judgments or reasons. One might also reason that there is

a need to concentrate on developing students' skills and abilities in Inference and Evaluation, in lieu of the Analysis skill.

This finding is also important because it helps to solidify the theory base concerning GPA's contribution to critical thinking skill. However, it is time to apply this finding. If total critical thinking skill is related to GPA (student academic performance), then higher education should investigate the possibility of admitting students to their colleges based on their GPA, and not rely so heavily on standardized measures, such as the ACT or the SAT.

Objective 3: Determine the Relationship between Critical Thinking Skill Level of Youth Leaders in the FFA and Levels of Leadership Training and Experience

There was a low and positive relationship between critical thinking skills and level of leadership training

Leadership training score was derived from students' involvement in formal leadership training opportunities either in the FFA or outside of the FFA. Though the positive relationship was only statistically significant for total critical thinking skill score and Evaluation, each subskill steadily increased with increases in each level of leadership training. This relationship could be attributed to the content of the leadership training workshops, seminars, and courses, which participants listed as contributory to their leadership development. Topics such as conflict resolution, problem-solving, and inter-personal communication seemed to be laced with scenario-based educational activities that develop a leader's ability to evaluate circumstances and make critical decisions.

The relationship between Analysis and Inference may not be significant because some students likely chose not to list all of their activities in the open-ended response areas that were used, in part, to develop the leadership training score. Additionally, the leadership training score, which attempted to measure how much formal instruction FFA

members had received in leadership was the second strongest predictor of total critical thinking skill score and the only variable that backwards regression left in the model to predict the Evaluation subskill.

The relationship between leadership training and critical thinking is a new finding in leadership and critical thinking studies as only one other piece of research, conducted at the University of Connecticut (Duchesne, 1996) made the connection between leadership training and critical thinking. If the National FFA Organization believes effective leaders in their organization should "think critically, think creatively, practice sound decision-making, be problem solvers, commit to life long learning, articulate opinions to persuade others, practice sound study skills, and maximize mental assets and compensate for mental limitations," as a report by the National FFA Task Force on Leadership and Personal Success (2002) suggests, then a greater effort should be put forth to substantiate the relationship between leadership education and critical thinking. A concerted effort to teach critical thinking in leadership training could yield greater impacts on critical thinking skills.

This connection between leadership and critical thinking is natural, and one that is necessary. It is necessary because leaders who do not use critical thinking as they make decisions that affect and influence others are dangerous (Facione, Facione, and Giancarlo, 1998). Facione, Facione, and Giancarlo list several ways that we can protect ourselves from leaders who lack the willingness or the ability to make good judgment, but the most important way cited was simply, educating persons to think. If the ideal critical thinker, according to this study is someone who practices the critical thinking skills of Analysis, Inference, and Evaluation and the critical thinking dispositions of Innovativeness,

Maturity, and Engagement, then the direct opposite of the ideal critical thinker, of which we desperately would try to avoid in developing leaders would be characterized as individuals who are "intellectually dishonest, intolerant, inattentive, haphazard, mistrustful of reason, indifferent, and simplistic" (Facione, et al., 1998, p.6).

The finding that critical thinking is related to leadership training may be important for teacher educators and agricultural leaders responsible for curriculum development. Recall from Chapter 2 that critical thinking is discipline specific (Cheak, 1999; Ennis, 1989; Tindal & Nolet, 1995). Students in agricultural and other types of education need to be exposed to formal teaching and training in leadership development that directly and indirectly affect their ability to make fair, informed, judicious, and critically thought out decisions.

There was a low and positive relationship between leadership experience and critical thinking skills

Activities classified as leadership experience involved any Career Development Events (CDEs), experiences as an officer, committee member, or any other activity in the FFA that was not a formal leadership training experience and any other activities participants listed that they believe contributed to their leadership development that was not a formal leadership training experience. Although gains in critical thinking are not as pronounced for the leadership experience variable, an examination of the total critical thinking scores clearly demonstrates a steady increase in critical thinking skill scores at each level increase in leadership experience. This low, but positive relationship was significant for Analysis and total critical thinking skill score.

The significant correlation between leadership experiences and total critical thinking skill may be a function of experiences a young person has in Career

Development Events (CDEs) and in leading the FFA chapter, district, area or state as an officer. It could be that the more leadership experiences they are exposed to, the more their mind, and the skill it has for critical thought is improved. Participation in CDEs, otherwise known as FFA contests was a major determining factor of the leadership experience variable. The competition provided by CDEs could be the reason for improved critical thinking. The Analysis and quick thinking those contests require could also foster critical thinking. Additionally, the leadership experience of being an FFA officer may have contributed to the leadership experience variable. One could reason that the officer experience contributes to the relationship between total critical thinking and Analysis. One reason for the significant relationship between Analysis and critical thinking could be because of the nature of the Analysis critical thinking construct. According to Facione (1990), Analysis involves examining ideas; identifying arguments; and analyzing arguments. Presumably, FFA officers and CDE participants are engaging in analysis types of activities as part of their responsibilities to the FFA members or CDE team.

One could make a logical inference that the lack of significance for the positive relationship between leadership experience and Inference and Evaluation could be the very similar experiences that each of the participants in this study have experienced. Even though many states have minor differences in the activities they offer, many of the activities are similar as they fall under the umbrella of the National FFA Organization. If a random sample of agricultural education students were drawn, it is likely that the diversity of their experiences would be much greater and thus the differences would be more evident.

The connection between leadership experiences and critical thinking is just as important as the connection between leadership training and critical thinking. This may even be more important because teachers and leadership trainers do not have to wait on the approval of the right leadership curricula. They could immediately begin to foster critical thinking by encouraging students to be more active and to participate in more activities that have been proven to develop leadership (Ricketts, 1982; Townsend & Carter, 1983; Wingenbach & Kahler, 1997). It may be the case that those same activities are improving the critical thinking abilities of students.

Critical thinking skill is associated with total leadership score

The total leadership score is the leadership experience score plus the leadership training score. Obviously, the same incremental rise in critical thinking scores is occurring at each level of the total leadership score. Interestingly, the additive influence of the variables yielded a significant relationship between total leadership score and total critical thinking skills. Additionally, each subskill was significantly related except Inference. The lack of a significant relationship between Inference and leadership could be due to the homogeneity of the sample. Another explanation for the lack of relationship with Inference could be the stark lack of Maturity of the group, denoted in Chapter 4. If participants are to make inferences, or query evidence, conjure alternatives, and draw conclusions (Facione, 1990), then a certain amount of Cognitive Maturity may be needed, which is lacking in this sample (Table 18).

On a positive note, the high level of motivation this group of students exhibits may be the reason that leadership and critical thinking are related (Garcia & Pintrich, 1992). Garcia and Pinctrich conducted a study to identify correlations between critical thinking and motivation, learning strategies, and classroom experiences. College students (n=278)

in 12 different classrooms in three different universities in Biology, English, and Social Science classes were sampled to discover that intrinsic goals and critical thinking were positively related. In other words, Garcia and Pintrich's study supported the positive relationship between critical thinking and motivation. The students in this study should be highly motivated and therefore, according to Garcia and Pintrich (1992) adept at critical thinking as well. All of this is important information if the connection is to be made between leadership and critical thinking.

Objective Four: Determine the Relationship between Critical Thinking Skill Level of Youth Leaders in the FFA and their Critical Thinking Dispositions

Critical thinking dispositions were measured using a researcher-developed instrument referred to as the EMI, which stands for Engagement, Maturity, and Innovativeness. Engagement, Maturity, and Innovativeness are the three sub-scale factors of critical thinking disposition that the author decided to use in order to get a more representative view of Facione' s (1990) framework of critical thinking disposition. The EMI was designed and used instead of the California Critical Thinking Disposition Inventory (CCTDI) because of the CCTDI's inability to discriminate between factors (Moore, Rudd, & Penfield, submitted for publication), and because of its length and complexity.

Total critical thinking disposition (EMI) score was associated with critical thinking skill scores

EMI critical thinking disposition scores ranged from 76 to 117, with an average score of $M = 96.68$, $SD = 7.60$. There was a low positive relationship between total EMI and critical thinking skills. This is evidenced by the reported scores in Chapter 4. Recall that the subjects scoring the lowest on the EMI scored the lowest in total critical thinking skill ($M = 197.34$, $SD = 49.29$). Similarly, the subjects scoring the lowest on the EMI

also scored the lowest on Analysis (*M* = 76.39, *SD* = 17.09), Inference (*M* = 56.67, *SD* = 24.97), and Evaluation (*M* = 64.29, *SD* = 19.75). As indicated in Table 14, there seems to be a relationship between critical thinking and EMI scores as total critical thinking, Analysis, Inference, and Evaluation skill scores improved each time total EMI scores improved.

EMI score was significantly related to total critical thinking skill scores and the specific subskill, Inference. The positive relationship was not significant for Analysis, and Evaluation.

The increase in critical thinking skill scores with each increase in EMI is important because EMI is the representation of "habits" and "intentions." Recall from chapter two, the Triandis (1979) Model of Human Behavior; Behavior/Critical thinking skill = {Habits + Intentions} + Facilitating factors. According to Triandis, if someone has the habit and intends to do something, that is half the equation for human behavior, so it is very important that we found critical thinking disposition to be positively related to critical thinking skill. This finding substantiates the use of the researcher-developed critical thinking skills test and the use of the EMI because many other social scientists have also found a relationship between critical thinking skills and dispositions (Claytor, 1997; Facione, 1998; Giancarlo, 1994; Taube, 1997).

There was a positive and low relationship between Innovativeness and critical thinking

There were low and positive relationships between the Innovativeness disposition and critical thinking. This is evidenced by the average critical thinking scores at each level of Innovativeness. This relationship was significant for total critical thinking skill

scores , Analysis, and Inference. Why would there be a significant relationship between these variables?

"Venturesomeness" and "interest in ideas" are two descriptors used by Everett Rogers (1995) to describe an Innovator (p.262). His descriptors are not far from the meaning Innovativeness in this study. Innovativeness was a critical thinking disposition derived from the Facione theoretical framework, which embodied "inquisitiveness with regard to a wide range of issues," "concern to become and remain generally well-informed," and "diligence in seeking relevant information" (1990, p. 25). There were low and positive relationships between the Innovativeness disposition score and total critical thinking score, and the specific skills of Analysis and Inference. This means that scores on Innovativeness improved as scores were improving in Analysis, Inference, and total critical thinking skills.

If this is true, then it would seemingly become easier to teach students to examine ideas, detect arguments, analyze arguments, examine evidence, ponder alternatives, and draw conclusions if they are inquisitive, informed, and continually seeking information. Strangely, this would indicate to educators that there is more to concentrate on and to try to instill than skills alone, if students are to get better at critical thinking.

This finding could be indicating that students have a better chance at becoming a critical thinker if they were equipped with the proper experiences and attitudes to engage in critical thinking. Agricultural educators and leadership trainers may be able to develop these attitudes and pre-dispositions with and without formal education. Teachers could expose students to a wide range of cultures through travel, video tapes, service-learning, and the Internet. They could also reward students who bring helpful information to a

discussion that challenge the disseminated curriculum or at least causes a different perspective. These types of cognitive dissonance strategies could influence the Innovativeness disposition, which could influence critical thinking skills.

The types of activities that influence the Innovativeness disposition, and thus critical thinking skills may be more easily accomplished in a leadership development course that uses the *Model of Youth Leadership Development* (Ricketts & Rudd, 2002). This model requires students to process leadership at the highest levels of cognition. Achieving high levels of cognition would require dissonance inducing activities such as travel, service-learning, and looking at information from different angles in order to be ahead of the curve, or on the front end of knowing something.

There was a negative and low relationship between the Maturity disposition and critical thinking skills

There was a relationship between the Maturity disposition and critical thinking, but it was a negative relationship. In other words, critical thinking skills tended to decrease as the Maturity scores increased. This low and negative relationship is significant for Analysis, Inference, and total critical thinking skill score. Assuming that the critical thinking skills instrument and the EMI disposition instrument were measuring the constructs they were intended to measure, this finding was somewhat disturbing. It indicates that students who are competent at Analysis (examining ideas, detecting arguments, analyzing arguments) and Inference (querying evidence, conjecturing alternatives, making decisions) are not open-minded regarding different worldviews, not flexible in considering alternatives and opinions, not accepting of the opinions of others, and not willing to change a decision when reflection indicates a change is warranted.

This is disturbing in terms of leadership development. As students develop their leadership abilities, which include skills in critical thinking, they are better able to move and influence others towards a goal because of their skills. If a leader becomes competent in Analysis of arguments and Inference to make decisions, but is not considering the rights, opinions, or desires of other, then they are not a leader; they are a dictator. Again, formal training in leadership development, which takes the time to discuss the leadership attitude, will, and desires of others (Ricketts & Rudd, 2002) could be beneficial in stopping such a trend.

It should be pointed out that the Maturity scale of the EMI, which was very reliable (r =0.75) going in to the second administration, was the least reliable (r =0.57) after the second administration. This could indicate a problem with the data collection, but further investigation since this study indicates that the Maturity scale is indeed reliable. It is possible that respondents may have been concerned with giving the "politically correct" response or trying to give the right answer instead of indicating how they truly felt since this study was conducted under the auspices of their position as a National FFA leader.

There was a low and positive relationship between Engagement and critical thinking skill

The Engagement disposition had a low positive relationship to critical thinking skills. Analysis, Inference, Evaluation, and total critical thinking skill scores increased as Engagement disposition scores increased. This relationship was significant for Analysis, Inference, and total critical thinking skill, but similarly to Maturity and Innovativeness the relationship was not significant for Evaluation. The relationship is likely significant because the components of Engagement involve alertness to opportunities to use critical thinking; trust in the process of reasoned inquiry; and persistence, though difficulties are

encountered. If participants were pre-disposed to look for opportunities to critically think, and even believe in the value of critical thinking it is no wonder they are also likely to be successful at analyzing and making inferential judgments.

Even though, there is literature to suggest that infusing critical thinking is better than pre-teaching it (Angeli, 1999; Hagelskamp, 2000), teachers and leadership trainers who understand this relationship would probably do well to not only try to teach students how to critically think, but they should also sell them on the value of critical thinking. Teachers should also model the attitudes of being alert to opportunities for critical thinking and believing in the process of reasoning. Additionally, including instruction in and about critical thinking in a youth leadership curriculum as the Ricketts and Rudd (2002) model advocates could better equip students with the Engagement disposition, which they could use and incorporate as they learn leadership.

Objective Five: Predict the Critical Thinking Skill Level of Selected Youth Leaders Using the Age, Gender, GPA, Leadership, and Critical Thinking Disposition Variables

GPA, leadership training score, and Innovativeness sum were the variables providing the best prediction of critical thinking skill

Grade point average of participants, leadership training score, and Innovativeness sum represented the model best predicting variance in total critical thinking skill. Regression analysis revealed that the model significantly predicted total critical thinking score. R^2 for the model was 0.14, and adjusted R^2 was 0.12. This set of variables collectively accounted for 12 percent of the variance in the dependent variable, total critical thinking skill score. The fact that a significant model was found to predict critical thinking was interesting since other research (Prestholdt, 1995) failed to find a significant portion of the variance in critical thinking skill. Other studies (Torres, 1993; Torres &

Cano, 1995a; Rollins, 1990) have attempted to predict critical thinking ability in agriculture, but no studies identified the set of variables that were discovered in this study.

This kind of information is important to agricultural educators, leadership trainers, and even higher education administrators for a number of reasons. If other youth leaders are like the ones in this study, then agriculture teachers at the secondary and post-secondary levels could better prepare their students for successful critical thinking by encouraging them to keep their grades up, learn as much as they can about leadership by participating in leadership workshops, conferences, and/or formal leadership courses, and by challenging students to remain inquisitive, well-informed, eager learners.

Leadership trainers, instructors, and developers of leadership training materials could use this finding to impress upon their constituents that a good stage presence and a winning smile is not enough. Leadership learners also need to hit the books, proactively pursue knowledge and truth, and develop reasoning and critical thinking skills.

GPA, gender, age, and Innovativeness sum were the variables best predicting the subskill Analysis

Grade point average, gender, age, and the Innovativeness sum score of participants were the variables in the model best predicting variance in the specific subskill of analysis. Regression analysis revealed that the model significantly predicted the Analysis subskill. R^2 for the model was 0.14 and adjusted R^2 was 0.13. This set of variables collectively accounted for 13 percent of the variance in the dependent variable, Analysis. Torres and Cano (1995a), who explained critical thinking (Analysis), using a general critical thinking instrument (DCAT) and without looking at dispositions, also found that

age, gender, and GPA collectively accounted for 13 percent of the variance in total critical thinking skill.

It is interesting that subjects' ability to "identify intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express beliefs, judgments, experiences, reasons, information, or opinions" (Facione, 1998c, p. 7) was best explained by three demographic variables and the specific disposition Innovativeness. Recall from Chapter 4 that analysis was the only sub skill, in which there were significant differences between gender and the only variable, in which there were significant differences between GPA. Additionally, there was a significant relationship between Analysis and Innovativeness. However, age was also included in the model best predicting Analysis, and there were no differences in regards to this variable.

The reason for this combination of variables explaining critical thinking could lie within the following line of logic. First, there were almost twice as many females as males who participated in this study. According to a qualitative study conducted by Ricketts, Osborne, and Rudd (2003) in the state of Florida, females in the schools where the interviews were conducted had become the prominent leaders in the FFA, attending more FFA activities, competing in more career development events, and assuming more of the leadership positions than males. They also discovered that males became disinterested in the FFA as they got older. Bourgon (1967) also found that females' academic performance compared to males' was the reason for their prominence in activities. Since this study found a positive correlation between leadership and critical

thinking, the imbalance of males and females in this study could explain why gender, GPA, age, and Innovativeness best predicts Analysis.

Instructors concerned with preparing students to think critically need to be aware of the fact that age and gender account for some of the difference in a student's critical thinking skill of Analysis. Being aware of this helps teachers remain focused in preparation and cognizant in their efforts to foster critical thinking. Educators should also reward and push students to succeed academically, and structure and design activities that develop their attitude or disposition of Innovativeness if they want to influence the development of the Analysis subskill.

Innovativeness and GPA were the variables best predicting the subskill Inference

The Innovativeness disposition and participants' GPA were the variables in the model best predicting variance in the specific subskill of Inference. Regression analysis revealed the model significantly predicted the Inference subskill. The R^2 for the model was 0.10, and adjusted R^2 was 0.09. This set of variables collectively accounted for nine percent of the variance in the dependent variable, Inference. This is an interesting discovery, since few researchers (Bowles, 2000) have even attempted to predict Inference or even realize its relationship (Parker, 1991) to other variables.

The theoretical framework for this study claims the purpose of Inference is "to identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation" (Facione, 1998c, p. 9). According to Facione's conceptualization of Inference, discipline-specific knowledge would be needed to successfully accomplish Inference. The reason a statistically

significant prediction equation was found for Inference probably rests with the discipline-specific nature of the critical thinking test that was administered. The two variables that were identified as best predictors of critical thinking would indicate a student who is very knowledgeable about agriculture. Recall that Innovativeness measured inquisitiveness with a wide range of issues, concern to become and remain generally well-informed, and diligence in seeking relevant information (Facione, 1998c). Combining GPA and Innovativeness would definitely make for a student who is competent at making inferences.

Leadership training score was the best variable predicting Evaluation

The only variable contributing to the model predicting Evaluation was the leadership training score. Regression analysis revealed that the best model for predicting the Evaluation subskill, failed to be significant at the 0.05 alpha level. The R^2 for the model was only 0.02, and adjusted R^2 was 0.01. Although only one percent of the variance is explained by the model, recall that Evaluation was also significantly related to leadership training score and total leadership score. Duchesne (1996) also found that leadership learning experiences was a predictor of critical thinking skill.

Facione (1998c, p. 8) described the purposes of Evaluation as

> To assess the credibility of statements or other representations, which are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, descriptions, questions, or other forms of representation.

The researchers assumed that someone trained in leadership would more successfully evaluate claims and arguments in leadership contexts than someone who does not have such training. Unfortunately, the data did not support this assumption.

Recommendations

Based on the findings of this study, the following recommendations were made:

- Since the critical thinking abilities of the select group of individuals were high, and since other researchers (Rollins, 1988; Cano & Martinez, 1991; Cano, 1993) would agree that agricultural education students have the potential to be more competent at critical thinking than non agricultural education students, educators should sell their FFA programs as a place where critical thinking skill may be developed.

- The findings of this study suggest that the agricultural education curriculum is doing something right in terms of affecting the critical thinking abilities (Analysis) of students. However, there seem to be some deficiencies in the critical thinking skills (Evaluation) of agricultural education students that could be accounted for if agricultural education made an effort to focus on them. Therefore, agricultural educators should incorporate teaching strategies that are intended to improve the critical thinking skills of students.

- Educators and leadership trainers should develop and use curricula, workshops, and activities that focus students' abilities to assess the credibility of statements and representations of others and assessing the logical strength of statements, descriptions, or questions. In other words, the specific critical thinking skill of Evaluation should be the most immediate focus of educators and leadership trainers. Additionally, in order to focus on Evaluation, critical thinking should be taught and evaluated in a contextually specific manner, for one cannot make value judgments if one does not understand the subject matter there are about to judge.

- It is unclear whether females are actually more competent in critical thinking, but it has been proven that the females in this study are equally effective critical thinkers to the males. Agricultural educators, employers and business leaders should not discriminate based on gender, for this research and others have proven that females are just as capable as or possibly more capable of using critical thinking to solve problems and make decisions as males.

- In this study critical thinking skill was lower (not significant) for 17-year-old participants compared to 16-year old participants. Educators should not only concentrate on the development of critical thinking skills, but they should also concern themselves with the maintenance and retention of those abilities, as students progress through adolescence.

- According to this study, competence in critical thinking was related to higher student academic performance. Thus, another benefit of teaching critical thinking skills would be improved student achievement. Teachers concerned with having high achieving students that can more easily get into college and/or high skill/high wage jobs should teach for critical thinking in their leadership development and agricultural education courses.

- Given the findings from this study, the National FFA Organization, teacher educators, and agricultural teachers need to continue to provide leadership learning opportunities in the form of workshops, conferences, and formal leadership development courses.

- Because learning critical thinking is contextually specific (Ennis, 1989), and because leadership was related to critical thinking skills in this study, educators and administrators should adopt formal leadership development courses that use a comprehensive leadership development curriculum like the one proposed by Ricketts and Rudd (2002), which includes instruction in and about critical thinking and decision-making.

- Since this study found a significant relationship between critical thinking disposition and critical thinking skill, educators need to make an effort to influence the critical thinking dispositions of students and try to teach students how to think critically.

- Because of the relationship between Innovativeness and critical thinking skill, educators and leadership trainers should attempt to influence critical thinking dispositions by exposing students to a wide range of cultures and experiences through travel, video-tapes, service-learning, and the Internet. Educators should also reward students who bring helpful information to a discussion that challenges the curriculum or at least causes students to view information from a different perspective.

- Assuming the Maturity scale is psychometrically sound, teacher educators and administrators need to develop sound curriculum that develops Cognitive Maturity. Additionally, educators should offer pre-service and in-service training to teachers on how to develop the components (open-mindedness regarding different worldviews, flexibility concerning alternatives and opinions, understanding of the opinions of others, willingness to change a decision if needed) of Cognitive Maturity.

- Because of the relationship that exist between Engagement and Analysis and Inference, educators can promote competent Analysis and Inference by infusing critical thinking into the content of courses and leadership training, but also by providing information regarding the "nuts and bolts" of critical thinking.

- Agriculture teachers should inform students and parents that the best predictors of critical thinking skill, (according to this study) are maintaining a grade point average at the highest possible level; engaging in leadership conferences, workshops, and/or formal leadership development courses; and being inquisitive, well-informed, eager learners.

- Instructors concerned with preparing students to think critically need to be aware of the fact that age and gender account for some of the difference in a students critical

thinking skill of Analysis. Being aware of this helps teachers remain focused in preparation and cognizant in their efforts to foster critical thinking.

Suggestions for Additional Research

- Similar research should be conducted that assesses the critical thinking skills of agricultural education students not in the FFA and students not in agricultural education. The findings of this study of National FFA leaders should be compared with findings of research conducted that assesses the critical thinking skills of agricultural education students not enrolled in the FFA and those not enrolled in agricultural education.

- Because of the rich history of problem-solving and agricultural education and because of this study's finding concerning the critical thinking skill of students, research should be conducted that links problem-solving and contextually specific (agriculture) critical thinking skill.

- Gender seems to be a demographic variable that is evaluated secondarily. Because it is still unclear whether there are differences between males and females in regards to critical thinking skill, a focused study should be conducted that empirically defines the impact of gender on critical thinking.

- Research should be conducted to understand the extreme differences in critical thinking skill between 16-year-old and 17-year-old students. Are the differences related to grade level? Are they related to more or less exposure in a particular grade level? Are there more stresses on 17-year-old students than 16-year olds? The answers to these questions could help critical thinking curriculum development efforts.

- Overall GPA was reported by the participants. Further research should evaluate the content area GPA that is related to the content of the specific critical thinking skills test. In this regard, research should also be conducted to determine if students who score better on leadership and agriculturally specific critical thinking skills tests perform better in leadership and agriculturally related courses.

- A Delphi or nominal group type of study should be conducted to develop a more reliable quantitative measure of leadership training and experience. A newly developed quantitative measure of leadership should then be used for pre-test/post-test evaluations of specific leadership training experiences and resources. This instrument should be used in conjunction with critical thinking skills and disposition tests.

- Researchers should continue to investigate the relationship between leadership and critical thinking skill. More effective measures of leadership than were used in this study should be used as the relationship between leadership and critical thinking is further examined.

- In order to explain more of the variance in critical thinking skill, variables such as motivation, educational experience, learning styles, reading proficiency, and personality types should be involved in future prediction research.

- The EMI critical thinking disposition assessment should be further developed, and stronger versions of the instrument should be used to check the relationships between disposition and critical thinking skills. Specifically, the Maturity construct should be focused investigated to determine if the negative relationships were because of the instrument or the actual disposition of the participants.

APPENDIX A
YOUTH LEADERSHIP CRITICAL THINKING SKILLS TEST KEY

The Youth Leadership Decision-Making Test

DIRECTIONS: Read each question carefully. When answering, *select the best choice among those provided* by circling the letter of your choice. There are 20 questions. Each question is of equal value, so use your time wisely.

1. Kristina was applying for a new job. One of the interviewers said, "Don't worry about the interview – you're in." "You're in" probably meant:

A) The interview should be easy.
B) The interview is just a formality.
C) The interview is going to be difficult.
D) The interview is inside the office.

2. Consider the following statement, "Leading people to accomplish group goals takes patience, determination, and good communication skills." Which of the following pieces of information would best support the statement?

A) A slogan entitled "Leadership is influence."
B) A research report supporting the need for patience, determination, and good communication skills in leading groups.

C) A magazine article with editorial comments supporting the need for patience, determination, and good communication in leading groups.

D) A comment from a friend supporting the statement.

Use the following information to answer Question 3.

Research on scientists' and the public's opinions of biotechnology has shown that although some people fear biotechnology may have adverse consequences, many scientists believe that it will produce healthier foods, more effective pharmaceuticals, and an increase in agricultural production.

3. Which of the following sentences is most like the one above?

A) Only scientists support the use of biotechnology.
B) People who do not support biotechnology are wrong because scientific research has proven that biotechnology is beneficial.
C) Despite the fact that some scientists support biotechnology, a portion of the public remains skeptical about its safety, according to research.
D) According to research, biotechnology has benefits and consequences.

4. Consider the following problem: Dawn and Jessie are trying to develop an "ice-breaker" for their next chapter meeting. They want to start the meeting off with a game for learning everyone's

name. When they have used the game before, it was very effective, but very loud as well. The FFA meeting is next door to the main office and they don't want to disturb the principal. Assuming that Dawn and Jessie use the "ice-breaker," which of the following choices would not be a sensible alternative?

A) Start the meeting in an outside location and re-convene in the meeting place.
B) Inform the individuals next door of potential loudness during a certain time.
C) Don't worry about the consequences and proceed anyway
D) Change the rules of the game so that it doesn't get so loud.

5. Crop production is higher in the summer than in the winter. Select the statement that DOES NOT support this claim:

A) Warm weather and rainfall increase production.
B) The longer growing season increases production.
C) More help is available in the summer months therefore production is greater.
D) Taxes are due in the summer therefore production is greater.

Use the following information to answer Question 6

Karen is a marketing specialist at Strauss Pharmaceuticals and has been given the task of developing a marketing strategy for their new product, Breath Again. Breath Again is a bioengineered product that helps reduce the likelihood of asthma attacks. In her presentation, Karen stated, "Ladies and Gentlemen, we have entered the 21st century and it's time to take our marketing campaigns one step further. For our Breath Again campaign, I suggest that we place heavy focus on the advancements of modern biotechnology. We have a product here that will change people's lives. Asthmatics no longer have to worry about a sudden attack dampening their day at the park with the kids. People with asthma can now live better lives…thanks to biotechnology."

6. Based on the content of Karen's speech, which of the following *cannot* be considered true?

A) Karen feels passionately about the benefits of biotechnology.
B) Karen used the example of an asthmatic's day at the park with his/her kids as an attempt to persuade the listeners emotionally into agreeing with her point of view.
C) Breath Again is an example of a modern biotechnological advancement.
D) Breath Again is a campaign to change people's lives.

Questions 7 and 8 refer to the following information

After Karen's speech, one of her co-workers said, "Don't you think it is a little risky to lay the outcome of this whole campaign on its 'biotechnology' component, especially with so much public uncertainty about bioengineered products?" Karen replied, "Don't you realize that with this one campaign, we can help educate the public on the benefits of biotechnology and possibly help shape their opinions on all biotechnological products?"

7. Which of the following is true of Karen's co-worker?

A) Karen's co-worker is against biotechnology.
B) Karen's co-worker does not like Karen.
C) Karen's co-worker is concerned that people's perceptions of biotechnology will deter them from buying Breath Again.
D) Karen's co-worker thinks campaigns are a waste of time.

8. Which of the following *cannot* be inferred from the statement above?

A) Education is a good way to influence public perception of biotechnology.
B) Karen and her co-worker have differing views about how the Breath Again campaign should be approached.
C) The public has a good grasp on the benefits and risks of biotechnology.
D) Public uncertainty can cause a marketing campaign to fail.

9. Farmer John planted several hundred acres of corn last spring, and after a hot and wet summer, he is anxiously waiting to begin harvest. One day he was driving around, gauging how dry the corn was, and noticed several patches of corn much shorter than the rest. Since he had applied water, fertilizer and herbicide in equal amounts across his corn, he deduced that the soil conditions were less ideal in these areas. John's conclusion:

A) Is probably true, but may be false.
B) Is probably false, but could be true.
C) Could not be true.
D) Could not be false.

10. The area of the country where Grady farms has had some hard times recently, and the government has been supplying subsidies for all the farmers in the area. Unfortunately, the subsidies are driving down the price of grain, and thus causing a never-ending cycle that the area farmers can't get out of. A better solution for these farmers might be:

A) Increase the amount of the subsidies, which might help the farmers get back on their feet.
B) Develop an educational opportunity where local farmers could learn to use their land more effectively.
C) Give up – nothing can be done to help these farmers.
D) Have farmers switch to turnip production.

11. Consider this high school newspaper excerpt: "The student body president is out of control. He routinely speaks on behalf of all of us about issues we know nothing about. He doesn't consult with any of us on the stances he takes, and quite frankly, we've had enough." The author is probably:

A) Somewhat pleased with the president's performance.
B) Unhappy with the president's performance.
C) Thinks the president is overworked.
D) Wants to be president himself.

Question 12 refers to the following information

Lily and Kevin are neighbors and both have small backyard gardens. Each claims that his/her garden is 100% organic. One day while working in their gardens, they got into a debate:

"How can you call your garden *organic*?" Kevin asked.
Shocked, Lily replied, "What do you mean? I don't use any chemicals what so ever!"
Kevin answered, "Maybe not, but the seeds you are using are a product of biotechnology. They were genetically engineered to bolster growth."
"The manipulation of the seeds in my garden," Lily exclaimed, "is no different than the selective breeding you do in yours!"

12. Who would most likely say that biotechnology is unnatural?

A) Lily

B) Kevin
C) Lily and Kevin
D) Neither Lily nor Kevin

13. Which of the following ffa.org headlines cannot be false?

A) President Falls in Love With Secretary
B) A **Main Motion is a Lower Ranking Motion than an Amendment**
C) National FFA Convention Moved to December
D) State Officers Do Not Have to Wear Jackets

14. Barrett is the president of the Cattlemen's association and a stockbroker by trade. He raises purebred Angus cattle, and he is a supporter of all beef farmers. Barrett experienced a year of poor returns on his own on farm and reported to other members of the association that beef prices were headed for a long recession. Which of the following factors were not useful in determining if Barrett had the credibility to make such a statement?

A) He is the president of the Cattlemen's association
B) He supports all beef farmers
C) He works as a stockbroker
D) He raises purebred Angus

15. Steve raises purebred Hereford cattle for sale to the local market and area producers. To feed his herd, he raises alfalfa hay and corn. The corn crop this year was very good; however, the alfalfa got rained on several times and as a result, ended up moldy and unable to be used as feed. Which of the following would be Steve's best alternative?

A) Sell the cattle and go totally into corn production.
B) Sell only part of the corn, and use this money to buy hay for the cattle.
C) Sell all of the corn and cattle, and concentrate on alfalfa production.
D) Sell all of the corn and use this money to buy hay for the cattle.

16. Consider the following scenario: Margaret was put in charge of her service-learning group because of her "history of good leadership in similar situations," according to her advisor. Her group started volunteering at the 4-H office about two weeks ago. She has only been there two out of the scheduled times to volunteer, and she barely knows all of the information regarding the project for which the group is volunteering. Which of the following statements is not a problem with the above scenario?

A) She has a "history of good leadership in similar situations.
B) She has only been there two out of the scheduled times to volunteer
C) She barely knows all of the information regarding the project for which the group is volunteering.

D) She was selected to lead the group because of her "history of good leadership in similar situations.

17. Francis has 55 ewes and 12 lambs to go to the sale barn. The ewes average 150 lbs. each, with the lambs averaging 60 lbs. Unfortunately, her stock trailer will only hold a maximum of 1000 lbs. What would be the best combination for Francis' first load?

A) 6 ewes and 2 lambs.
B) 4 ewes and 3 lambs.

C) 3 ewes and 9 lambs.
E) 1 ewe and 13 lambs

Use the following information for Question 18

Uncle Joe is buying his niece, Sandy, a horse. Sandy wants a Paint Quarter Horse, and her mom says that she cannot have a mare because they are "too temperamental". Uncle Joe says that he will only travel 50 miles to pick it up. Also he says that it needs to be older than 7 years old and that color shouldn't matter.

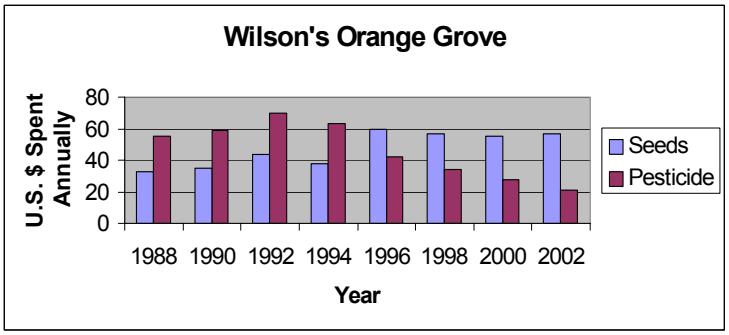
18. What should Sandy look for when shopping for a new horse?

A) A Paint Quarter Horse mare that is 6 years old and that is 23 miles away.
B) A Palomino Thoroughbred mare that is 13 years old and that is 55 miles away.
C) A Paint Quarter Horse gelding that is 9 years old and that is 20 miles away.
D) A bay quarter horse gelding that is 7 years old and that is 13 miles away.

Use the Information Below for Question 18

Karen and Jim Wilson established Wilson's Orange Grove in 1988. Karen, an avid environmentalist, became increasingly concerned about the amount of pesticide being used on the grove. In 1995, she heard about a new line of orange seed bioengineered to resist insect disease. Even though the new seeds cost considerably more than the traditional variety, Karen convinced Jim that the bioengineered seeds would, in time, pay off by reducing the financial burden of chemical pesticide sprays. Jim agreed to try out the new seeds at the start of the 1996 season.

The graph below represents the amount of money (in U.S. dollars) the Wilson's spent yearly on seeds and pesticides in 1988, 1990, 1992, 1994, 1996, 1998, 2000, and 2002.



19. Given all the information provided above, which of the following statements is most correct?

A) Jim is not an environmentalist.
B) Karen is incorrect in her claim that the new line of seeds would be more profitable than the traditional variety because, even though less money is being spent on pesticides, the new seeds cost more.
C) Although the cost of the new seeds is more than the cost of the traditional variety, the amount spent on pesticides has decreased since the inception of the new seeds.
D) Financially speaking, the Wilson's should go back to using the traditional variety of orange seed.

20. Consider the following statement: "Rex has experienced managing people, so he is probably the best person for the leadership role within the young farmers organization," as it pertains to the following reason. "Rex was a part-time manager with the school newspaper, and he has dealt with people in a worker/supervisor role. He is the most experienced of the possible candidates for the

leadership role, and he is confident that he could do a good job with leading the young farmers group. Assuming that all of the statements made as part of the reason are true, the initial claim.

A) Could not be false.
B) Is probably true, but may be false
C) Is probably false, but may be true.
D) Could not be true.

Please answer the following demographic questions.

1. What state are you from? _____

2. Are you male or female? _____

3. How old are you? _____

4. What is your estimated Grade Point Average in school? _____

5. Below you will find a list of activities and events. Please place the number of times you have participated in each of these activities. For example if you had participated in Made for Excellence (MFE) two times, then you would mark the blank beside MFE like this: __2__. Made for Excellence. Please fill in the number of times you have participated in each of the events.

_____ Courtesy Corps at State Convention
_____ Agricultural Issues Contest
_____ Agricultural Communication Contest
_____ Ag. Sales and Service Contest
_____ Filled out a proficiency application
_____ Chapter FFA officer
_____ State FFA officer
_____ National FFA officer
_____ Blast Off
_____ Washington Leadership Conference
_____ Participated in the Ag Ambassador program
_____ EDGE
_____ MFE
_____ ALD
_____ International experience
_____ Livestock judging in the past 2 years
_____ Horse judging in the past 2 years
_____ Dairy judging in the past 2 years
_____ Vegetable, fruit, or crop judging in the past 2 years
_____ Parliamentary procedure
_____ Creed
_____ Prepared Public Speaking
_____ Extemporaneous Public Speaking
_____ Chapter FFA degree
_____ State FFA degree
_____ American FFA degree
_____ Service learning projects
_____ Agriscience fair
_____ Agri-Entrepreneurship Program
_____ Food for America
_____ New Century Farmer program
_____ PALS
_____ Stars Program

6. How many actual courses have you taken on leadership development? _____

7. Please list all other activities that are part of the FFA and not a part of the FFA that have helped developed your leadership.

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APPENDIX B
EMI: CRITICAL THINKING DISPOSITION ASSESSMENT

Directions: Indicate how much you agree or disagree with each numbered statement by circling the appropriate number. 1 = Strongly disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly agree.

		SD	D	U	A	SA
I1.	**I always believe there is more to be learned.**	**1**	**2**	**3**	**4**	**5**
M2.	When someone disagrees with me I usually tune him or her out.	1	2	3	4	5
E3.	**I look for opportunities to solve problems.**	**1**	**2**	**3**	**4**	**5**
E4.	**I am interested in many issues.**	**1**	**2**	**3**	**4**	**5**
I5.	**It is important for me to have a deep understanding of more than one issue.**	**1**	**2**	**3**	**4**	**5**
E6.	**I am able to relate to a wide variety of issues.**	**1**	**2**	**3**	**4**	**5**
I7.	**I ask lots of questions in a learning environment.**	**1**	**2**	**3**	**4**	**5**
E8.	**I enjoy finding answers to challenging questions.**	**1**	**2**	**3**	**4**	**5**
E9.	**I am a good problem solver.**	**1**	**2**	**3**	**4**	**5**
E10.	**I am confident that I can reach a reasonable conclusion.**	**1**	**2**	**3**	**4**	**5**
I11.	**It is important to be well informed.**	**1**	**2**	**3**	**4**	**5**
M12.	I am not likely to change my values even when I am given new information that might conflict with them.	1	2	3	4	5
E13.	**I like to think things through.**	**1**	**2**	**3**	**4**	**5**
I14.	**I enjoy solving problems.**	**1**	**2**	**3**	**4**	**5**
M15.	I know I have biases and if other people can't accept that it is their problem.	1	2	3	4	5
E16.	**I am able to apply my knowledge to a wide variety of issues.**	**1**	**2**	**3**	**4**	**5**
I17.	**I enjoy learning even when I am not in school.**	**1**	**2**	**3**	**4**	**5**
E18.	**Good leaders listen to different opinions.**	**1**	**2**	**3**	**4**	**5**
M19.	I can quickly judge people and decide whether or not I can get along with them.	1	2	3	4	5
E20.	**I am able to explain things clearly.**	**1**	**2**	**3**	**4**	**5**
E21.	**I ask good questions when trying to clarify a solution.**	**1**	**2**	**3**	**4**	**5**
E22.	**I present issues in a clear and precise manner.**	**1**	**2**	**3**	**4**	**5**
M23.	The people from my hometown are better people than those from other communities.	1	2	3	4	5

I24.	**My views are not always right.**	**1**	**2**	**3**	**4**	**5**
I25.	**I search for the truth even when it makes me uncomfortable.**	**1**	**2**	**3**	**4**	**5**
I26.	**There are always different ways to answer a question.**	**1**	**2**	**3**	**4**	**5**
E27.	**I keep on working on things until I get them right.**	**1**	**2**	**3**	**4**	**5**
I28.	**When surfing the Web, I am good at finding the information that I need.**	**1**	**2**	**3**	**4**	**5**
I29.	**I will go out of my way to find the right answers to a problem.**	**1**	**2**	**3**	**4**	**5**
M30.	All murderers deserve the death penalty.	1	2	3	4	5
M31.	**When making decisions I try to listen to all points of view.**	**1**	**2**	**3**	**4**	**5**
M32.	The problem with politicians is they cannot see simple solutions.	1	2	3	4	5
M33.	Homeless people should just get a job.	1	2	3	4	5

Bold = Reverse Coded

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BIOGRAPHICAL SKETCH

The writer was born in Mt. Juliet, Tennessee on February 24, 1975. Raised on a diversified livestock farm, he graduated from Mt. Juliet High School, Mt. Juliet, Tennessee. Mt. Juliet High School is where Mr. Ricketts met his wife Jennifer. This is also where he developed a love for agricultural education as a member of the Mt. Juliet FFA Chapter.

Mr. Ricketts received his Bachelor of Science degree in Agricultural Education from Middle Tennessee State University in the summer of 1996. During his time there he worked for the Tennessee Livestock Center and United Parcel Service.

Upon graduation, Mr. Ricketts taught agriscience, aquaculture, horticulture, greenhouse management, leadership development, and agricultural mechanics at Lebanon High School, Lebanon, Tennessee. Mr. Ricketts then journeyed to a neighboring county to teach agriscience, animal science, horse science, wildlife management, and leadership development at Gallatin High School, Gallatin, Tennessee.

While teaching high school, Mr. Ricketts received his Master of Science degree in vocational-technical education with an emphasis in agricultural education, again from Middle Tennessee State University, Murfreesboro, Tennessee.

In August, 2000 Mr. Ricketts began work on a PhD in Agricultural Education at the University of Florida. While there he served as a graduate teaching and research assistant, teaching and/or assisting in seven agricultural education courses. He was also responsible for supervising a number of student teachers at the University of Florida.