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ABSTRACT

This study examined adult educators' perceptions of components related to critical thinking, including definitions of critical thinking, instructional methods used, and methods of measuring students' growth. A self-report survey method elicited responses from adult educators who currently teach or previously taught adult education courses in United States institutions offering graduate degrees in adult education. Of 155 questionnaires, 78 were returned and 68 were usable. Data were summarized using frequencies, percents, means, and standard deviations. Some tests of statistical significance were carried out using the chi-square statistic. No statistically significant results were found. Respondents agreed that one goal of adult education should be to develop students' critical thinking skills. Moreover, they believed they are teaching critical thinking, using an indirect approach. However, they indicated that adult educators do not have a clear idea about what critical thinking is, which suggests that instruction has not been addressed systematically. Although no single definition of critical thinking emerged, results led to development of a conceptual framework of critical thinking for adult educators. Results indicated adult educators used experiential and participatory methods when teaching critical thinking skills. To evaluate gains in students' critical thinking skills, adult educators reported using a variety of qualitative measures. (Appendixes contain 119 references, instrument, and responses.) (YLB)

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ED 420 794

DEFINING, TEACHING, AND EVALUATING CRITICAL THINKING SKILLS IN ADULT EDUCATION

A Thesis

Presented to

the School of Education

Drake University

In Partial Fulfillment

of the Requirements for the Specialist in Education Degree

by Joann M. Vaske

June 1998

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DEFINING, TEACHING, AND EVALUATING CRITICAL THINKING SKILLS

IN ADULT EDUCATION

by Joann M. Vaske

June 1998

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DEFINING, TEACHING, AND EVALUATING CRITICAL THINKING SKILLS IN ADULT EDUCATION

An abstract of a Thesis by
Joann M. Vaske
June 1998
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Advisor: Charles S. Greenwood

One of the goals of adult education is to develop students' abilities to think critically, yet there is a paucity of research to guide adult educators in their pursuit of this goal. This exploratory study was designed to examine adult educators' perceptions of components related to critical thinking, including definitions of critical thinking, instructional methods used for teaching critical thinking, and methods of measuring students' growth in critical thinking.

A self-report survey method was used to elicit responses from adult educators who currently teach or previously taught adult education courses in institutions within the United States offering graduate degrees in adult education. Seventy-eight of 155 questionnaires were returned. Sixty-eight questionnaires were usable for a response rate of 47%.

Data were summarized using frequencies, percents, means, and standard deviations. Some tests of statistical significance were carried out using the chi-square statistic. No statistically significant results were found.

Respondents agreed one of the goals of adult education should be to develop students' critical thinking skills. Moreover, they believed they are teaching critical thinking, using an indirect approach. However, they indicated that adult educators do not have a clear idea about what critical thinking is which suggests critical thinking instruction has not been addressed systematically.

Although no single definition of critical thinking emerged, results led to development of a conceptual framework of critical thinking for adult educators. The framework presents critical thinking as a two-dimensional construct consisting of cognitive skills and dispositions. Relative to instructional methods, results indicated adult educators used experiential and participatory methods when teaching critical thinking skills. To evaluate gains in students' critical thinking skills, adult educators reported using a variety of qualitative measures.

Further research is needed to develop or adapt a uniform and comprehensive definition of critical thinking by adult educators. Additionally, it should be determined if critical thinking is perceived differently by adult educators than by educators in other disciplines. Also, instructional methods should be examined to determine which are most effective in teaching critical thinking skills and dispositions in adult education. This would lead to investigation of the validity and reliability of qualitative measures adult educators use to measure gains in critical thinking. Finally, longitudinal studies are needed to examine if adult learners who show improvement in their ability to think critically maintain these gains over time and whether they are able to transfer these skills to other areas of their lives such as employment and personal/social.

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Chapter 1

INTRODUCTION

"A democracy cannot survive unthinking citizens."

- Thomas Jefferson

In the 1980's, critical thinking skills began receiving increased attention in education and business/industry (Facione, 1990; Halpern, 1993; Reboy, 1989; Sternberg, 1985; Tucker, 1996). Emphasis on critical thinking emerged in response to constant and rapid change in every aspect of life, including family, work, community, and society (Brookfield, 1987; Glaser & Resnick, 1991; Kerka, 1992). Critical thinking experts argued the most effective way to prepare individuals for a productive, full, and satisfying life, amidst the constant change, was to help them develop critical thinking skills (Beyer, 1985; Ennis, 1985; Facione, 1990; Paul, 1982; Penner, 1995; Siegel, 1988; Sternberg, 1985).

Halpern (1993) described the increasing complexity of society and concluded that learning faster and better may be the only viable responses to a rapidly changing world. According to Tomlin (1997), the learning curve began to steepen in the 1980's and not just with more content. With the Information Age, it became nearly impossible to keep up with content, and the real task became learning in and of itself. Davis and Botkin (1995) described the pace of modern society and noted that no sooner do people adjust to a new way of doing things than those things change on them again. For example, the

rapid pace of technological change meant education must be updated throughout the individual's working life. Adult educator and futurist Paul Larson (cited in Tomlin, 1997) predicted

> the smart people of the future will be those who can learn a new technology very very quickly and add value to their job, or who will be able to create a new and different job to meet an immediate and new need. In other words, the rules have changed and adults must change how and what they learn. (p. 19)

Lifelong learning has become the norm, and people have to "increase learning power to sustain earning power" (Davis & Botkin, 1995, p. 16).

Sternberg (1985) believed the resurgence of interest in critical thinking resulted from a combination of social forces, including: (1) declining scores on tests of scholastic aptitude which have called attention to the apparently declining levels of students' critical thinking; (2) a number of national reports which have blamed schools because students are not learning to think as well as they should; and (3) the advancement of psycho-educational knowledge to the point that programs for teaching critical thinking look more promising than ever before.

Schrag (1992) concurred with Sternberg's third point, pointing out that "From the 1950's until the 1970's, most educational research was dominated by the behaviorism school of psychology which either denied the existence of mental processes or denied their accessibility to scientific study" (p. 255). In the 1980's, however, cognitive approaches to psychology began replacing behavioral approaches, and cognitive approaches are well suited to the experimental investigation of thinking and problem solving. In fact, modern cognitive research has shown that instruction must do more

than convey factual information. According to Glaser and Resnick (1991), instruction must encourage students to ask questions about what they learn, invent new ways of solving problems, connect new knowledge to information they already have, and apply their knowledge and reasoning skills in new situations. In short, instruction must help students develop critical thinking skills.

Halpern (1993) also supported Sternberg's analysis of the problem, reporting that American students routinely rank below those from other parts of the world in academic areas such as scientific knowledge and understanding, mathematical problem solving, and general literacy. As a result, economists and politicians worry about the country's ability to remain a world leader in science and technology. To remedy this situation, leaders in government and business/industry have demanded that teachers include critical thinking in their curriculum.

Patrick (1986) and Brookfield (1987) described changes in the political realm that have occurred in the last two decades of this century and argued that good citizenship requires informed participants who have the capability to think critically about public issues, candidates for public office, and the decisions of government officials. Penner (1995) added that without critical thinking, citizens would believe all politicians' claims and would lose the ability to distinguish good from evil.

Repeated forecasts indicate the work force of the future will require a much greater ability of workers to solve problems on their own (Schrag, 1992). Kerka (1992) studied the changing world of work and noted that as the nature of work changes and

people work longer, the skills they need are the "capacities to learn continuously through thinking and reasoning, problem solving, and decision-making" (p. 2). Thomas (as cited in Kerka, 1992) reported that occupations are becoming more reliant on cognitive capacities, and the changing work environment requires flexibility and adaptability to changing conditions. In support of these views, Feuer and Geber (1988) insisted "Today's organizations need more educated, responsible and flexible work forces composed of employees who can think for themselves and direct their own life-long learning" (p. 38).

Another factor contributing to the attention being paid to critical thinking is the expanding marketplace. Many authors, including Marsick (cited in Feuer & Geber, 1988) argued that today's global marketplace requires employees at many levels of the organization to think and act more independently, use judgment, and figure out what the nature of the problem is rather than just applying a set of predefined rules.

Underscoring the pace of change, some researchers (e.g., Toffler cited in Tomlin, 1997) estimated the United States alone will create 10,000 new jobs a day every day for the next ten years. While many of these jobs will be in the service sector, many others will be in careers that have not yet been invented. Workers in these new careers do not know what or how they will need to learn.

In response to the demands of a changing society and workplace, leaders at every level in education--from elementary/secondary education through adult education--and business/industry began calling for the development of critical thinking skills. They

argued that successful adaptation to a changing world requires the ability to think critically and to synthesize large quantities of new information (National Institute of Education, 1984). Howe and Warren (1989) summarized the value placed on critical thinking skills: "The ability to think critically is essential if individuals are to live, work, and function effectively in our current and changing society" (p. 3).

The arguments for critical thinking were successful. According to Tucker (1996), in the 1980's and 1990's several activities promoting critical thinking emerged. Watson and Glaser's (1980) Critical Thinking Appraisal was developed and became a widely used tool for assessing the effects of undergraduate education on reasoning skills. The publication of A Nation at Risk (U.S. Department of Education, 1983) in 1983 resulted in increased emphasis on certain core skills, including critical thinking. In 1988 and 1989, 46 experts, using the Delphi technique, participated in a project (hereafter known as the Delphi Project) designed to reach consensus on the essential elements of critical thinking for college graduates (Facione, 1990). In 1989, the nation's governors adopted the National Education Goals (U.S. Department of Education, 1993) that identified critical thinking as a core skill. By 1990, the Secretary's Commission to Achieve Necessary Skills (SCANS) Report (U.S. Department of Labor, 1990) and the publication of America's Choice: High Skills or Low Wages (National Center on Education and the Economy, 1990) had focused the nation's attention on the importance of indispensable skills, including critical thinking, in maintaining national productivity and global competitiveness. In 1993, the National Education Goals were adopted under Goals 2000

(U.S. Department of Education, Office of Educational Research Improvement, 1994) and became law. In support of the SCANS Report, the national goals focused on teaching all students to become critical thinkers. Professional education programs, nursing education among the most notable, made the assessment of critical thinking skills a top priority. Human resource development and corporate education departments attempted to find better ways to assess and improve thinking and decision-making skills in the workplace.

In the span of a few years, the critical thinking movement gained momentum in elementary and secondary schools, at the undergraduate and graduate levels, in professional education programs, and in human resource development programs. In the field of adult education, critical thinking assumed an important position as adult educators came to recognize with Hallenbeck (cited in Darkenwald & Merriam, 1982) that the basic aims of adult education are:

> to maintain an adult population up to the standards of competence in the knowledge, wisdom, and skill which society requires; to develop in adults an understanding of the serious problems which interrupt the operations and progress of their cooperative society and prepare them to participate in the solution of these problems; and to provide all adults with opportunities for their highest possible development in attitudes, understanding, knowledge, and quality of human existence toward the goal of the greater self-fulfillment and realization of each individual human being. (pp. 50-51)

Given the emphasis on critical thinking skills over the past two decades, one would expect to see growth in students' critical thinking skills. Yet a high percentage of students are not able to use critical thinking effectively, and business/industry continues to report that many employees are not able to think critically in job situations (Howe & Warren, 1989). In fact, based on 1992 test results of adult literacy, almost half of all

American adults do not perform at the level of literacy considered by the National Education Goals Panel to be necessary for competing successfully in a global economy and for exercising the rights and responsibilities of citizenship (Gronlund, 1993).

Statement of the Problem

"There is no innate tendency to think critically, nor is it easy to acquire."

- R. S. Peters

Critical thinking skills are not a new topic in education. In fact, the concern to teach students how to think and not merely what to think predates the existence of formal schooling (Schrag, 1992). Some (e.g., Schrag) attributed the beginnings of teaching critical thinking to Socrates and his dialogue method of discovery. Others (Brookfield, 1987; Garrison, 1991) linked the modern conceptualization of critical thinking to John Dewey (1933) and his landmark work, How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process, in which Dewey argued that equipping students with the ability and desire to solve the problems facing them and the larger society was the most important task facing educators. Paul (cited in McPeck, 1990) traced the critical thinking movement back to Glaser's Experiment in the Development of Critical Thinking (1941). In the second half of this century, there have been many philosophers, psychologists, and educators (e.g., Beyer, 1985; Brookfield, 1987; Ennis, 1985; Facione, 1990; Garrison, 1991; Halpern, 1993; Kurfiss, 1988; Lipman, 1985;

McMillan, 1987; McPeck, 1981; Mezirow, 1981; Norris, 1988; Paul, 1982; Siegel, 1988) who have contributed to our understanding of critical thinking.

Despite both the long-standing and more recent interest in developing students' critical thinking skills, few published studies documented the development of critical thinking or demonstrated how to improve it with specific curriculum materials or instructional methods (Terenzini, Theophilides, & Lorang, 1984).

One of the goals of adult education is to develop students' ability to think critically (Brookfield, 1987; Candy, 1991; Garrison, 1991; Kummerow cited in Naylor, 1984; Mezirow, 1981). Lindeman, the father of adult education (cited in Darkenwald & Merriam, 1982) emphasized that "Changing individuals in continuous adjustment to changing social functions--that is the . . . purpose of adult learning" (p. 52). McPeck (1990) agreed with Garrison (1991) that "the development of critical thinking skills appears to be more appropriate and teachable in mature learners who have, as a precondition, the foundational knowledge and experience" (p. 302). Garrison believed that critical thinking is a useful and powerful construct in adult education with which to understand learning and knowledge development. Despite the support for critical thinking in adult education, Brookfield (1987) reported that "as a dimension of learning, critical thinking in adulthood has been largely neglected in the educational literature" (p. ix).

The effort to define critical thinking has received a good deal of attention, yet there is no consensus as to its meaning (Garrison, 1991; McMurray, Thompson, &

Beisenherz, 1989; Sternberg, 1985; Tucker, 1996). Lipman (1985) requested a set of criteria by which critical thinking could be identified, a working definition that could guide teachers to encourage their students to think critically and to coach them as they do.

Patrick (1986) claimed critical thinking has not been taught extensively or satisfactorily. Garrison (1991) agreed but suggested that educators are confused about how to develop critical thinking in adult learners. Smith (1980) reported that educators have advanced a plethora of engaging ideas aimed at improving their students' critical thinking skills but have reported little experimental research to assess the effectiveness of their instructional strategies. McMillan (1987) noted there is little evidence that critical thinking skills are influenced by specific instructional variables.

One of the most difficult aspects of critical thinking is how to measure gains in students' critical thinking skills. Despite the importance of this issue, Norris (cited in McPeck, 1990) argued that many of the questions about measuring critical thinking skills have been treated by philosophers but without benefit of empirical studies. Tucker (1996) criticized extant tests of critical thinking for lack of an underlying empirical structure.

While there is wide agreement that the ability to think critically is one of the desirable outcomes of adult education, there is a paucity of research to guide adult educators in their pursuit of this goal. Despite the attention given to critical thinking over the past two decades, there is no single agreed-upon definition of critical thinking. Without a workable definition of what is meant by critical thinking skills, it is difficult

for educators to develop appropriate curriculum, effective instructional strategies, or valid assessment tools. Moreover, few empirical studies have been reported that demonstrate the effectiveness of specific instructional strategies on the development of critical thinking skills. Although there is consensus that change in students' critical thinking skills should be documented, there is little empirical evidence to help educators know which critical thinking measurements are valid and reliable.

Purpose of the Study

The purpose of this study was to examine adult educators' perceptions of components of critical thinking. Specifically, the study attempted to contribute to professional understanding of critical thinking by defining critical thinking in the context of adult education, documenting instructional methods used by adult educators to teach critical thinking, and reporting evaluation techniques used by adult educators to measure students' growth in critical thinking.

Research Questions

Five research questions guided this investigation:

1. To what extent is critical thinking being taught in adult education courses?
2. How do adult educators define critical thinking?
3. Do adult educators have a preference in how critical thinking is taught?
4. How do adult educators measure gains in students' critical thinking?

5. To what extent do adult educators agree or disagree on topics related to teaching critical thinking?

Significance of the Study

Given the increasing complexity of our society, the development of critical thinking skills is a laudable educational goal (McPeck, 1990). There is widespread agreement that the ultimate aim of critical thinking is to improve people's reasoning ability about everyday problems and issues. Garrison (1991) reported "the concept of critical thinking reflects the increased emphasis that educators place upon cognitive processes in knowledge development and problem solving as opposed to simple information acquisition" (p. 287).

In recent years, critical thinking has become a central tenet of the study and practice of adult education (Garrison, 1991). As Brookfield (1987) stated, "Learning to think critically is one of the most significant activities of adult life" (p. ix). Kummerow (cited in Naylor, 1984) suggested the most relevant tasks faced by adults include decision-making and problem solving.

Gibbs (1985) reported that educators involved in the critical thinking movement would be able to direct their efforts more effectively if additional research were available to guide them. The review of literature for this study revealed reports of critical thinking done at the undergraduate level (e.g., Allen, 1995; Clarke, 1995; Gipe & Richards, 1992; Gokhale, 1995; Karabenick & Collins-Eaglin, 1996). None of these studies addressed

issues related to critical thinking in adult education. However, one study (Ruminski & Hanks, 1995) was of particular interest because of the instrument used. Although the population studied was journalism and mass communications faculty teaching at the undergraduate level, some items from the instrument were of value to investigate critical thinking issues with adult educators teaching graduate-level courses.

This researcher investigated several components of critical thinking in the context of adult education. In order for adult educators to make more comprehensive decisions about critical thinking skills curriculum, instructional methods, and evaluation techniques, a working definition of critical thinking is needed. This study sought to contribute to the knowledge base on critical thinking for adult education by attempting to define critical thinking by identifying dimensions and characteristics of the construct. With an agreed-upon definition of critical thinking guiding their efforts, adult educators could better teach their students to think critically.

Definition of Terms

Terms used throughout this study are operationally defined as follows:

Ability--what a person can or has the power to do.

Adult--an individual performing social roles typically assigned by our culture to those it considers adults; that is, the roles of worker, spouse, parent, responsible citizen, soldier, and the like. A person is adult "to the extent the individual perceives herself or himself to be essentially responsible for her or his own life" (Knowles, 1980, p. 24).

Adult education--"the process whereby persons whose major social roles are characteristic of adult status undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values, or skills" (Darkenwald & Merriam, 1982, p. 9).

Adult educators--individuals who are currently teaching or previously have taught graduate-level courses in adult education in institutions granting graduate degrees in adult education.

Construct--a postulated trait of human beings, such as critical thinking ability, intelligence, anxiety. Constructs are thought to underlie performance and explain its occurrence (Norris & Ennis, 1989).

Creative thinking--"sensing difficulties, problems, gaps in information, missing elements, something askew; making guesses and formulating hypotheses about these deficiencies; evaluating and testing these guesses and hypotheses; possibly revising and retesting them; and finally communicating results" (Taylor cited in Garrison, 1991, p.47).

Dispositions--habits of mind; habitual ways of behaving.

Metacognition--awareness of one's own cognitive processes; process of examining how oneself thinks and makes decisions.

Limitations of the Study

Data for this descriptive study were collected from adult educators who were currently teaching or have previously taught adult education classes in institutions in the

United States offering graduate-level degrees in adult education. The results of the study apply only to the population investigated and should not be generalized to other educators or trainers.

Survey research methods were used to obtain adult educators' perceptions of critical thinking skills and related topics. No commercial questionnaire was available; therefore, the researcher developed one. The questionnaire used for the study was not pilot tested although a draft of the instrument was reviewed by a panel of experts. Results of the questionnaire are limited by how respondents interpreted the items.

The study investigated adult educators' perceptions of three components of critical thinking: definitions of critical thinking, instructional methods used for teaching critical thinking, and methods of measuring students' growth in critical thinking. However, these three are not the only components of critical thinking. The study is limited by the inclusion of these three components only.

Summary

Increasing attention is being given to critical thinking skills in response to the rapid rate of change in our complex world. In recent years, adult educators have begun to suggest that teaching critical thinking is an identifying characteristic and central function of adult education. A rationale for conducting this research was presented, and an overview of the study design was provided. Many issues introduced in this chapter will be addressed in more detail in the following chapters.

In Chapter 2, the related literature is reviewed concerning definitions, instructional methods, and methods of measuring gains in critical thinking skills. Chapter 3 includes a detailed discussion of the research design and methodology utilized in the study. Chapter 4 contains a presentation and analysis of the data, and Chapter 5 discusses the results of the study and presents recommendations for future research.

Chapter 2

REVIEW OF RELATED LITERATURE

"The sign of a poor education . . . is not ignorance. It is . . . the thoughtless habit of believing that one's unexamined, superficial or parochial opinions and feelings are the truth; or the habit of timid silence when one does not understand what someone else is talking about."

(Grant Wiggins, 1989, p. 57)

It is widely believed that the development of critical thinking skills is the most effective way to prepare individuals to live and work successfully in a complex world marked with rapid and constant change (Bangert-Drowns & Bankert, 1990; Brookfield, 1987; Facione, 1990; Halpern, 1993; Howe & Warren, 1989; Kerka, 1992; Patrick, 1986; Terenzini, Springer, Pascarella, & Nora, 1995). Despite the fact that critical thinking skills are considered crucial to survival, research on critical thinking is limited (Terenzini, Theophilides, et al., 1984). McMurray et al. (1989) observed that despite recent progress in delineating a construct of critical thinking, the nature of critical thinking remains unclear.

Current literature which investigates the definition of critical thinking, the efficacy of various instructional methods on the development of critical thinking, and the effectiveness of measurements of students' growth in critical thinking skills is presented in this chapter. The first section reviews definitions of critical thinking; the second

section reviews instructional methods, and the third section reviews methods of evaluation.

Definitions of Critical Thinking

Operationalizing a concept such as critical thinking is not easy. In fact, one of the problems plaguing research in this area is the lack of a standard definition of critical thinking (Dixson, 1991; Garrison, 1991; Lipman, 1985; McMurray et al., 1989; Sternberg, 1985; Tucker, 1996). Yet, as McMurray et al. (1989) and Facione (1990) pointed out, everything else rests on having a workable definition. "It is clear that efforts to teach critical thinking presume the ability to diagnose needs and to measure intervention effects, and measurement, in turn, presumes the ability to define the construct being measured" (McMurray et al., pp. 1-2). Facione stated that "a clear and accurate conceptualization of critical thinking is absolutely essential for the development of valid critical assessment tools and effective critical instructional programs" (p. 5).

There are many variations on the definition of critical thinking. Bangert-Drowns and Bankert (1990) reported that critical thinking has been equated with a multiplicity of constructs, including intelligence, domain-specific expertise, problem solving, logic and sound reasoning, and other higher order mental activities. Some scholars, including Beyer (1985), have defined critical thinking in a narrow sense. Others (Ennis, 1987; Facione, 1990; Paul, 1982; Siegel, 1988) offered a broader definition, insisting that critical thinking consists of both skills and dispositions but debating exactly what those

skills and dispositions are. Some, including Ennis (1987), Garrison (1991), Lipman (1985), and Siegel (1988), proposed that good thinking involves creative thinking as well as critical thinking. Others maintained that creative thinking is separate and distinct from critical thinking. Overall, these disagreements reflect the complexity of critical thinking.

The remainder of this section of Chapter 2 is organized around the following questions relative to a definition of critical thinking as described in the literature:

1. What is the goal of critical thinking?
2. How should critical thinking be conceptualized?
3. How do adult educators define critical thinking?
4. What do the various definitions of critical thinking have in common?

What Is the Goal of Critical Thinking?

As was discussed in Chapter 1, the primary aim of critical thinking is to help individuals develop the skills and abilities that will enable them " to live, work, and function effectively in our current and changing society" (Howe & Warren, 1989, p. 3). Examination of this aim yields some characteristics of critical thinking and thus helps define the construct.

The goal of critical thinking requires learners to think for themselves which implies they develop the abilities to challenge assumptions, maintain a certain skepticism, and reserve judgment. Dewey (as cited in Meyers, 1986), one of the early advocates of critical thinking, associated critical thinking with "suspended judgment", "healthy skepticism", or "reflective thought" (p. 8). McPeck (1981) suggested that "perhaps the

most notable characteristic of critical thought is that it involves a certain skepticism, argument or suspension of assent toward a given statement, established norm or mode of doing things" (p. 6).

While McPeck (1981) believed that skepticism is a key element of critical thinking, a study by Ruminski and Hanks (1995) resulted in a different perspective. Of 172 members of the Association of Education in Journalism and Mass Communication (AEJMC) responding to an open-ended question requesting definitions of critical thinking, less than one percent listed "skepticism", "independence", or "willingness to question".

In a manner similar to McPeck, Brookfield (1987) viewed critical thinking as more than indiscriminate questioning of ideas and activities. He stated that critical thinking involves a two-fold activity of "identifying and challenging assumptions", and "exploring and imagining alternatives" (pp. 15, 229). Meyers (1986) called critical thinking "the ability to formulate generalizations, entertain new possibilities, and suspend judgment" (pp. 28-29).

How Should Critical Thinking Be Conceptualized?

In attempting to define critical thinking, scholars have been concerned with the following issues:

1. Is critical thinking a product (i.e., a set of discrete skills) or a process?
2. Does critical thinking involve both skills and dispositions? If so, which skills and which dispositions?

3. Does critical thinking require collaboration with others?

In response to the first question, Beyer (1985) defined critical thinking in a narrow sense, arguing that "critical thinking is not a process at least not in the sense that problem solving or decision making are processes; that is, critical thinking is not a unified operation consisting of a number of operations through which one proceeds in sequence" (p. 303). He defined critical thinking as a set of nine discrete skills (Beyer, 1984), including: (1) distinguishing between verifiable facts and value claims; (2) determining the reliability of a source; (3) determining the factual accuracy of a statement; (4) distinguishing relevant from irrelevant information, claims, or reasons; (5) detecting bias; (6) identifying ambiguous or equivocal claims or arguments; (7) recognizing logical inconsistencies or fallacies in a line of reasoning; (8) distinguishing between warranted or unwarranted claims; and (9) determining the strength of an argument. Further, Beyer (1995) noted the word "critical" comes from the Greek word for criterion, *kriterion*, which he defined as a benchmark for judging. He concluded that critical thinking is "judging the reasonableness or soundness and truthfulness of statements" (Beyer, 1995, p. 9), not taking things for granted.

Others who defined critical thinking in a narrow sense, for example Dressel and Mayhew (1954), equated critical thinking with problem solving only. Kurfiss (1988) and D'Angelo (1971) also associated critical thinking with problem solving, but they pointed out differences between the two constructs. Kurfiss believed that critical thinking "is a form of problem solving, but a major difference between the two constructs is that critical

thinking involves reasoning about open-ended or 'ill-structured' problems, while problem solving is usually considered narrower in scope" (p. 45). Consistent with Kurfiss' perspective, D'Angelo viewed problem solving as part of critical thinking but stated that critical thinking consists of more skills, e.g., intuition and creativity, than are used in the problem-solving approach.

Despite the support for problem solving as a significant component of critical thinking, Ruminski and Hanks (1995) discovered that journalism and mass communication instructors at the undergraduate level did not define critical thinking that way. Responding to an open-ended question asking for definitions of critical thinking, only one person (out of 172 respondents) specifically named problem solving as central to the definition of critical thinking.

A number of critical thinking experts disagreed that critical thinking is only a set of skills and maintained that critical thinking also involves dispositions. Paul (1990) argued that technical skills can be used simply to criticize the views of opponents and to reinforce one's existing views. He characterized this view as "critical thinking in the weak sense" (p. 5). Critical thinking in the "strong sense" (Paul, p. 5) involved approaching issues from multiple perspectives and demanded open-mindedness to understanding points of view with which one disagrees. Another scholar who linked critical thinking with skills and dispositions was Siegel (1988) who described a "critical spirit" which includes the ability to reason but also "certain attitudes, dispositions, habits of mind, and character traits" (p. 39).

Among those who advocated for skills and dispositions was Ennis (1985) whose definition is the one most frequently quoted by scholars: "Critical thinking is reasonable, reflective thinking that is focused on deciding what to believe or do" (p. 45). Scholars may have confidence in this definition because they can interpret it broadly to include higher order thinking, problem solving, and metacognition (Schrag, 1992). Based on his broad definition of critical thinking, Ennis (1985) developed a taxonomy of critical thinking skills that includes thirteen dispositions and twelve abilities that together make up critical thinking.

While many scholars defined critical thinking as involving both skills and dispositions, there is continuing debate about which skills and which dispositions constitute critical thinking. Ennis (1985) and Paul (1990) identified the dispositions they believed are most characteristic of critical thinking. In their collective judgment, critical thinkers habitually: are skeptical, fair-minded, open-minded; respect evidence and reasoning; value clarity and precision; consider different points of view, and willingly change a position when reason and evidence warrant.

In 1990, the results of a two-year study of critical thinking by a body of 46 scholars were published. Using a qualitative research methodology known as the Delphi method, the panel came to consensus regarding a definition of critical thinking which stated that good critical thinking includes a skill dimension and a dispositional dimension (Facione, 1990):

> We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference. . . . The ideal critical

> thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers . . . 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)

Through the Delphi Project, the panel of critical thinking experts generated a list of six cognitive skills and sixteen sub-skills crucial to becoming a good thinker. Table 1 contains a list of the skills and sub-skills outlined in the panel's final report (Facione, 1990, p. 12).

Table 1

Delphi Project's List of Critical Thinking Skills and Sub-Skills

	Skill	Sub-skill
(1)	interpretation	categorization
		decoding significance
		clarifying meaning
(2)	analysis	examining ideas
		identifying arguments
		analyzing arguments
(3)	evaluation	assessing claims
		assessing arguments

(table continues)

	Skill	Sub-skill
(4)	inference	querying evidence
		conjecturing alternatives
		drawing conclusions
(5)	explanation	stating results
		justifying procedures
		presenting arguments
(6)	self-regulation	self-examination
		self-correction

While Beyer's (1985) listing of critical thinking skills (above) is not refuted by the Delphi Project, his list is subsumed under their notions of "identifying" and "analyzing" all aspects of arguments. The Delphi Project expanded Beyer's list of skills to include the components of "interpretation", "inference", and "explanation" as well as the metacognitive skill of "self-regulation" by which one is asked to monitor one's own possible bias toward an issue.

Close examination of the skills identified by the Delphi Project demonstrates the 46 experts' belief that critical thinking skills are cognitive, not behavioral. Other critical thinking scholars agree with this position (e.g., Dixson, 1991; Halpern, 1993).

The Delphi panelists also came to consensus about the dispositions that good critical thinkers exhibit (Facione, 1990, p. 25) as shown in Table 2.

Table 2

Delphi Project's List of Affective Dispositions of Critical Thinking

Approaches to life and living in general
Inquisitiveness with regard to a wide range of issues.
Concern to become and remain generally well-informed.
Alertness to opportunities to use critical thinking.
Trust in the processes of reasoned inquiry.
Self-confidence in one's own ability 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, egocentric or sociocentric tendencies.
Prudence in suspending, making or altering judgments.
Willingness to reconsider and revise views where honest reflection suggests that change is warranted.
Approaches to specific issues, questions or problems
Clarity in stating the question or concern.
Orderliness in working with complexity.

(table continues)

Approaches to specific issues, questions or problems
Diligence in seeking relevant information.
Reasonableness in selecting and applying criteria.
Care in focusing attention on the concern at hand.
Persistence though difficulties are encountered.
Precision to the degree permitted by subject and circumstances.

Having identified the cognitive skills and affective dispositions of critical thinking, the Delphi panelists cautioned that neither skills nor dispositions should be overemphasized at the expense of the other. Unless persons have the dispositions toward critical thinking, they are unlikely to apply their critical thinking skills appropriately in both their personal and their civic life (Facione, 1990).

A comparison of the dispositions enumerated by the Delphi Project (Facione, 1990) and those listed by Ennis (1985) and Paul (1990) shows considerable overlap.

Another consideration in the definition of critical thinking is whether it requires collaboration with others. Several theorists have argued that critical thinking does not occur unless there is a sharing and interacting with others. For example, McPeck (1990) believed that critical thinking requires reflection, i.e., analyzing arguments, and then communication with others. He claimed this two-step approach helped avoid arbitrariness and also served as a procedure for testing judgments. Garrison (1992) summarized McPeck's position by stating the learner has a dual responsibility: (1) to

construct meaning (internal process), and (2) to justify that meaning through discourse with informed others (external process). Freire (1989) affirmed McPeck's theory by claiming only dialogue with others is capable of generating critical thinking.

Dewey (1933) also believed that knowledge results from the constant interplay between internal and external processes. He proposed five phases of reflective thought; the last phase was to test the hypothesis or understanding in the external world. Brookfield (1987) also suggested a five-phase model of critical thinking similar to Dewey's. Brookfield's phases included: a triggering event, appraisal of the situation, exploration to explain anomalies, development of alternative perspectives, and integration of perspectives into the fabric of living. According to Garrison (1992), Brookfield's model begins and ends in the external world. In the middle are three reflective phases. During the integration phase, individuals act upon their perspectives by communicating with others. Thus, for Brookfield, meaning developed in isolation does not meet the criteria for critical thinking. It is only in the shared world that true meaning is achieved.

Halpern (1984), on the other hand, viewed critical thinking as an internal process where one "takes new information, combines it with information stored in memory, and ends up with something more than and different from what one started with" (p. 4).

In recent years, scholars have begun debating whether critical thinking includes creative thinking. Ennis (1985), Garrison (1991), Halpern, (1984), Lipman (1985), Nugent (1990), and Siegel (1988) argued that creative thinking is an integral part of

critical thinking. Viewing creative thinking as a process, Taylor (cited in Sternberg, 1988) described creative thinking as "sensing difficulties, problems, gaps in information, missing elements, something askew; making guesses and formulating hypotheses about these deficiencies; evaluating and testing these guesses and hypotheses; possibly revising and retesting them; and finally communicating the results" (p. 47). Using this definition of creative thinking, it is easy to see similarities to previous descriptions of both critical thinking and problem solving. As Halpern (1984) stated: "Many decisions are involved in solving a problem, and generating satisfactory solution paths often requires considerable creativity" (p. 162).

How Do Adult Educators Define Critical Thinking?

Garrison (1991) traced critical thinking as a central tenet of adult education to Eduard Lindeman, the father of adult education. Lindeman was a friend and colleague of John Dewey who developed an approach to critical thinking commonly referred to as the scientific method of inquiry. Darkenwald and Merriam (1982) described Dewey's method as a problem-solving approach which involved several steps: clarification of a problem to be solved, development of ideas or hypotheses about the problem, and the testing of these hypotheses by an examination of evidence.

Although Lindeman did not use the term, critical thinking (borrowed in part from Dewey) was a major aspect of his conceptualization of adult education. According to Garrison (1991),

> Meaning for Lindeman, as with Dewey, was derived from the verification of ideas through the experience of living. As a result, the full cycle of critical or reflective thought espoused by Dewey is evident in Lindeman's work; a process beginning with identifying and challenging preconceptions or assumptions, exploring new ways of thinking, and then evaluating these ideas through the experience of living. (p. 296)

Malcolm Knowles, Lindeman's chief disciple and advocate in contemporary adult education, adopted Lindeman's four basic assumptions about adult education. In their assumptions, both Lindeman and Knowles emphasized personal experience and problem solving which are closely associated with the critical thinking process.

Although interest in critical thinking among adult educators may be traced to Lindeman and Knowles, Garrison (1991) believed the individual who explicitly brought critical theory to the attention of contemporary adult educators was Jack Mezirow. Mezirow (1981) authored an inductively derived mode of learning called "perspective transformation" (p. 6) which he described as

> the emancipatory process of becoming critically aware of how and why the structure of psycho-cultural assumptions has come to constrain the way we see ourselves and our relationships, reconstituting this structure to permit a more inclusive and discriminating integration of experience and acting upon these new understandings. (p. 6)

Mezirow's (1981) cycle of perspective transformation is closely related to previously stated phases of critical thinking (e.g., appraisal of personal experience, integration of perspectives into everyday living).

Brookfield, another prominent contemporary adult educator, is one of the leaders in the critical thinking movement in adult education. His definition of critical thinking as well as his five-phase model of critical thinking was described previously in this section.

Adult educators Darkenwald and Merriam (1982) suggested knowledge comes from critically reflecting and acting on life's experiences. They believed a model of learning for adult education should include: recognizing a problem, analyzing it, discussing it in terms of other people's experiences and available information, using information to formulate solutions, and acting upon the solution(s). Central to this model are critical reflection and problem solving which they perceive as the preferred methods of adult education.

What Do the Various Definitions of Critical Thinking Have in Common?

It is interesting (though not surprising) that theorists, philosophers, psychologists, and other researchers and educators have been unable to come to consensus on a definition of critical thinking. An agreed-upon definition would be useful in helping identify critical thinking skills which in turn would be beneficial in identifying instructional methods and measurements for evaluating growth in critical thinking.

While there is still no single agreed-upon definition of critical thinking, a synthesis of the literature indicated common ground among the various scholars of critical thinking, including:

1. Most scholars agreed that critical thinking includes skills or proficiencies on one hand and tendencies or dispositions on the other.
2. Although opinions differed as to which skills and which dispositions constitute critical thinking, there was considerable overlap in the lists developed by various scholars. (The reader is referred to Table 1 for

examples of critical thinking skills and to Table 2 for examples of critical thinking dispositions.)

3. Many scholars believed critical thinking involves cognitive skills, not behavioral skills.
4. Critical thinking involves both an internal process (reflection) and an external process (collaboration with others).
5. Critical thinking seems to support a construct that involves two dimensions--analytic thought or the judging of information (that is, critical thinking) and the birthing of new ideas based on the combination of previous information (that is, creative thinking).
6. Aspects of thinking that make it "critical" (Garside, 1996, p. 215) are: (a) thinking that is clear, precise, accurate, relevant, logical, and consistent; (b) thinking that reflects a controlled sense of skepticism or disbelief of any assertion, claim, or conclusion until sufficient evidence and reasoning are provided to support it conclusively; (c) thinking that takes stock of existing information and identifies holes and weaknesses, thereby certifying what is known and what is not known; and (d) thinking that is free from bias, prejudice and one-sidedness of thought.

This section of Chapter 2 reviewed definitions of critical thinking. The next section summarizes the literature on the efficacy of various instructional methods on the development of critical thinking skills.

Teaching Critical Thinking

Garrison (1991) suggested the most fundamental role of adult educators is to encourage and develop critical thinking not only because critical thinking is a central component of adult education but also because it is the one function that learners find most difficult to perform themselves. Given this challenge, one would expect adult educators to conduct research regarding how to teach critical thinking most effectively. However, few research studies at the adult education level have been done on this topic. As Smith (1980) discovered, educators have proposed a number of interesting ideas aimed at improving their students' reasoning, but they have reported little experimental research on the effectiveness of their instructional strategies. McMillan (1987) observed there is little evidence that critical thinking skills are shaped by specific instructional variables. Reboy (1989) indicated that the problem may be that many of the critical skills currently found in various taxonomies are not "teacher friendly" (p. 411); that is, they do not lend themselves easily to instructional design and measurement.

Although the purpose of the current research study was to examine adult educators' perceptions of critical thinking, because of the limited research in adult education, the researcher expanded the literature review to include research studies that involved undergraduate students in a variety of disciplines.

The remainder of this section of Chapter 2 is organized around the following questions relative to the teaching of critical thinking as described in the literature:

1. Can critical thinking be taught?

2. Should critical thinking be taught directly or indirectly?
3. Which instructional methods are effective in teaching critical thinking skills?
4. What conclusions can be drawn about the teaching of critical thinking skills?

Can Critical Thinking Be Taught?

The claim that critical thinking skills can be taught is supported by a diverse body of evidence showing that "better thinking can be improved with appropriate instruction" (Halpern, 1993, p. 250). Chance (1986) reviewed several thinking programs and concluded that good thinking is a skill that can be taught, and Kurfiss (1988) reported that critical thinking is a learnable skill. McPeck (1981) stated that to the extent critical thinking is a skill, it is teachable in much the same way other skills are teachable, namely through drills, exercises, or problem solving.

Dixson (1991), on the other hand, argued that

> teaching is usually accomplished through example and explanation. Although some explanation is possible, it is difficult to "show" critical thinking. Since it is a cognitive, rather than a behavioral skill, we cannot directly observe the process. This makes it difficult to teach such a skill directly. It is far more likely that we can facilitate it. (p. 6)

Dixson's viewpoint is more than a semantic difference. It reflects one of the strongly held tenets of adult education; namely, that educators should facilitate learning rather than impart knowledge (Brookfield, 1987; Candy, 1991; Darkenwald & Merriam, 1982; Garrison, 1992; Knowles, 1980; Mezirow, 1981). According to adult education

theorists, the most important distinction between facilitating and teaching is that the facilitator engages the learner as an equal partner in every step of the learning process (Knowles, 1980).

Using a simple vote counting procedure, the overall results from the current literature review were slightly positive for teaching critical thinking skills. Of the 26 studies included in the review, 15 found significant differences or positive gains in critical thinking skills; seven found no significant differences, and the remainder yielded mixed results.

Agreeing that critical thinking can be taught, scholars collectively have developed a set of guidelines for teaching higher order or critical thinking skills as shown in Table 3 (adapted from Halpern, 1984; Kerka, 1992; Kurfiss, 1988).

Several of the guidelines in Table 3 reference characteristics of critical thinking as delineated in the definitions of critical thinking cited previously. Further, the guidelines confirm Kerka's (1992) observations that when educators teach critical thinking, other things change as well, particularly teaching methods, the role(s) of the teacher, and the classroom environment. For example, regarding changes in teaching methods, Kerka advocated building on what students already know which might be a way to "actively involve students in the learning" (Table 3, item 2). Regarding teachers' roles, Kerka suggested teachers ask open-ended questions (Table 3, item 4). As far as changes in classroom environment, Kerka recommended opportunities for reflection on real life

Table 3

Guidelines for Teaching Higher Order Thinking Skills

1.	Offer a rationale for learning the skills.	7.	Provide practice of thinking skills in multiple settings.
2.	Actively involve students in the learning.	8.	Use multiple learning strategies.
3.	Allow sufficient time for students to reflect on the questions asked or problems posed.	9.	Use examples that are similar to the situations in which the skills will be used.
4.	Ask open-ended questions.	10.	Teach for transfer.
5.	Promote interaction among students as they learn.	11.	Use intrinsic motivational techniques.
6.	Model problem-solving techniques.	12.	Promote metacognitive attention to thinking.

situations and contexts. Table 3, item 9, advises teachers to "use examples that are similar to the situations in which the skills will be used".

Should Critical Thinking Be Taught Directly or Indirectly?

A recurring topic in the literature is whether critical thinking should be taught directly or indirectly (Reboy, 1989). Browne, Haas, and Keeley (1978), de Bono (1983), Penner (1995), and Statkiewicz and Allen (1983) found that direct training combined with practice and reinforcement are needed to facilitate the development of critical thinking. For example, de Bono believed thinking skills can be taught directly, but in

order for these skills to be successfully transferred, they must relate to circumstances individuals face in their personal or professional lives. de Bono's research stressed the element of practice to ensure students were comfortable with different strategies involved in critical thinking and problem solving.

Results of a meta-analysis of 20 studies of the effects of explicit instruction for critical thinking by Bangert-Drowns and Bankert (1990) consistently favored programs that used explicit instruction methods. Further, intensive programs proved more effective than did programs providing only periodic training in critical thinking. Length of the treatment was unrelated to effectiveness.

While results of the meta-analysis are useful regarding explicit versus indirect instruction, they do not help answer the related question about whether it is more effective to teach critical thinking skills in courses designed solely for that purpose or whether the instruction would be more effective if it were integrated into subject matter courses.

Halpern (1993) claimed a broad-based, cross-disciplinary approach is most effective for critical thinking instruction. Further, she contended that critical thinking skills do not necessarily develop as a by-product of discipline-specific course work. The answer, she believed, is specially designed courses that focus on generic thinking skills using varied examples because such courses provide the ideal combination of skills training and practice with transferring skills. Chance (1986) recommended integrating critical thinking instruction into subject matter courses.

Before examining the results of the research studies included in this section of the literature review, a listing of the principles that guide critical thinking courses would be useful. Kurfiss (1988) summarized the common features of critical thinking courses taught across disciplines. These features apply as well to courses specifically designed to teach critical thinking skills (see Table 4).

Table 4

Common Features of Critical Thinking Courses

1.	Critical thinking is a learnable skill; the instructor and peers are resources in developing critical thinking skills.
2.	Problems, questions, or issues are the point of entry into the subject and a source of motivation for sustained inquiry.
3.	Successful courses balance challenges to think critically with support tailored to students' developmental needs.
4.	Courses are assignment centered rather than text and lecture centered. Goals, methods, and evaluation emphasize using content rather than simply acquiring it.
5.	Students are required to formulate and justify their ideas in writing or other appropriate modes.
6.	Students collaborate to learn and to stretch their thinking, for example, in pair problem solving and small group work.
7.	Several courses, particularly those that teach problem-solving skills, nurture students' metacognitive abilities.

Four studies included in this literature review addressed the question of the efficacy of special courses designed specifically to teach critical thinking. Studies by Browne, Haas, et al. (1978), Davidson and Dunham (1996), and Logan (1976) supported the view that direct teaching of critical thinking skills through courses designed specifically to teach critical thinking significantly improves students' thinking skills. On the other hand, a study by Ruminski and Hanks (1995) indicated that a large majority of journalism and mass communication faculty integrate instruction on how to think critically into the subject matter of their communication courses.

Browne, Haas, et al. (1978) reported that after one academic quarter, college freshmen enrolled in a special course designed to teach critical thinking skills outperformed seniors (control group) on a standardized posttest. Davidson and Dunham (1996) studied the impact of a critical skills seminar on Japanese students enrolled in an English as a Second Language course. Students receiving the critical skills training scored significantly higher on the standardized posttest.

Logan (1976) studied critical thinking skills as they were taught in an experimental course for college freshmen and sophomores. Results showed that students who took the experimental course were able to spot an average of 1.79 fallacies among a possible ten on a scale measuring inclination to think scientifically. When specifically told to think scientifically, they spotted 2.35 fallacies. Graduate teaching assistants in the same department who had not taken the experimental course scored 1.11 and 1.92 respectively.

Which Instructional Methods Are Effective in Teaching Critical Thinking Skills?

McMillan (1987) pointed out that one of the primary means used to enhance critical thinking is classroom instruction. Young (cited in McMillan, 1987) added that it is assumed that if teachers use appropriate instructional methods and curriculum materials, students will improve their critical thinking skills. Yet educators continue to struggle to uncover instructional strategies that have a positive impact on students' critical thinking.

The literature included several studies investigating the efficacy of various instructional methods on undergraduate students' thinking skills. Fourteen studies included in this literature review investigated one or more instructional methods for teaching critical thinking skills. Nine of these 14 studies resulted in statistically significant or positive results; four resulted in no statistically significant difference, and one produced mixed results. Instructional methods reviewed here that resulted in positive findings include: discussion classes, case study, structured inquiry, critical thinking environment, reflection (including "think aloud" activities), reasoning message strategies, collaborative learning, argumentation, annotation, logic, declarative sentence method, and out-of-class activities. Because the studies examined separate and distinct instructional methods, it is difficult to make meaningful comparisons and conclusions about particular methods.

Having reviewed 27 studies that investigated the effects of instructional methods, courses, programs, and general college experiences on changes in students' critical

thinking, McMillan (1987) concluded the results failed to support the use of specific instructional or course conditions to enhance critical thinking but did support the conclusion that college attendance improves critical thinking. McKeachie, Pintrich, Lin, and Smith (1986) disagreed with McMillan's assessment. After completing an extensive review of the literature, they attributed improvement in critical thinking to three instructional variables: student discussion, explicit emphasis on problem solving, and explicit emphasis on methods to encourage development of metacognition.

A previous review of the literature by McKeachie (1970) cited seven studies to demonstrate discussion classes are more effective than lecture classes in promoting retention and higher level thinking. McKeachie's review of studies also indicated that other variables, such as programmed learning, independent study, and simulation were found to be unrelated to critical thinking outcomes. Finally, McKeachie found student-centered classes rather than instructor-centered classes promoted higher level cognitive outcomes. Howe and Warren (1989) described student-centered classrooms as ones which involve students in paired problem solving, cooperative learning settings, simulations, debates, and critical reporting sessions.

Allen (1995) researched the effects of case studies, integrative logs, and traditional lecture on undergraduate students' achievement in an educational psychology survey course. Students in the case study group received instruction in a combined lecture-recitation format followed by in-depth discussion of a case. The discussion focused on developing problem-solving and decision-making skills. Students in the

integrative log group were taught primarily through a traditional lecture-recitation format. Outside of classroom time, the students were required to produce log entries that attempted to develop reflective thought in a non-case manner. Students in the traditional lecture method were taught entirely through a lecture-recitation format without any specific reflective treatments. Results demonstrated that, when compared to more traditional instructional methods, the case study method significantly increased students' content knowledge base.

Baker and Anderson (1983) studied the effects of three inquiry methods on students' critical thinking skills. Inquiry methods, according to Kurfiss (1988), are useful in teaching causal relationships and correcting misconceptions. Instructors using the inquiry method deliberately ask questions, select examples, and use entrapment strategies to elicit misconceptions in students' thinking so they can be corrected. In the Baker and Anderson study, the structured inquiry method produced the highest percentage of gain, but the focused inquiry and open-ended inquiry also produced substantial percentage gains. These results support the findings of Kurfiss (1988) who examined numerous studies at the college level in which the inquiry method proved effective in improving critical thinking skills.

Tien and Stacy (1996) examined three instructional environments: traditional, guided inquiry, and a course for non-science majors that emphasized critical reasoning. The traditional laboratory environment provided hands-on experiences in which the experiments were rote procedural exercises. Students were not required to engage in

meaningful problem-solving activities or examine evidence critically. For the guided inquiry environment, the researchers based their instructional methods on a modeling, coaching, scaffolding, and fading paradigm designed by Collins, Brown, and Newman. During the guided inquiry process, students were asked to predict outcomes, observe data, and explain results. The third environment in the study was a critical reasoning course designed for non-science majors. Students were asked to apply chemistry to everyday problems and evaluate chemistry-related studies published in newspapers and magazines. The results of the Tien and Stacy study showed the critical reasoning environment was more successful in fostering inquiry skills than the other two environments. Critical reasoning students outperformed both guided inquiry and traditional students in regard to explaining scientific procedures and offering relevant improvements for fabricated studies.

Through a multi-tiered study, Koehler and Neer (1996) researched the relationship and impact of trait argumentativeness ("one's disposition to either approach or avoid an argument", p. 6), argumentative flexibility ("one's disposition to argue in either a flexible or collaborative manner, or an inflexible manner", p. 6), and self-reported perception of critical thinking dispositions on critical thinking competence. Two separate surveys, including standardized tests for argumentation and critical thinking skills, were administered five weeks apart. Results showed that neither argumentative style nor perceived critical thinking competence (as measured by self-report) impacted positively on critical thinking competence scores.

Walters and Strode (1991) investigated the impact of training in annotation writing on students' comprehension and summary writing. The researchers described annotation writing as "summarizing written information as well as commenting or reacting to a piece of writing" (p. 2). Students in the experimental group received annotation training which allowed for practice, revision, and sharing. Using a nonequivalent control group design, the researchers reported no significant difference in critical and evaluative thinking skills between students receiving the special training and students receiving a more traditional type of instruction.

Darkenwald and Merriam (1982) described critical reflection as one of the preferred methods of adult education and emphasized that opportunities for reflection should include discussion, questions, and collaborative exploration of differing viewpoints. The use of reflection as a method of enhancing critical thinking skills was investigated in ethnographic studies by Clarke (1995) and Gipe and Richards (1992). Clarke's study followed four science student teachers during a 13-week practicum. The student teachers were videotaped during "reflective teaching cycles" (p. 246), and the transcribed tapes were given to students for their analysis regarding themes and incidents of reflection. The researcher was interested in learning: (1) What do student teachers reflect upon? (2) What precipitates the student teachers' reflections? (3) What factors enhanced or constrained the student teachers' reflections? Results included the documentation of 15 reflective themes across the four cases. In all, 47 factors were documented that either enhanced or constrained student teacher reflection.

In another ethnographic study, Gipe and Richards (1992) also studied prospective teachers and reflective thinking. In this study, 23 elementary education majors engaged in an early field experience and wrote their thoughts and feelings about teaching for 15 weeks. The dialogue journals were evaluated by university supervisors who looked for the number of reflective statements per journal entry. These results were compared to the evaluations of teaching ability made by supervising teachers and the university's student teacher supervisor. The findings supported the assumption that reflective thinking helps improve teaching ability.

Lavoie (1991) investigated the effect of "if-then" logic in making successful predictions. Participants were pre-service college students enrolled in methods classes. The experimental group used "think-aloud" interviews to solve problems; the control group solved predication-problem sheets silently in class. The think-aloud interviews were more effective than traditional methods for identifying the knowledge of individual students.

Three studies included in this literature review studied collaborative learning at the undergraduate level and obtained mixed results. Garside (1996) found no significant differences when he compared learning resulting from traditional teaching methods with learning resulting from collaborative groups. Gokhale (1995) and Karabenick and Collins-Eaglin (1996), on the other hand, found that collaborative learning is beneficial to student learning.

The Garside (1996) study involved 118 students enrolled in an introductory interpersonal communications course at a medium-sized university. Students in the experimental group (three classes) were organized into small groups and were given a list of questions that required them to talk about the concepts the instructor wanted to cover in class. The control group received the concepts in a lecture format. No significant differences were found between the two instructional teaching strategies. However, the researcher offered several reasons why this result may have occurred: (1) the lecture is still the dominant method of instruction in college classrooms; therefore, students have less experience with group discussion; (2) in this study, the group's discussion process was not structured, and the students may have lacked experience with group discussion in general; and (3) the study is based on a limited sample size in one course.

In another study of collaborative learning, Gokhale (1995) examined the difference in achievement by students engaged in drill and practice and students involved in collaborative learning/discussion groups. Findings demonstrated a significant difference in achievement when discussion group students were tested on critical thinking items, but no significant difference was found regarding drill and practice. The researcher concluded that collaborative learning fosters the development of critical thinking.

Several scholars (Beyer, 1985; Dixson, 1991; Halpern, 1984; McPeck, 1990) would applaud Gokhale's findings. While Dixson did not conduct research on the subject, she reviewed the effects of group discussion and believed this method is highly

conducive to the development of students' critical thinking skills. McPeck suggested that teachers need to change their methods of presentation from a didactic mode to a discussion mode of teaching and assessment in order to emphasize critical thinking skills. Beyer (cited in Garside, 1996) described the characteristics of classrooms that reinforce and support critical thinking:

> Students feel free to risk, challenge, and question; there is student-to-student interaction focused on information processing, where students consider the ideas, contributions, and arguments of peers; teachers don't "tell", rather, they help students critically analyze ideas; students are encouraged to become active learners rather than passive recipients of information; and students take responsibility for their own thinking and learning. (p. 216)

Karabenick and Collins-Eaglin (1996) studied two features that impact learning: learning goals and incentive structures. The researchers were particularly interested in the association between goals and incentives and students' use of learning strategies known to facilitate student performance. Participants were asked to complete a questionnaire described to them as a way to acquire more information about their learning environment. Based on responses from 1,037 participants, the researchers found

> the more that students indicated that grades in their classes were based on group performance (rather than individual performance) the more they reported using critical thinking. In addition, perceived emphasis on grades was inversely related to students' use of cognitive strategies of elaboration and critical thinking. Most notable, however, is that more emphasis on student cooperation to learn the material was related to greater student use of learning strategies of elaboration, metacognition, and critical thinking. Critical thinking was also more evident in classes in which grades were based on group performance. There was no evidence, however, that emphasis on competition or individual accomplishment, or learning and comparative ability emphasis was related to a class' use of learning strategies. (p. 5)

Smith (1977, 1983), like Karabernick and Collins-Eaglin (1996), investigated learning atmospheres. Specifically, he was interested in student participation in class discussion, teacher encouragement, and peer-to-peer interaction as they impact student grades. In his 1977 study, Smith found statistically significant associations between high scores on the Watson-Glaser Critical Thinking Appraisal and greater student participation in class discussion, higher encouragement by the teacher, and higher peer-to-peer interaction. In a later study (1983), Smith, after one semester, found no significant relationship between students' critical thinking skills and the three factors being studied.

In a mass communications course, Meiss and Bates (1984) used three distinct instructional methods to assess the development of critical thinking and affective behavior. The independent variables were three reasoning guides: declarative sentences, questions, and topical outlines. Students instructed according to the first two guides were introduced to a hierarchical thinking process which included application, analysis, synthesis, and evaluation of basic mass communication concepts and related those cognitive processes to problem solving. Students taught by the topical outline method served as the control group. The researchers found a statistically significant improvement in critical thinking by students exposed to the declarative sentence method but no significant difference for students exposed to the question guide method or the topical outline. The researchers suggested that strategies based on the discovery theory of learning, such as the declarative sentence method which encourages student participation, self-awareness and informed guessing, foster a growth in cognition.

Statkiewicz and Allen (1983) introduced out-of-class practice exercises to examine development of students' analytical skills and transferability of skills to new situations. Their findings indicated that with practice analytical skills improve and these skills will transfer to new and unfamiliar problems. However, Gibbs (1985) in his review of this study cautioned that the authors' inferences were weakly supported due to a lack of a control group or even a comparison group.

Although the research studies cited above were conducted at the undergraduate level and in various disciplines, they can help inform adult educators about the teaching of critical thinking. What is known about teaching critical thinking in adult education comes primarily from theorists. Adult educators, in general, agree with Knowles (1980) that adults' experiences are a rich resource for learning. Consequently, Feuer and Geber (1988) among others advocated for participatory, learner-centered techniques that draw on learners' experiences. Lanese (1983) encouraged adult educators to use the experiences of adults as the primary curriculum in adult education classes.

Knowles (cited in Mezirow & Associates, 1990) recommended tapping into the experiences of learners by using experiential techniques such as group discussion, simulation exercises, problem-solving activities, case method, and laboratory methods. Mezirow and Associates noted that facilitators are effective in using learners' experiences when they

> encourage learners to look at problems from many perspectives, challenge one another and themselves, probe connections, try out new behaviors, see and confront their own dysfunctional behavior, act when they would rather talk, and

> reflect some more when they are ready to act prematurely to solve a problem that has not been thoroughly considered. (p. 44)

While adult educators are in agreement that experiential techniques are effective with adult learners, they also recognize that no one instructional strategy or method can be effective for all learners or all learning goals. They insist facilitators of adult education must have a broad repertoire of instructional methods and be able to choose the most appropriate method determined in part by the purpose, objectives, and content of the lesson as well as the learning styles of the adult learners (Hayes, 1993). Merriam (1984) proposed contract learning, experiential learning, portfolios, and self-pacing as among the most effective instructional techniques for use with adult learners.

Although adult educators agree that teaching adults should be approached in a different way from teaching pre-adults, there have been few efforts to test whether educators actually use a different style when teaching adults (Imel, 1989). Two studies (Beder & Darkenwald, 1982; Gorham, 1984, 1985) examined this area by investigating the following questions: Do teachers teach adults in a different way? If so, what are these differences? In both studies, subjects were educators who taught both adults and pre-adults. In the Beder and Darkenwald study, information was collected solely through a self-report questionnaire. Gorham used an adaptation of Beder and Darkenwald's instrument for the initial phase of her study, then followed up with classroom observations of a small number of her sample for a second phase.

Both studies investigated educators' perceptions of the learning differences between adults and pre-adults and found that educators believed adults to be significantly

more intellectually curious, motivated to learn, willing to take responsibility for their learning, willing to work hard at learning, clear about what they want to learn, and concerned with the practical applications and implications of learning than were children and adolescents. In both studies, respondents reported significant differences in teaching styles. As compared to teaching children and adolescents, when teaching adults, respondents reported they spend less time on discipline and giving directions, provide less emotional support to students, structure instructional activities less tightly, and vary their teaching techniques more. Beder and Darkenwald (1982) also found significant differences in adult classes in greater use of group discussion, more adjustment in instructional content in response to student feedback, and a greater relationship of class material to student life experiences.

Gorham's (1985) follow-up classroom observations did not verify the self-reported information in the Beder and Darkenwald (1982) and Gorham (1984) questionnaires. The follow-up observations yielded several findings, including: (1) the use of directive teacher behavior was essentially the same with adults as with pre-adults, and (2) adults and teachers with more formal training in adult education tended to use student-centered approaches the least. However, educators did change the classroom environment to a more nontraditional, less formal room arrangement when they were teaching adults.

Educators involved in critical thinking instruction have studied the impact of a college education on students' critical thinking abilities. Eight studies in this literature

review (Browne & Keeley, 1988; Givens, 1976; Keeley, Browne, & Kreutzer, 1982; Lehman & Dressel, 1963; Lehman & Nisbett, 1990; Pascarella, Bohr, Nora, & Terenzini, 1996; Ruminski & Hanks, 1995; Terenzini, Springer, et al., 1995) investigated the impact of college attendance on critical thinking skills.

A descriptive study by Ruminski and Hanks (1995) indicated that the majority of journalism and mass communication instructors responding to a questionnaire either strongly agreed (13%) or agreed (55%) with the statement: "A four-year college education improves most college students' critical thinking skills" (p. 8). Results of other studies conflicted with this finding.

The studies yielding mixed results or no significant results will be presented first. Browne and Keeley (1988) recruited 37 college seniors to respond to an essay question designed to measure the cognitive processes individuals go through as they engage in critical evaluation. The results showed many seniors lack fundamental critical thinking skills. Keeley et al. (1982) obtained results that favored seniors over freshmen in a test of critical thinking skills, but the researchers expressed concern that 40% to 60% of seniors failed to provide a single example of a logical flaw, significant ambiguity, or misuse of data in a written passage.

Lehman and Nisbett (1990) conducted a longitudinal study to determine if an undergraduate education improves reasoning about everyday-life problems and whether some undergraduate training enhances reasoning more than others. Participants were tested in the first term of their freshman year and in the second term of their fourth year

of college. Though no statistical differences were found pre- to posttest, the results were promising, and the researchers contended there is optimism for believing that reasoning can be taught and that different undergraduate disciplines can teach different kinds of reasoning and in differing degrees.

Givens (1976) tested 40 faculty members and their students in four universities to answer questions about the cognitive level of classroom discourse, the difference in critical thinking skills between professors and students (basic and advanced), and the difference in critical thinking skills between students in smaller and larger classes. The findings showed student and faculty discourse averaged on the lowest cognitive level. There was no statistically significant difference between critical thinking scores of basic and advanced students. Scores were higher for students in small classes and for students in larger institutions. There was a positive association between "analysis" scores by professors and performance by students but no consistent relationship between the cognitive level of professors and corresponding cognitive level of students in their classes.

The four studies described above cause concern about the effectiveness of a college education in improving students' thinking skills. On the other hand, three studies provided evidence that a college education, in and of itself, can improve students' thinking skills. In a longitudinal study of Michigan State University students, Lehman and Dressel (1963) found a statistically significant improvement in critical thinking on freshman-to-sophomore, sophomore-to-junior, and junior-to-senior comparisons.

Pascarella et al. (1996), conducting a longitudinal study of 2,076 first-year full- and part-time students at two- and four-year colleges, also found that college attendance has a positive impact on the development of critical thinking. In addition, the more a student was exposed to the academic experience of college, the larger the net positive impact on his/her growth in critical thinking.

Terenzini, Springer, et al. (1995) studied the extent to which critical thinking is shaped by students' formal academic activities and out-of-class experiences. The results demonstrated that both classroom/instructional activities and out-of-class experiences make positive, statistically significant contributions to gains in critical thinking.

Though not directly related to the discussion of impact of college attendance on critical thinking skills, Garcia and Pintrich (1992) conducted a research study which has implications for adult educators. They investigated these research questions: What are the relationships among motivation, learning strategies, and critical thinking? What is the relationship between classroom experience and critical thinking? Study results provided support for positive relationships among motivation, cognitive engagement, and critical thinking. Collaborative learning and challenging course work were also positively related to critical thinking.

What Conclusions Can Be Drawn about the Teaching of Critical Thinking Skills?

Given the diversity of research questions, research designs, and instructional methods used in the research studies included in this literature review, there are few conclusions that can be drawn about the efficacy of teaching critical thinking skills at the

college level. Further, as Gibbs (1985) pointed out, much of the extant research utilized weak designs, particularly lack of randomization, and therefore results must be interpreted with caution.

However, based on the studies included in this literature review, the following general observations can be made about teaching critical thinking:

1. Critical thinking can be taught with appropriate instruction.
2. There is a growing body of literature that supports the direct teaching (as opposed to the indirect teaching) of critical thinking skills.
3. There is little evidence to support or refute the efficacy of selected instructional methods.
4. Researchers have focused on other related issues which continue to cause debate: Where in the curriculum should critical thinking skills be taught? Are critical thinking skills transferable to problems that occur outside the classroom?
5. Critical thinking skills are highly valued, but there is an insufficient body of knowledge to inform educators about what works and what does not work in the teaching of critical thinking skills in higher education and adult education.

This section of Chapter 2 reviewed the literature related to teaching critical thinking skills. The next section will review the literature related to evaluating growth in critical thinking.

Evaluating Critical Thinking

There is a close relationship among the three critical thinking components examined in this study: definitions of critical thinking, strategies for teaching critical thinking, and methods of measuring gains in critical thinking. Facione (1990), in writing the final report of the Delphi Project, stated that "a clear conceptualization of critical thinking is absolutely essential for the development of valid critical thinking assessment tools and effective critical thinking instructional programs" (p. 5). Tucker (1996) affirmed Facione's conclusion and emphasized that

> Many of the unresolved issues in creating a broadly useful model for assessing and teaching critical thinking are unlikely to be resolved until there is considerably more empirical evidence about what critical thinking means . . . and what components of this meaning are responsive to educational intervention. (p. 7)

Lacking an operational definition of critical thinking, it is not surprising that few valid and reliable assessment strategies and methods have been developed. After searching the literature for research studies examining critical thinking outcomes for college students and finding only 27, McMillan (1987) concluded the paucity of research suggested greater attention needs to be directed to the measurement of critical thinking skills.

Educators and evaluators agreed that questions surrounding the issue of evaluation of critical thinking are diverse and difficult (Ennis, 1993; Facione, 1990; Halpern, 1993; Norris, 1988; Tucker, 1996). Furthermore, they recognized that currently available measures have many limitations. Therefore, these scholars have recommended

that better critical thinking measures be constructed and considerable empirical research be conducted in the field (Norris, 1988).

The remainder of this section of Chapter 2 is organized around the following questions relative to the measurement of critical thinking skills as described in the literature:

1. What are the issues surrounding the evaluation of critical thinking skills?
2. Which methods are effective in measuring gains in critical thinking?
3. What conclusions can be drawn about the evaluation of critical thinking skills?

What Are the Issues Surrounding the Evaluation of Critical Thinking Skills?

Educators committed to teaching critical thinking are interested in knowing what to measure, how to measure, when to measure, and how often to measure changes in critical thinking skills. They are also concerned about whether critical thinking skills are transferable and whether gains in critical thinking last. The literature cited experts' opinions as well as limited empirical evidence on these issues.

As was discussed earlier in this chapter, critical thinking experts have offered various definitions of critical thinking. For example, some consider critical thinking to be a process, while others defined it as a product. How critical thinking is defined determines what will be measured through critical thinking assessments. Thus, prior to designing assessment tools, test makers must decide if critical thinking is a process or

product, a skill or disposition, a cognitive or behavioral skill, an internal or external process.

Measuring growth in critical thinking skills is challenging, particularly for those who define critical thinking as a process. Scholars such as Facione (1990), Kerka (1992), and Norris (1988) were more concerned with whether sound thinking processes were displayed than with correct answers to test questions. Kerka reported that "existing right and wrong answer approaches to testing are clearly inadequate" (p. 3). Facione observed that sound critical thinking assessment should target the quality of critical thinking students put into arriving at their answers. Norris argued that "Different examinees can arrive at different answers using equally justifiable processes of inference making" (p. 132).

Contrary to current practice, the 46 critical thinking experts participating in the Delphi Project recommended frequent measurements of gains in critical thinking and utilization of multiple assessment methods in order to compile a composite picture of the subject and to cross check the result(s) of any one assessment technique (Facione, 1990).

Another concern is the timing of measurements of critical thinking. Halpern (1993) pointed out that cognitive growth is a gradual and cumulative process, making assessment more difficult. Halpern (1993) and McMillan (1987) noted, and the research of Terenzini, Springer, et al. (1995) confirmed, that it is unrealistic to expect a huge gain in thinking abilities that can be attributable to one course that is a quarter or semester in length. Brookfield (1990a) concurred, stating a great deal of what is learned occurs long

after the course is finished. Yet many empirical studies are based on outcomes after one course on critical thinking.

Halpern (1993) was also concerned with whether or not gains in critical thinking last over time. Specifically, she posed the following research question: "Do students who show improvement in their ability to think critically maintain these gains over time, or do they revert to easier and less effective methods of thinking" (Halpern, p. 243)? Halpern believed an ideal measure must extend beyond the semester or quarter of instruction so the evaluator can determine if any lasting gains are obtained. Yet, according to current practice, subjects are not re-evaluated at intervals following the completion of instruction on critical thinking.

Additionally, there is concern about whether gains in critical thinking in one area are transferable to another area. Kerka (1992) wrote that cognitive research demonstrates that learning is not automatically transferred to new settings. Research by McMurray et al. (1989) suggested that critical thinking skills may not generalize across content domains. McMillan's (1987) review of several empirical studies also indicated critical thinking skills may not transfer. Consequently, he recommended measures of critical thinking skills that are curriculum specific. Ennis (1993) examined critical thinking instruments and concluded there were no subject-specific critical thinking tests even though the National Academy of Education recommended there be a strong effort to develop subject-specific higher order thinking tests.

Which Methods Are Effective in Measuring Gains in Critical Thinking?

Facione (1990) and Norris (1988) stated that no technique for gathering information about thinking is infallible, and each has limitations which must be explored and understood. It is beyond the scope of this thesis to discuss the limitations of the existing critical thinking instruments. However, a brief discussion of some of the criticisms of the most frequently used measurements is in order.

McMillan (1987) reviewed several research studies and concluded that currently available instruments rely on a single measure of critical thinking and may not be sufficiently discriminating to measure changes in critical thinking. He claimed "what is needed is a set of multiple measures of critical thinking that can be used to triangulate the results" (p. 15). He suggested measures such as student and teacher perceptions, essay answers, and locally devised instruments could be used in addition to appropriate standardized tests.

While there are many critical thinking assessments available, most of them are multiple choice tests (Ennis, 1993). Ennis (1993) and Halpern (1993) expressed concern that multiple choice critical thinking tests are not sensitive enough to pick up on subtle changes in critical thinking abilities and often do not attempt to measure dispositions to think critically. For example, many instruments do not test for dispositions such as open-mindedness and willingness to change a position when reason and evidence warrant.

Norris (1988) expressed concern that standardized tests may penalize students who are thinking critically because: (1) the students may make assumptions different

from the assumptions made by the test designers, or (2) the students' background knowledge differs from that of the test makers. Further, Norris was apprehensive about objective critical thinking tests because they measure only the products of thinking. He believed that for really satisfactory evaluation of critical thinking ability, one must employ such techniques as essay testing, naturalistic observation, and one-on-one oral testing.

The Watson-Glaser Critical Thinking Appraisal (WGCTA) is the most commonly employed objective measure of critical thinking (McMillan, 1987). However, there is a growing body of literature which cites problems with the instrument. For example, Dowling (1990) suggested the five sub-skills reportedly measured by the WGCTA are not grounded in any particular theory of human cognition. Browne, Haas, et al. (1978) suggested the WGCTA, which is a multiple choice test, may measure the ability to recognize a valid syllogism but may not test the ability of students to apply valid deductive reasoning to a problem.

McMillan (1987) found the WGCTA technically weak and described problems with construct validity, normalization data, and the assessment of inferences as true or false rather than valid or invalid. Based on his review of 27 studies, 16 of which used the WGCTA, McMillan concluded that when the WGCTA is used as the dependent measure, it is likely nonsignificant measures will be found.

In place of the WGCTA, Dowling (1990) recommended using the "reflective judgment" approach which he claimed corrects for the weaknesses of the WGTCA

because it: (1) has a clear foundation in cognitive developmental theory; (2) has been validated by a growing body of empirical data; (3) measures skills that are teachable; and (4) deals with problem-solving skills that are most useful to the real world.

Browne, Haas, et al. (1978) were dissatisfied with the WGCTA because of the lack of correlation between student performance on the test and evaluation of classroom experience and paper assignments. They devised an essay exam with open-ended questions and developed explicit evaluation criteria for which they established reliability. The test measures not only whether students recognize critical thinking but whether they can engage in it.

To investigate the methods used by journalism and mass communications instructors teaching at the undergraduate level, Ruminski and Hanks (1995) asked participants to note which of two ways they evaluated students' critical thinking. Nine percent of the respondents reported they used a standardized test, but none of them named a specific test. The remaining respondents (91%) indicated they measured critical thinking using writing assignments.

Other concerns about critical thinking measurements include validity and reliability (Facione, 1990; Halpern, 1993). Facione provided definitions of validity and reliability as they relate to assessment of critical thinking and called for the development of valid and reliable assessment strategies from which educators can draw reasonable inferences about students' critical thinking, in contrast to their domain-specific knowledge or other academic abilities (such as reading or writing).

Halpern (1993) reported that

> In general, multiple choice tests tend to have problems with validity, and open-ended verbal and written examinations tend to have problems with reliability. The current trend toward open-ended assessments such as portfolios, interviews, focus groups, and responses to hypothetical situations all suffer from the problem of unknown reliability and validity. (p. 244)

While many scholars described limitations of existing measurements, they also identified emerging assessment methods or strategies which may be more effective in measuring gains in critical thinking. Kerka (1992) expressed hope that new forms of evaluation such as the tailored response test, stimulated recall, scenario analysis, and concept mapping will be more effective in measuring increases in critical thinking. She also indicated that existing methods such as true-false, multiple choice, and essay can be adapted by having students indicate why an answer is false, how two things are similar or different, or by requiring evaluation or critique.

Facione (1990) believed there are several ways, in theory at least, to measure proficiency in critical thinking, including observation, comparison of the results of carrying out a given skill against some predetermined criteria, and interviews with individuals to obtain their descriptions of the procedures and judgments they used as they exercised a particular thinking skill. Halpern (1993) suggested that good assessment of critical thinking should be based on "simulation scenarios" (p. 242) that are similar to situations the students will encounter outside the classroom.

Despite the difficulties of measuring gains in critical thinking, Halpern (1993) concluded there are at least seven different forms of outcome evaluations that generally

support the idea that thinking skills can be improved. These include formal evaluations, student self-reports, gains in IQ scores, cognitive growth and development, expert-like mental representations, a cognitive skills approach, and measures of spontaneous transfer.

Smith (1977) believed that limitations in evaluating gains in critical thinking were responsible for the failure to find meaningful differences among teaching methods. Consequently, he designed a different approach to measure gains in critical thinking. In addition to using the WGCTA as pre- and posttest, he used the Chickering Critical Thinking Behaviors Inventory to assess the impact of different classroom processes on critical thinking. The Chickering self-report instrument asked students to report the percentage of time spent on each of six activities (defined according to Bloom's taxonomy) while studying for the particular course in question. The results were not only statistically significant but dramatic, leading Smith to conclude that "improved research strategies do indeed add to our knowledge of instruction" (p. 187).

What Conclusions Can Be Drawn about the Evaluation of Critical Thinking Skills?

Critical thinking is a complex construct, and a variety of ways of measuring it have been advanced (McMillan, 1987). Educators interested in developing and measuring students' critical thinking skills have been impeded by two factors: (1) there is a paucity of research to guide their efforts; and (2) available critical thinking measures have significant limitations.

A synthesis of the literature suggested the following general findings about the evaluation of critical thinking skills:

1. Available measurements of critical thinking have serious weaknesses. They tend to focus on products (i.e., correct answers), not process (i.e., the ability to think critically). They tend to rely on a single measure of critical thinking. Most are multiple choice tests and incapable of measuring significant components of critical thinking such as dispositions to think critically. Commercially available tests often do not consider potential differences in background knowledge and assumptions between test takers and test makers.
2. Contrary to current practice, assessment of critical thinking should be done frequently and over time, rather than expecting significant results in a short period of time.
3. Good assessment should use multiple measures rather than relying on a single measure. Suggested alternative measures include new forms of evaluation being developed such as the tailored response test, stimulated recall, scenario analysis, and concept mapping as well as familiar forms such as portfolios, interviews, focus groups, observations, and case studies.
4. Care should be given that assessments are valid, reliable, and fair.
5. Because critical thinking skills may not generalize across content domains, subject-specific critical thinking tests are needed.

Summary

This chapter has reviewed pertinent literature in the area of critical thinking as it relates to definitions, instructional methods, and evaluation techniques. Although no consensus has been reached regarding a standard definition of critical thinking, scholars generally agree that critical thinking includes skills and dispositions, cognitive skills rather than behavioral skills, internal and external processes, and creative thought. There is also general agreement about which aspects of thinking make it "critical". Garside (1996) has summarized these aspects which include: (1) thinking that is clear and logical; (2) thinking which reflects skepticism until sufficient evidence is provided; and (3) thinking that is free from bias.

While critical thinking skills are highly valued, there is little empirical research that informs educators about what works and what does not work in the teaching of critical thinking skills. Further, much of the available research used weak designs, particularly lack of randomization, and therefore results must be interpreted with caution. However, based on a review of the literature, some general observations can be made about teaching critical thinking. First, critical thinking can be taught (or facilitated) with appropriate instruction. Second, direct, rather than indirect, teaching of critical thinking has produced significant results. Third, there is little evidence to support or refute the efficacy of selected instructional methods.

Measuring gains in critical thinking is difficult particularly since there is limited research to provide guidance and existing measures are fraught with problems. The

literature suggested departing from current practice to obtain more accurate results. Recommendations included: use multiple measures of critical thinking; assess critical thinking skills frequently and over longer periods of time; employ alternative measures such as stimulated recall and concept mapping; take steps to ensure the assessments are valid, reliable, and fair; and develop subject-specific critical thinking tests.

Chapter 3

METHODOLOGY

The purpose of this study was to explore adult educators' perceptions of topics related to critical thinking, particularly definitions of critical thinking, instructional methods, and methods of measuring growth in students' thinking skills. The study used descriptive statistical methodology to summarize, organize, and simplify data to increase knowledge about adult educators' perceptions of critical thinking. Descriptive research is dependent upon instrumentation for measurement (Gall, Borg, & Gall, 1996). This study used a self-report questionnaire to elicit responses from adult educators and used causal-comparative methods which Gall et al. describe as "a type of quantitative research that seeks to discover possible causes and effects by comparing individuals in which a phenomenon is present with individuals in whom the phenomenon is absent or present to a lesser degree" (p. 380).

This chapter describes the population and sample studied, instrumentation, the null hypotheses, and the analysis of data.

Description of the Population

The target population for this study was adult educators who currently teach or previously taught adult education courses in institutions within the United States offering graduate degrees in adult education. Peterson's Guide to Graduate Programs in Business, Education, Health, Information Studies, Law and Social Work (1997), hereafter referred

to as Peterson's Guide, listed 83 U. S. colleges and universities offering graduate degrees in adult education. One questionnaire, addressed either to Director, Adult Education Program, or to a specific individual listed as the program director in Peterson's Guide, was sent to each of the 83 programs.

Additionally, mailing labels for the current membership (September, 1997) of the Commission of Professors of Adult Education, a subdivision of the American Association for Adult and Continuing Education, were obtained. Of the 220 members listed, only those who were located in communities where graduate programs in adult education were being offered (according to Peterson's Guide, 1997) were included in the survey. Members who lived outside the United States were eliminated from the sample as were members whose listings clearly indicated they were not teaching adult education courses. After eliminating duplications between the two lists, another 72 names were added to the original 83, resulting in a sample size of n = 155.

Sample

The mailing to the sample included a request from the researcher's advisor asking adult educators to respond to the questionnaire, a cover letter to adult educators (see Appendix A), the three-page questionnaire (see Appendix B), and a stamped, self-addressed envelope for returning the completed questionnaire. The mailing was sent on October 17, 1997, requesting responses by October 31, 1997.

Of the 78 questionnaires returned, 10 were not completed either because the institution no longer had a graduate degree program in adult education or because the addressee had moved and left no forwarding address. Usable questionnaires totaled 68 (out of a possible 145 remaining) for a response rate of 47%. No follow up was attempted since a 45% response rate is considered adequate for survey research (Suskie, 1992). Analyses for items with n < 68 reflect missing values.

Teaching Load, Years of Teaching Experience, Academic Rank

Over half of the respondents (51.5%) reported teaching adult education classes 100% of the time. Nearly two-thirds of the respondents (62.1%) reported teaching adult education courses three-fourths time to full time (see Table 5).

Table 5

Teaching Load, Frequency and Percent Distributions

Time Teaching	Frequency	Percent
0 - 25%	9	13.6
26 - 50%	6	9.1
51 - 75%	10	15.2
76 - 100%	41	62.1
Totals:	66	100.0

Over two-thirds of the respondents (67.2%) have taught adult education courses for ten years or more. Less than 12% of the respondents (11.9%) have three or fewer years of experience teaching adult education classes (see Table 6).

Table 6

Number of Years Teaching Experience, Frequency and Percent Distributions

Years	Frequency	Percent
0 – 3	8	11.9
4 – 6	8	11.9
7 – 9	6	8.9
10 +	45	67.3
Totals:	67	100.0

Nearly half of the respondents (45.6%) were full professors. Less than 10% of the respondents (7.3%) were instructors. One respondent provided a title (i.e., adjunct professor) other than those listed on the questionnaire (see Table 7).

Table 7

Academic Rank, Frequency and Percent Distributions

Rank	Frequency	Percent
Instructor	5	7.3
Assistant Professor	11	16.2
Associate Professor	20	29.5
Full Professor	31	45.6
Other	1	1.4
Totals:	68	100.0

Instrumentation

For this study, a three-page instrument (see Appendix B) was developed to address the research questions. A panel of three experts (an adult educator, a psychologist with expertise in survey research, and a mass communications professor who had conducted survey research of journalism and mass communications instructors on critical thinking skills) was invited to review a draft of the instrument. Two responded, and their recommendations were incorporated into the final draft of the instrument.

The questionnaire asked for responses in six areas. The first section requested demographic data about teaching load (i.e., percentage of time spent teaching adult education courses), number of years teaching experience in adult education, and academic rank.

The second section included three questions about critical thinking. To help answer the first research question (Is critical thinking being taught in adult education classes?), respondents were asked if they included critical thinking in their adult education curriculum. Those who responded affirmatively were asked to what extent they taught critical thinking skills and whether they used a direct or indirect approach to teaching critical thinking.

To obtain definitions of critical thinking (the second research question), the third section of the questionnaire asked respondents to indicate the extent to which they agreed or disagreed with eight statements about characteristics and definitions of critical thinking borrowed from adult educators and theorists, using a scale including 1 = "Strongly Agree", 2 = "Agree", 3 = "Uncertain", 4 = "Disagree", and 5 = "Strongly Disagree".

The fourth section of the questionnaire was designed to investigate which instructional methods were being used to teach critical thinking skills (research question three). Respondents were asked to indicate the extent to which they used 18 specified instructional methods, using a scale including 1 = "Do Not Use", 2 = "Occasionally Use",

and 3 = "Frequently Use". At the end of this section, space was provided for respondents to list additional instructional methods and rank the extent to which each was used.

Section five was designed to help answer the fourth research question (How do adult educators measure gains in students' critical thinking?). This section contained six statements about evaluating students' critical thinking. Items used the same three-point scale described for section four (above). At the end of this section, space was provided to allow respondents to list and rank additional evaluation methods.

The final section of the questionnaire asked respondents to mark their responses on a five-point scale indicating the extent to which they agreed or disagreed with 17 statements about a variety of topics related to adult education and critical thinking. This section was designed to answer the fifth research question (What are the perceptions of adult educators on topics related to teaching critical thinking?).

While no single questionnaire on critical thinking was found to fulfill the purpose of this study, the instrument used by Ruminski and Hanks (1995) was acquired prior to development of questionnaire items (as described above). Permission was granted to use all or parts of the instrument (H. J. Ruminski, personal correspondence, August 27, 1997). Although the purpose, goals, and target population of their study were different from those of the present study, their instrument was used to provide guidance in developing five items used in the questionnaire for this study. For the second section of the questionnaire related to instructing students on how to think critically, two items from the Ruminski and Hanks instrument were modified and used. For the final section of the

questionnaire related to adult educators' perceptions of teaching critical thinking, one item from the Ruminski and Hanks instrument was used, and two other items were modified and used.

Research Questions

The following section restates the research questions and lists related statistical hypotheses. The level of significance at which statistical hypotheses were tested was set at $p = .05$. This value was adjusted to control for Type I error rate.

Research Question 1: To what extent is critical thinking being taught in adult education classes?

Responses related to this question were summarized using frequencies and percents. No statistical hypotheses were tested for this research question.

Research Question 2: How do adult educators define critical thinking?

Analysis consisted of comparing adult educators' responses with practices discussed in the review of literature. No statistical hypotheses were tested for this research question.

Research Question 3: Do adult educators have a preference in how critical thinking is taught?

Although there were a number of items on the questionnaire about instructional methods, selected items were analyzed because of their interest to the investigator.

H_0^1: There will be no difference in the proportion of more experienced adult educators and less experienced adult educators in the use of open-ended inquiry.

H_0^2: There will be no difference in the proportion of adult educators who agree critical thinking "involves higher order thinking, problem solving, and metacognition" and those who disagree with this definition of critical thinking in the use of reflection.

H_0^3: There will be no difference in the proportion of adult educators who use a direct approach and adult educators who use an indirect approach to teaching critical thinking skills in the use of small groups.

H_0^4: There will be no difference in the proportion of adult educators with the rank of full professor and adult educators with a lesser rank in the use of lecture.

H_0^5: There will be no difference in the proportion of adult educators who teach critical thinking all the time and adult educators who

seldom or occasionally teach critical thinking in the use of case studies.

H_0^6: There will be no difference in the proportion of adult educators who view critical thinking as a "behavioral skill" and adult educators who view critical thinking as a "cognitive skill" in the use of drill and practice.

H_0^7: There will be no difference in the proportion of adult educators who agree critical thinking is "reasonable reflective thinking" (Ennis, 1985, p. 45) and those who disagree with this definition in the use of logs/journals.

Research Question 4: How do adult educators measure gains in students' critical thinking?

H_0^8: There will be no difference in the proportion of more experienced and less experienced adult educators in the use of in-class discussion to evaluate students' critical thinking.

H_0^9: There will be no difference in the proportion of adult educators who agree critical thinking includes "attitudes and values" and adult educators who disagree with this definition of critical thinking in the use of essay tests.

H_0^{10}: There will be no difference in the proportion of adult educators who view critical thinking as a "behavioral skill" and adult educators who view critical thinking as a "cognitive skill" in the use of subjective observations.

H_0^{11}: There will be no difference in the proportion of adult educators who agree critical thinking includes "identifying and challenging assumptions, and exploring and imagining alternatives" (Brookfield, 1987, p. 15) and adult educators who disagree with this definition of critical thinking in the use of interviews with students.

H_0^{12}: There will be no difference in the proportion of adult educators who frequently use lecture as an instructional method and adult educators who occasionally use or do not use lecture in the use of standardized tests.

Research Question 5: To what extent do adult educators agree or disagree on topics related to teaching critical thinking?

Analysis consisted of comparing adult educators' responses with practices discussed in the review of literature. No statistical hypotheses were tested for this research question.

Analysis of Data

Data collected were coded and prepared for statistical analysis. JMP (SAS Institute, 1989-1996) statistical software was utilized to process quantitative data. Data were summarized using frequencies, percents, means, and standard deviations. Some tests for statistical significance were carried out.

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Chapter 4

ANALYSIS OF DATA

Introduction

The purpose of this study was to investigate the perceptions of adult educators on topics related to defining, teaching, and evaluating critical thinking skills. This chapter presents data analysis results. Chi-square tests were used to test for statistical significance. Each research question is examined individually.

Research question 1 dealt with teaching critical thinking skills. Respondents were asked if they included critical thinking in their curriculum. If they responded "yes", they were asked to what extent they taught critical thinking skills: "seldom", "occasionally", "frequently", or "all the time". Respondents who instructed students on how to think critically were also asked if they "offer specific courses or units within courses on critical thinking skills (direct approach)" or if they "integrate critical thinking into subject-matter units (indirect approach)". Results for research question 1 are reported using frequencies and percents. No tests of statistical significance were carried out.

Research Question 1: To what extent is critical thinking being taught in adult education classes?

A vast majority of respondents (89.7%) indicated they included critical thinking in their adult education curriculum. Of those respondents, nearly half (46.8%) reported

they taught critical thinking skills "frequently" while another large group (40.3%) said they taught critical thinking "all the time" (see Table 8).

Table 8

Extent of Teaching Critical Thinking, Frequency and Percent Distributions

Extent	Frequency	Percent
Seldom	0	0.0
Occasionally	8	12.9
Frequently	29	46.8
All the time	25	40.3
Totals:	62	100.0

A large majority of respondents (88.9%) reported integrating critical thinking skills into subject-matter units; i.e., they used the indirect approach to teaching critical thinking. Only one respondent reported using the direct approach to teaching critical thinking skills.

Nearly 10% of respondents (9.5%) indicated they used both the direct and indirect methods of instructing students on how to think critically (see Table 9).

Table 9

Direct or Indirect Method of Instruction, Frequency and Percent Distributions

Method	Frequency	Percent
Direct	1	1.6
Indirect	56	88.9
Both direct and indirect	6	9.5
Totals:	63	100.0

Research question 2 dealt with definitions of critical thinking. Respondents were asked to indicate the extent to which they agreed or disagreed with eight statements related to characteristics and definitions of critical thinking.

Results for research question 2 are reported using frequencies and percents. No tests of statistical significance were carried out.

Research Question 2: How do adult educators define critical thinking?

There was little variation among responses by participants responding to definitions of critical thinking. Most respondents (98.5%) agreed or strongly agreed with Stephen Brookfield's (1987) definition that critical thinking includes "identifying and

challenging assumptions, and exploring and imagining alternatives" (p. 15). Over 90 percent of respondents (94.1%) agreed or strongly agreed with the statement that "Critical thinking involves higher order thinking, problem solving, and metacognition". The same number of respondents (94.1%) agreed or strongly agreed with the statement that "Critical thinking includes attitudes and values". A large number of respondents (85.3%) agreed or strongly agreed with McPeck's (1981) definition that critical thinking involves "a certain skepticism toward given statements, established norm or mode of doing things" (p. 6). Over 80% of respondents (83.3%) agreed or strongly agreed with Ennis' (1985) definition that critical thinking includes "reasonable, reflective thinking that is focused on deciding what to believe or do" (p. 45).

In general, respondents tended to disagree or strongly disagree with three specified definitions of critical thinking. Eighty percent of respondents disagreed or strongly disagreed with the statement "Critical thinking is a behavioral, not a cognitive skill". Nearly 70% of respondents (68.8%) disagreed or strongly disagreed that "Critical thinking is a set of discrete skills or proficiencies rather than a process". Approximately two-thirds of respondents (67.1%) disagreed or strongly disagreed with the statement "Critical thinking is a synonym for problem solving".

Appendix C contains a table with individual ratings of definitions of critical thinking.

Research question 3 dealt with instructional methods. Respondents were asked to indicate whether each of 18 specified instructional methods was "Not Used", "Occasionally Used", or "Frequently Used". Since there were 18 tests for statistical significance, Type I error rate was controlled by setting the level of significance at .05/18 = .003. Of particular interest were responses to the following instructional methods: open-ended inquiry, reflection, small groups, lecture, case studies, drill and practice, and logs/journals.

Research Question 3: Do adult educators have a preference in how critical thinking is taught?

There was little variation in the responses of adult educators in the present study to 18 pre-selected instructional methods. In general, respondents indicated they frequently used the following instructional methods: small groups (85.1%); discussion (79.1%); reflection (77.2%); and open-ended inquiry (52.4%). Respondents indicated they occasionally used: lecture (65.7%); role play (62.1%); demonstration (61.5%); simulation (57.6%); games (55.4%); critical incidents (53.7%); brainstorming (53.0%); case studies (52.2%); and debate/logic (51.5%). On the other hand, respondents indicated they did not use: programmed instruction (89.4%); drill and practice (87.9%); and think aloud interviews (63.5%).

H_0^1: There will be no difference in the proportion of more experienced (9 + years teaching experience) and less experienced (0 – 9 years teaching experience) adult educators in the use of open-ended inquiry.

Results: When grouped by experience, there was no statistically significant difference (χ^2 (2) = .92, p > .003) in the use of open-ended inquiry.

H_0^2: There will be no difference in the proportion of adult educators who agree critical thinking "involves higher order thinking, problem solving, and metacognition" and those who disagree with this definition of critical thinking in the use of reflection.

Results: There was no statistically significant difference (χ^2 (2) = .38, p > .003) in the proportion of adult educators who agreed critical thinking "involves higher order thinking, problem solving, and metacognition" and those who disagreed with this definition of critical thinking in the use of reflection.

H_0^3: There will be no difference in the proportion of adult educators who use a direct approach and adult educators

who use an indirect approach to teaching critical thinking skills in the use of small groups.

Results: There was no statistically significant difference (χ^2 (4) = 4.28, p > .003) in the proportion of adult educators who used a direct approach and adult educators who used an indirect approach to teaching critical thinking skills in the use of small groups.

H_0^4: There will be no difference in the proportion of adult educators with the rank of full professor and adult educators with a lesser rank in the use of lecture.

Results: When grouped by rank, there was no statistically significant difference (χ^2 (2) = 1.90, p > .003) in the use of lecture.

H_0^5: There will be no difference in the proportion of adult educators who teach critical thinking "all the time" and adult educators who "seldom" or "occasionally" teach critical thinking in the use of case studies.

Results: There was no statistically significant difference (χ^2 (2) = 11.41, p > .003) in the proportion of adult

educators who taught critical thinking "all the time" and adult educators who "seldom" or "occasionally" taught critical thinking in use of case studies.

H_0^6: There will be no difference in the proportion of adult educators who view critical thinking as a "behavioral skill" and adult educators who view critical thinking as a "cognitive skill" in the use of drill and practice.

Results: Chi-square analysis could not be computed because of the response pattern. None of the respondents fit one of the groups.

H_0^7: There will be no difference in the proportion of adult educators who agree critical thinking is "reasonable reflective thinking that is focused on deciding what to believe or do" (Ennis, 1985, p. 45) and those who disagree with this definition in the use of logs/journals.

Results: There was no statistically significant difference ($\chi^2(2) = 1.27$, $p > .003$) in the proportion of adult educators who agreed critical thinking is "reasonable reflective thinking that is focused on deciding what to believe or do"

(Ennis, 1985, p. 45) and those who disagreed with this definition in the use of logs/journals.

Appendix D contains a table summarizing frequency and percent results for instructional methods.

The instructional methods section of the questionnaire concluded with an open-ended question asking respondents to list additional methods used for teaching critical thinking. Ten individuals contributed responses; some provided more than one response. Two respondents listed "readings". All other responses were listed only once and included methods such as autobiographies, real world projects, experiential learning, structured interviews, instrumentation, and contracts.

Appendix E provides a complete list of responses to the open-ended question related to instructional methods.

Research question 4 dealt with methods of evaluating students' critical thinking. Respondents were asked to indicate whether each of six specified evaluation methods was "Not Used", "Occasionally Used", or "Frequently Used". Since there were six tests for statistical significance, Type I error rate was controlled by setting the level of significance at .05/6 = .008.

Of particular interest were in-class discussion, essay tests, subjective observations, interviews with students, and standardized tests. These topics led to the formation of statistical hypotheses.

Research Question 4: How do adult educators measure gains in students' critical thinking?

Nearly all respondents (97.1%) stated they frequently or occasionally used in-class discussion to evaluate growth in critical thinking. A large majority of respondents (81.6%) used interviews with students, and an even greater number of respondents (86.6%) used subjective observations to measure gains in critical thinking. Nearly three-fourths of the respondents (73.8%) reported using essay tests occasionally or frequently to evaluate student's critical thinking. Under half of the respondents (45.3%) occasionally or frequently used teacher-made tests to evaluate critical thinking. None of the respondents (0%) used standardized tests to evaluate students' increases in critical thinking.

H_0^8: There will be no difference in the proportion of more experienced and less experienced adult educators in the use of in-class discussion to evaluate students' critical thinking.

Results: When grouped by experience, there was no statistically significant difference ($\chi^2(2) = 1.53$, $p > .008$) in the use of in-class discussion as an evaluation technique.

H_0^9: There will be no difference in the proportion of adult educators who agree critical thinking includes "attitudes

and values" and adult educators who disagree with this definition of critical thinking in the use of essay tests.

Results: There was no statistically significant difference ($\chi^2(2) = 1.37$, $p > .008$) in the proportion of adult educators who agreed critical thinking includes "attitudes and values" and adult educators who disagreed with this definition of critical thinking in the use of essay tests.

H_0^{10}: There will be no difference in the proportion of adult educators who view critical thinking as a "behavioral skill" and adult educators who view critical thinking as a "cognitive skill" in the use of subjective observations.

Results: Chi-square analysis could not be computed because of the nature of the data.

H_0^{11}: There will be no difference in the proportion of adult educators who agree critical thinking includes "identifying and challenging assumptions, and exploring and imagining alternatives" (Brookfield, 1987, p. 15) and adult educators who disagree with this definition of critical thinking in the use of interviews with students.

Results: There was no statistically significant difference ($\chi^2(2) = 2.28$, $p > .008$) in the proportion of adult educators who agreed critical thinking includes "identifying and challenging assumptions, and exploring and imagining alternatives" (Brookfield, 1987, p. 15) and adult educators who disagreed with this definition of critical thinking in the use of interviews with students.

H_0^{12}: There will be no difference in the proportion of adult educators who "frequently use" lecture as an instructional method and adult educators who "occasionally use" or "never use" lecture as an instructional method in the use of standardized tests.

Results: Chi-square analysis could not be computed because of the nature of the data.

Appendix F contains a table with frequency and percent results for methods of evaluating critical thinking skills.

The evaluation methods section of the questionnaire concluded with an open-ended question asking respondents to list additional methods used for measuring students' gains in critical thinking. Of 68 respondents, 36 (53%) submitted responses with some providing more than one response. The most popular response was papers.

Eleven individuals specifically listed papers as an evaluation method used although there was variation in the types of papers listed (e.g., reflection papers, reaction papers, research papers, position papers, critical papers). Other forms of writing were also listed. For example, three respondents listed essays; five listed journals/journaling. Nine respondents named projects, either individual or team, while seven listed portfolios. Other responses included evaluation methods such as case studies, self-assessment, peer evaluation, and literature reviews.

Appendix G provides a complete list of responses to the open-ended question related to evaluation methods.

Research question 5 dealt with adult educators' opinions toward teaching critical thinking. Respondents were asked to indicate the extent to which they agreed or disagreed with 17 statements related to teaching critical thinking, using a five-point scale. Items of interest included the perceptions of adult educators regarding: the goal of adult education, the goal of critical thinking, the efficacy of teaching critical thinking, the clarity of definition of critical thinking, the value placed on critical thinking by students, and the efficacy of using standardized tests to measure gains in critical thinking.

Results for research question 5 are reported using frequencies and percents. No tests of statistical significance were carried out.

Research Question 5: To what extent do adult educators agree or disagree on topics related to teaching adult education and critical thinking?

All respondents (100%) strongly agreed or agreed that one of the goals of adult education should be to develop students' critical thinking skills. Over 90% of respondents (94.1%) strongly agreed or agreed that the goal of critical thinking should be to produce students who are better thinkers in real-world contexts. The remaining 6% reported they were uncertain.

Nearly two-thirds (65.7%) of respondents disagreed or strongly disagreed that most adult educators have a clear idea of what critical thinking is. Over half the respondents (51.5%) disagreed or strongly disagreed that instruction in critical thinking should be based on some conceptual definition that is comprehensive and measurable.

Nearly 80% of respondents (79%) strongly agreed or agreed that critical thinking is a major objective in their curricula. Nearly 60% of respondents (58.2%) strongly agreed or agreed there is considerable evidence that critical thinking skills can be taught in adult education classes. Another 31.3% of respondents indicated they were uncertain about this statement. More than half the respondents (54.6%) disagreed or strongly disagreed that critical thinking skills can be facilitated but not taught. Another 27.3% strongly agreed or agreed with the statement while the remaining 18.2% were uncertain. Over 70% of respondents (70.2%) disagreed or strongly disagreed that critical thinking is best taught by direct, systematic instruction.

Over 60% of respondents (61.1%) strongly agreed or agreed that many students in adult education classes lack fundamental critical thinking skills. While 50.8% of respondents disagreed or strongly disagreed that students learn to think critically without explicit instruction, another 32.8% agreed with this statement.

There was consensus among respondents regarding the use of standardized tests. Ninety-one percent disagreed or strongly disagreed that growth in critical thinking can best be measured with standardized tests; the remaining nine percent were uncertain.

Appendix H contains a table with frequency and percent results for adult educators' perceptions of topics related to teaching critical thinking.

Summary

This chapter reported results of data analysis for this study. Research questions 1, 2, and 5 used descriptive results. Tests for statistical significance were conducted for hypotheses related to research questions 3 and 4. No statistically significant results were found. Chapter 5 contains a summary and discussion of the results, conclusions, and recommendations for future research.

Chapter 5

SUMMARY, DISCUSSION, AND RECOMMENDATIONS FOR FUTURE RESEARCH

"The real act of discovery consists not in finding new lands but in seeing with new eyes."

- Marcel Proust

The purpose of this exploratory study was to examine adult educators' perceptions of components of critical thinking, particularly definitions of critical thinking, instructional methods used for teaching critical thinking, and methods of measuring students' growth in critical thinking.

In the study, adult educators were defined as individuals who are currently teaching or previously have taught graduate-level courses in adult education in institutions granting graduate degrees in adult education. The study utilized a questionnaire, developed by the researcher, to obtain adult educators' perceptions of critical thinking.

The research questions that guided this study were:

1. To what extent is critical thinking being taught in adult education classes?
2. How do adult educators define critical thinking?
3. Do adult educators have a preference in how critical thinking is taught?

4. How do adult educators measure gains in students' critical thinking?
5. To what extent do adult educators agree or disagree on topics related to teaching critical thinking?

Data related to research questions one, two, and five were summarized using frequencies and percents. Research questions three and four generated statistical hypotheses that were tested using the chi-square statistic. Discussion of the findings follows.

Discussion of Findings

Extent to Which Critical Thinking Is Being Taught

Research question 1 dealt with the extent to which critical thinking skills were being taught in adult education classes. Results revealed adult educators believed one of the goals of adult education should be to develop students' critical thinking skills. This is consistent with the adult education literature (e.g., Brookfield, 1987; Candy, 1991; Garrison, 1991; Mezirow, 1981). Garrison claimed the most fundamental role of adult educators is to encourage and develop critical thinking because adult learners have the experience and intellectual and personal maturity to engage in critical thinking while pre-adults are not capable of or prepared for critical reflection. The findings of the present study also suggest adult educators agreed with Brookfield that "Learning to think critically is one of the most significant activities of adult life" (p. ix).

Respondents indicated they included critical thinking in their curriculum "frequently" or "all the time". This suggests adult educators believe intensive programs are more effective than programs providing only periodic training in critical thinking and supports results of the meta-analysis by Bangert-Drowns and Bankert (1990).

The literature suggests there is a growing body of research that supports the direct teaching of critical thinking skills (Chance, 1986; Halpern, 1993). Despite this research, a large majority (88.9%) of adult educators in this study reported integrating critical thinking skills into subject-matter units; i.e., they used the indirect approach to teach critical thinking. This preference for the indirect method may exist because adult educators lack training and experience in directly teaching critical thinking skills. Further, given the amount of curricular material to be covered as well as the constraints of time, adult educators may be unable to offer specific courses or units on critical thinking.

A previous self-report study of journalism and mass communications faculty across the United States yielded nearly identical results. Ruminski and Hanks (1995) wrote that 89% of respondents in their study reported using the indirect method of teaching critical thinking. However, the current study differed in two substantial ways from the Ruminski and Hanks study: level of education and discipline. The present study examined the perceptions of adult educators teaching graduate level courses in adult education while the study by Ruminski and Hanks investigated the perceptions of journalism and mass communications instructors teaching at the undergraduate level.

Although previous studies of adult educators were not available, results of the present study may indicate that adult educators teach critical thinking in the same or similar ways to educators of other disciplines and at other levels.

Defining Critical Thinking

Participants generally agreed in their responses to eight pre-selected definitions of critical thinking. Because of this level of agreement on all definitions, it was impossible to identify one definition of critical thinking. However, it was possible to identify dimensions and characteristics of critical thinking which were upheld by respondents and supported in the literature.

Respondents agreed or strongly agreed with the definitions of Brookfield (1987), Ennis (1985), and McPeck (1981). These definitions share several characteristics of critical thinking which were supported in the literature. For example, all three definitions described critical thinking as a process, not a product, affirming the conclusion of others (e.g., Darkenwald & Merriam, 1982; Dewey, 1933; Ennis, 1985; Facione, 1990; Paul, 1990; Siegel, 1988). In the current study, adult educators indicated support for critical thinking as a process by disagreeing with the statement "Critical thinking is a set of discrete skills or proficiencies rather than a process".

Definitions of critical thinking by Brookfield (1987), Ennis (1985), and McPeck (1981) also denoted critical thinking as a cognitive rather than a behavioral skill. The literature consistently supported cognitive psychologists and their definitions of critical thinking (Dixson, 1991; Facione, 1990; Halpern, 1993). Adult educators in the present

study agreed with these experts by rejecting the statement "Critical thinking is a behavioral, not a cognitive skill".

By defining critical thinking as a cognitive skill, respondents were in concert with current theorists. Although behaviorism was popular for several years, Schrag (1992) summarized the changeover to cognitive psychology:

> From the 1950's until the 1970's, most educational research and development was dominated by the behaviorism school of psychology, which either denied the existence of mental processes or denied their accessibility to scientific study. The last decade has witnessed the ascendancy of cognitive approaches to psychology--approaches that are well suited to the experimental investigation of thinking and problem-solving processes. The cognitive revolution in psychology, in turn, has penetrated the training and outlook of educational research and development workers. (p. 255)

Although not stated explicitly, the definitions of Brookfield (1987), Ennis (1985), and McPeck (1981) suggested critical thinking involves both skills and dispositions. The dispositions of suspended judgment and skepticism crossed all three definitions and were also apparent in the findings of the Delphi Project which recognized these related dispositions: flexibility in considering alternatives and opinions; prudence in suspending, making, or altering judgments; and willingness to reconsider and revise views where honest reflection suggests that change is warranted (Facione, 1990). By agreeing with Brookfield, Ennis, and McPeck, adult educators in the present study may have been voicing support for a definition of critical thinking that involves both skills and dispositions, and particularly the dispositions of skepticism and suspended judgment.

Further evidence that adult educators believed critical thinking includes dispositions is found in their responses to the statement "Critical thinking includes

attitudes and values". By agreeing with this definition, adult educators in the present study supported the literature. Ennis (1985), Facione (1990), and Paul (1990) identified attitudes and values which critical thinkers habitually exhibit, such as: flexibility, open-mindedness, fairness, clarity, precision, and willingness to consider different points of view.

Adult educators in the present study rejected the statement "Critical thinking is a synonym for critical thinking" but agreed with the statement "Critical thinking involves higher order thinking, problem solving, and metacognition". Their responses supported the literature (e.g., D'Angelo, 1971; Facione, 1990; Kurfiss, 1988; Schrag, 1992) which reported that critical thinking is broader than problem solving. Facione (1990) listed the six cognitive skills identified by the 46 critical thinking experts who participated in the Delphi Project. These six cognitive skills can also be grouped under the categories of higher order thinking, problem solving, and metacognition. For example, interpretation, analysis, evaluation, inference, and explanation are types of higher order thinking and problem-solving skills while self-regulation is a metacognitive skill.

In summary, the review of literature indicated no single agreed-upon definition of critical thinking. Respondents' perceptions paralleled the literature in that no uniform definition of critical thinking emerged. However, there was consensus regarding characteristics of critical thinking. Adult educators in the present study and scholars cited in the review of literature viewed critical thinking as a process (not a product) and a cognitive skill rather than a behavioral skill. Further, both the literature and the subjects

of this study agreed that critical thinking involves both cognitive skills and dispositions. Finally, both agreed that critical thinking is broader than problem solving and in fact involves higher order thinking, problem solving, and metacognition.

Instructional Methods for Teaching Critical Thinking

Instructional methods used by adult educators to teach critical thinking skills were also investigated. In general, respondents reported frequent use of small groups, discussion, reflection, and open-ended inquiry and occasional use of lecture, role play, demonstration, simulation, games, critical incidents, brainstorming, case studies, and debate/logic. It is possible that adult educators used a broad repertoire of methods because they recognize that no single strategy or method can be effective for all learners, all learning styles, or all learning goals. On the other hand, results indicated neither programmed instruction nor drill and practice were used to teach critical thinking.

More experienced and less experienced adult educators were compared on their use of open-ended inquiry. Results indicated respondents used open-ended inquiry regardless of how many years of teaching experience. Respondents seemed to agree with others (Brookfield, 1987; Candy, 1991; Darkenwald & Merriam, 1982; Dixson, 1991; Garrison, 1992; Knowles, 1980; Mezirow, 1981) that the role of the adult educator is to facilitate learning rather than to teach adult learners. Facilitators view open-ended inquiry as an effective instructional method, a perception which is borne out by the studies of Kurfiss (1988) and Baker and Anderson (1983).

Reflection was described in the literature as one of the preferred methods of adult education (Darkenwald & Merriam, 1982). Further, ethnographic studies by Clarke (1995) and Gipe and Richards (1992) investigated the use of reflection as a method of enhancing critical thinking and concluded that reflection improves critical thinking. Respondents in the current study supported these results with nearly 80% reporting frequent use of reflection in their teaching of critical thinking. Respondents used reflection as an instructional method whether they agreed or disagreed with the definition that critical thinking "involves higher order thinking, problem solving, and metacognition".

As a method of teaching critical thinking, reflection may be widely used by adult educators because of its close association with higher order mental processes. Mezirow and Associates (1990) referred to reflection as "intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciation" (p. 5). By definition, reflection includes cognitive skills and dispositions which adult educators previously affirmed as components of critical thinking. Further, reflection requires examination of life experiences, a tenet which adult educators uphold.

Participatory techniques, including small group work, were rated highly in the adult education literature (Brookfield, 1987; Darkenwald & Merriam, 1982; Garrison, 1991; Knowles, 1980; Mezirow, 1981). In addition, the effectiveness of paired problem solving and cooperative learning settings was reported by Howe and Warren (1989) and

Kurfiss (1988). Therefore, it was expected that adult educators in the current study would use small groups frequently when teaching critical thinking. Adult educators who used a direct approach to teaching critical thinking and adult educators who used an indirect approach were compared in the frequency of use of small groups. Nearly all the respondents used the indirect approach and also used small groups, resulting in no statistically significant difference.

Further, the frequent use of small groups by respondents confirmed results of earlier studies on the efficacy of using small groups to teach critical thinking (Gokhale, 1995; Howe & Warren, 1989; Karabenick & Collins-Eaglin, 1996; Smith, 1977).

Literature related to lecture as an instructional method yielded mixed results. Allen (1995) found the lecture format, when followed by other instructional methods such as in-depth discussion of a case, was effective in improving critical thinking skills. On the other hand, McKeachie (1970) cited seven studies to demonstrate lecture classes are less effective than discussion classes in promoting and retaining higher level thinking.

Although lecture as an instructional method has been denigrated by some educators, Brookfield (1990b) and Freire (1989) believed it merits attention in adult education. Describing his own experience as an adult educator, Brookfield wrote that early in his career he refused to give lectures based on his understanding that they were "domineering, authoritarian, and disrespectful of students' dignity" (p. 25). In time, he came to believe that lectures were not only appropriate but essential for certain purposes.

As a result, he began using lectures occasionally and has written book chapters on lecturing effectively for and with adult learners.

Results of the present study tend to support Brookfield's (1990b) position. In general, adult educators, regardless of their rank, used lecture but only occasionally. The types of lecture (e.g., mini lecture, participatory lecture, and traditional lecture) and the purposes for which respondents used lecture were not revealed. Even though adult educators are committed to experiential learning, it is possible they used lecture for specific purposes such as to impart complex or technical information or concepts unfamiliar to the learners. However, it appears likely that respondents used lecture infrequently because they believe adult education classes should be learner-centered rather than teacher-centered.

The case study, as an instructional technique, has become increasingly popular (Allen, 1995; Boyce, 1993; Zeakes, 1992). Because the case study approach is a learner-centered, problem-solving approach, it was expected that respondents would use the case study frequently. As predicted, a large majority (91.0%) reported frequent or occasional use of case studies. Whether they taught critical thinking "all the time" or "seldom" or "occasionally", adult educators included the case study as an instructional method. Previous studies (e.g., Allen, Boyce, Zeakes) indicated the case study method significantly increased students' ability to think critically.

Adult educators may use case studies because this approach provides opportunities for richer understanding of issues than could be gained from other

instructional approaches such as the lecture. Further, case analysis actively engages students in learning (a highly valued principle of adult education) and by its very nature requires use of critical thinking skills such as problem identification and formulation of possible solutions. Additionally, case studies may be used by adult educators because they make use of other important adult education techniques such as small group discussion or role play.

Adult educators who defined critical thinking as a behavioral skill and adult educators who defined critical thinking as a cognitive skill were compared in their use of drill and practice. Results indicated no respondents viewed critical thinking as a behavioral skill or used drill and practice. It is possible that adult educators did not use drill and practice to teach critical thinking skills because this method is incompatible with adult education principles which emphasize experiential, learner-centered approaches. Findings from the current study were consistent with the results of the Gokhale (1995) study which demonstrated that drill and practice is an ineffective instructional method for teaching critical thinking.

Journal writing has become a frequently used technique for discovering the nature of the learning process itself (Candy, 1991) and as a transformative tool for adults (Mezirow & Associates, 1990). Thus, it was expected adult educators would utilize journals or logs for teaching critical thinking skills. Nearly 90% of respondents reported using logs/journals frequently or occasionally. Whether or not they agreed critical thinking is "reasonable reflective thinking that is focused on deciding what to believe or

do", respondents used logs/journals as an instructional method for teaching critical thinking.

It is possible adult educators used logs/journals because this method is learner-centered, allowing adult learners to record and learn from their thoughts and feelings at the time they occur. Further, journal writing requires a high degree of critical reflection. Previously, it was noted that adult educators attempt to teach critical thinking through the use of reflection. Finally, with the recent emphasis on brain research, it is possible adult educators used the journal as a way to gain understanding of how adults learn.

In summary, respondents demonstrated little variation in the instructional techniques used to teach critical thinking. In general, findings were consistent with adult education literature. However, it is important to note the paucity of research in this area and the lack of evidence to support or refute the efficacy of selected instructional methods.

Methods Used to Evaluate Critical Thinking

Methods of evaluating gains in critical thinking skills were also investigated. In general, respondents reported frequent use of in-class discussion and frequent or occasional use of essay tests, interviews with students, and subjective observations. Interestingly, these methods fit under the category of "naturalistic evaluation" (Brookfield, 1986, p. 272) which advocates the use of qualitative rather than quantitative modes of data collection. Naturalistic evaluation has relevance for adult educators because of its emphasis on allowing learners to help set the curriculum and determine

evaluation criteria. Results of the current study also indicated standardized tests were not used to evaluate growth in critical thinking skills.

Respondents, regardless of length of teaching experience, used in-class discussion to evaluate students' critical thinking. Adult educators may use this approach because it has several advantages over written evaluation techniques. For example, through discussion, the evaluator can probe to discover the thinking processes students use as well as the assumptions they make as they solve problems. The discussion method also allows the evaluator to measure students' dispositions (e.g., open-mindedness and willingness to change positions when evidence warrants) to think critically. Another advantage of the discussion method is that it allows for frequent evaluation as recommended in the literature. Also, adult educators, as described previously, used discussion as an instructional method to teach critical thinking. It seems a logical extension to use discussion as an evaluation tool.

Regardless of whether they agreed or disagreed that critical thinking includes "attitudes and values", respondents used essay tests to evaluate growth in critical thinking. This finding supports studies of critical thinking (Browne, Haas, et al., 1978; Kerka, 1992; McMillan, 1987; Norris, 1988) that claimed essay tests were superior to multiple choice tests in measuring students' thinking skills. Adult educators may use essay tests because they go beyond products (that is, correct answers) to reveal students' thinking processes.

Respondents, whether they defined critical thinking as a behavioral or a cognitive skill, used subjective observations to measure gains in critical thinking. This finding supports Brookfield's (1986) argument that informality and flexibility are valuable characteristics of adult education evaluative procedures. Furthermore, qualitative approaches to evaluation of critical thinking, particularly interviews and observational methods, are gaining credibility (Brookfield).

Interviews with students was another evaluation technique used by respondents to measure gains in critical thinking skills. The premise that learners should be involved at all stages in the teaching-learning process, including evaluation, is one of the fundamental principles of adult education. Student interviews as an example of "participatory evaluation" (Brookfield, 1986, p. 276) places much of the responsibility for generating evaluative criteria on learners. Therefore, it seems reasonable that adult educators would utilize interviews as a means of assessing, with students, the development of thinking skills.

Respondents did not use standardized tests to evaluate growth in critical thinking perhaps because they recognize the shortcomings of such tests. The literature (Browne et al., 1978; Dowling, 1990; Ennis, 1993; Halpern, 1993; McMillan, 1987; Norris, 1988) described several weaknesses of standardized tests. For example, standardized tests measure products, not processes of critical thinking. They are unable to measure affective dimensions of critical thinking. Furthermore, standardized tests are often

summative (final) evaluation whereas adult educators are committed to formative (frequent, ongoing) evaluation.

When asked which evaluation methods they used beyond the six listed on the questionnaire, several respondents named papers, projects, portfolios, and journals. It may be that these methods will become part of the evaluative model for adult education which Brookfield (1986) recommended. His concern was that systematic evaluation of adult learning is infrequent due to the absence of an evaluative model that is grounded in the concepts, philosophies, and processes of adult learning.

Unfortunately, there were no available studies in the adult education literature regarding the efficacy of selected evaluation methods as a basis of comparison. From this study, it is not known why adult educators used in-class discussion, essay tests, interviews with students, and subjective observations to measure students' growth in critical thinking. Nor is it known why adult educators did not use standardized tests to measure gains in critical thinking. Further, it is not known how frequently adult educators measure changes in students' critical thinking or if the instruments are valid, reliable, and fair. These are concerns which were raised in the undergraduate literature and merit attention in adult education as well.

Teaching Critical Thinking

The final research question examined adult educators' perceptions of topics related to teaching critical thinking. Participants responded that teaching critical thinking should be one of the goals of adult education, that critical thinking can be facilitated (or

taught) in adult education, and that critical thinking is a major objective in their curricula. These results support beliefs of adult educators referenced in the literature (Brookfield, 1987; Candy, 1991; Darkenwald & Merriam, 1982; Garrison, 1991; Mezirow & Associates, 1990).

On the other hand, respondents claimed that adult educators do not have a clear notion of what critical thinking is. It appears adult educators, like others (e.g., cognitive psychologists, behaviorists, and philosophers) have been unable to come to consensus on a standard definition of the construct. Respondents were divided about whether instruction should be based on some conceptual definition of critical thinking that is comprehensive and measurable. The literature, however, tended to favor teaching critical thinking based on a conceptual definition (Facione, 1990; McMurray et al., 1989). Further, adult educators in this study disagreed that critical thinking is best taught by direct, systematic instruction which conflicts with the results of studies by Browne, Haas, et al. (1978); de Bono (1983); Penner (1995); and Statkiewicz and Allen (1983). However, these studies involved undergraduate students in disciplines other than adult education. Perhaps critical thinking has a different meaning for adult education.

Adult educators in the current study reported that one of the goals of teaching critical thinking should be to produce students who are better thinkers in real-world contexts, a perception that is consistent with others (e.g., Dowling, 1989; Kerka, 1992). However, respondents noted many students in adult education classes lacked fundamental critical thinking skills which parallels earlier studies carried out with undergraduate

students. One of these studies cited substantial evidence that college students have serious deficiencies in their ability to reason (Kurfiss, 1988).

Respondents were divided on whether students learn to think critically without explicit instruction. However, there is some evidence that critical thinking skills are improved with explicit instruction (Browne, Haas, et al., 1978; de Bono, 1983; Penner, 1995; Statkiewicz & Allen, 1983). Again, it should be noted that few research studies were available and those that were reviewed were conducted at the undergraduate level in a variety of disciplines.

Conceptual Framework of Critical Thinking

One important aspect of this study dealt with the definition of critical thinking for adult education. Based on results, it appears that a conceptual framework of critical thinking can be visualized as a two-dimensional construct (see Figure 1.) The proposed framework indicates critical thinking consists of cognitive skills and the cognitive and affective dispositions to use them (Brookfield, 1987; Ennis, 1987; Facione, 1990; Paul, 1982; Siegel, 1988).

According to the proposed framework, the first dimension of critical thinking is cognitive skills. Respondents in this study agreed with others (Brookfield, 1987; Dixson, 1991; Facione, 1990; Halpern, 1993; Kerka, 1992; McKeachie et al., 1986) that critical thinking consists of cognitive rather than behavioral skills.

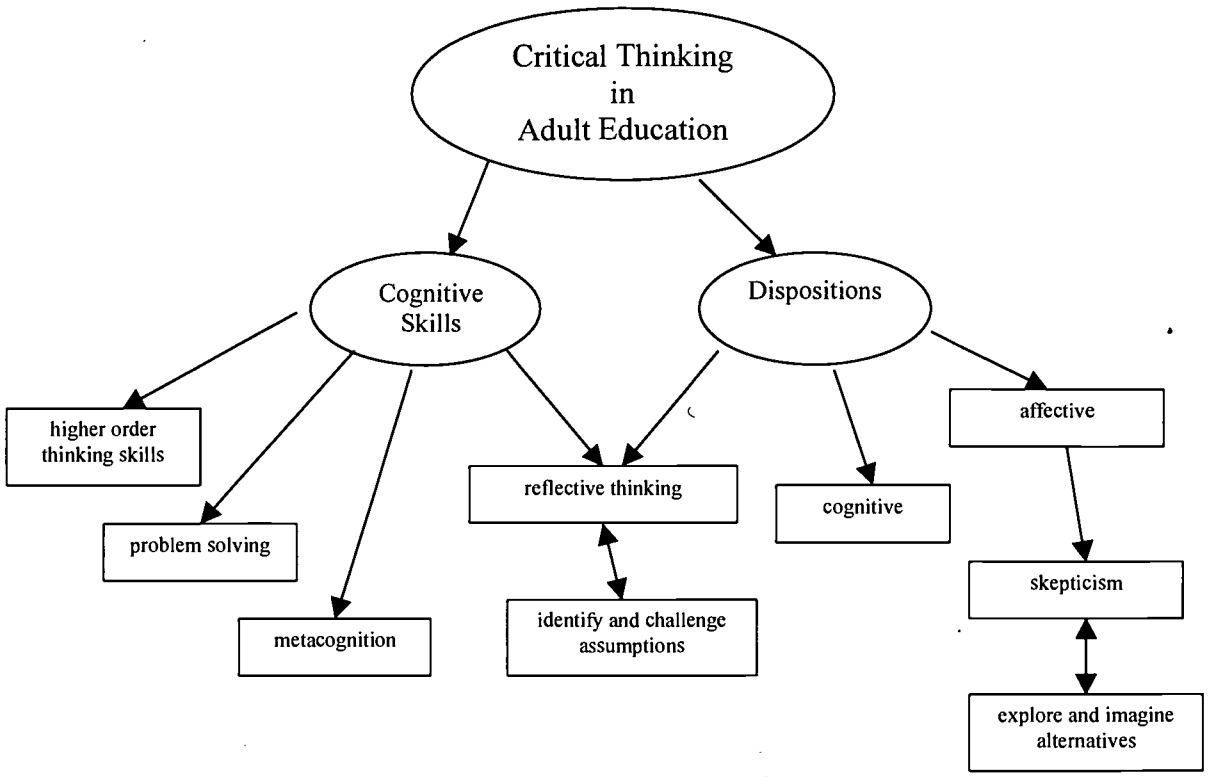

Figure 1. Proposed Conceptual Framework of Critical Thinking

Behaviorism is based on two primary assumptions. First, the focus of study is observable behavior rather than internal thought processes. Learning is manifested by a change in behavior. Second, the environment shapes one's behaviors. In other words, what one learns is determined by the environment, not by the individual learner (Merriam & Caffarella, 1991).

Adult educators in this study rejected the behaviorism approach in favor of the cognitive approach which views perception, insight, and meaning as the key contributors to knowledge and understanding. According to the cognitive approach to thinking, some conditions that promote the construction of meaning include:

> when students are able to link new information to prior knowledge; when students connect classroom learning to real world tasks and issues; when students actively engage with the content, questioning its premises and applying it to new examples and situations; and when students develop a repertoire of cognitive and metacognitive strategies. (Jones, 1992, p. 167)

A chief difference between behaviorists and cognitive psychologists is locus of control over the learning activity. For behaviorists, control lies with the environment; for cognitive psychologists it lies with the individual learner (Merriam & Caffarella, 1991). Another difference is the goal of learning. Behaviorists believe the goal is a change in behavior; cognitive psychologists claim the goal is constructing meaning (Merriam & Caffarella, 1991).

It seems logical that adult educators would support the cognitive approach because of their beliefs that (1) learning is within the adult learner's control; and (2) the learner's experiences are central to the learning process.

The proposed conceptual framework of critical thinking in Figure 1 suggests four cognitive skills which help define critical thinking: higher order thinking skills, problem solving, metacognition, and reflective thinking (also referred to as reflective learning and reflection). Although critical thinking experts (e.g., Ennis, 1987; Facione, 1990) have

proposed a number of cognitive skills, respondents in this study agreed to the four listed above.

Higher order thinking is a term often used as a synonym for critical thinking. In the proposed framework, however, higher order thinking skills together with problem solving skills are defined to include five of the six cognitive skills identified by the Delphi Project (Facione, 1990) as being at the core of critical thinking. These skills are interpretation, analysis, evaluation, inference, and explanation.

Although there is some overlap between higher order thinking skills and problem solving, there are also some important distinctions. Problem solving is defined as the cognitive activity that occurs when an individual attempts to overcome a problem (Mayer, 1994). Like higher order thinking skills, problem solving is cognitive because it occurs internally, but it differs from higher order thinking in that it is "a common and pervasive type of thinking, directed toward a specific goal" (Mayer, p. 4723). In the literature, problem solving was promoted as a significant critical thinking skill (e.g., Bangert-Drowns & Bankert, 1990; Beyer, 1985; D'Angelo, 1971; Darkenwald & Merriam, 1982; de Bono, 1983; Dressel & Mayhew, 1954; Howe & Warren, 1989; Knowles, 1980; Kurfiss, 1988; McKeachie et al., 1986; McPeck, 1981; Meiss & Bates, 1984).

The third cognitive skill proposed in the conceptual framework is metacognition, defined as "awareness of one's own cognitive processes" (Schrag, 1992, p. 255). The basic principles of metacognition demonstrate the connectedness of metacognition with

other cognitive skills and with the affective dispositions of critical thinking. The fundamental principles of metacognition may be summarized as follows: (1) Learning activities and processes, rather than learning outcomes, must be emphasized. (2) Students should be helped to become aware of their learning strategies, self-regulation skills, and the relationship of these strategies and skills to learning goals. (3) The interaction of cognitive, metacognitive, and affective components of learning is central to instruction. (4) Higher cognitive learning goals which require deeper cognitive processing should be emphasized (Simons, 1994).

The importance of metacognition as a critical thinking skill was recognized by Karabenick and Collins-Eaglin (1996), Kurfiss (1988), McKeachie et al. (1986), and Schrag (1992). In addition, metacognition was identified as the sixth and final cognitive skill by the critical thinking experts involved in the Delphi Project (Facione, 1990). Called self-regulation by the Delphi panelists, this skill was further described as requiring self-examination and self-correction.

Metacognition is included in the proposed framework because assisting adult learners in developing metacognitive skills enables them to negotiate and meet the demands of a wide variety of employment, social, and civic situations. This is one of the purposes of adult education and one of the goals of critical thinking.

The fourth and final skill included in the conceptual framework is reflective thinking which is shared between both dimensions of critical thinking: cognitive skills and dispositions (see Figure 1). Boud, Keogh, and Walker (1985) pointed out that

reflection is "a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciation" (p. 3).

The definition of reflective learning reveals its cognitive aspect: "the process of internally examining and exploring an issue of concern, triggered by an experience which creates and clarifies meaning in terms of self and which results in a changed conceptual perspective" (Boyd & Fales, 1983, p. 100). Candy (1991) added that there are many ways to reconcile new learning with existing views of knowledge. Reflection is one of those ways. The dispositional aspect of reflection is made evident by Harris (1990) who claimed reflection is "socially conditioned and affective in nature" (p. 113).

Reflective thinking is included in the proposed conceptual framework of critical thinking because respondents affirmed the definition by Ennis (1985) who declared that critical thinking includes "reasonable reflective thinking". In addition, many critical thinking experts and researchers (e.g., Allen, 1995; Brookfield, 1987; Candy, 1991; Clarke, 1995; Darkenwald & Merriam, 1982; Dewey, 1933; Dowling, 1990; Facione, 1990; Kerka, 1992; McPeck, 1981; Mezirow & Associates, 1990) have concluded that reflection is an essential component of critical thinking.

As a sub-component of reflective learning, the proposed conceptual framework of critical thinking (see Figure 1) depicts "identify and challenge assumptions" from Brookfield's (1987) definition of critical thinking. Brookfield believed that critical thinking takes place "when people probe their habitual ways of thinking and acting for

their underlying assumptions" (p. 15). Schlossberg (1981) concurred, stating the outcome of reflection is "a change in assumptions about oneself and the world" requiring "a corresponding change in one's behavior and relationships" (p. 5).

While many additional cognitive skills have been associated with critical thinking, this conceptual framework is limited to four cognitive skills because these are the four adult educators in the study agreed upon. Also, as noted previously in this chapter, there is substantial evidence from previous studies to support their inclusion in the proposed framework.

The second dimension of critical thinking proposed in the conceptual framework is dispositions. It was reported previously that several critical thinking experts (e.g., Brookfield, 1987; Candy, 1991; Ennis, 1985, 1987; Facione, 1990; Halpern, 1993; Paul, 1990; Siegel, 1988) have insisted that critical thinking has both a cognitive and a dispositional dimension. In support of the dispositional dimension, Brookfield (1987) declared that emotions, feelings, and intuitions are central to critical thinking. D'Angelo (1971) and the Delphi panelists (Facione, 1990) are among those who cataloged various dispositions of critical thinking ranging from curiosity to flexibility and honesty.

Respondents in this study agreed that critical thinking includes dispositions as well as values and attitudes. Dispositions can be subdivided between cognitive and affective. The Delphi Project (Facione, 1990) concluded that for every cognitive skill associated with critical thinking there is a corresponding cognitive disposition. Further, the experts participating in the Delphi Project identified affective dispositions of critical

thinking; i.e., the personal traits, habits of mind, or attitudes that characterize good critical thinkers.

Respondents agreed with McPeck (1981) that critical thinking involves a "certain skepticism toward given statements, established norm or mode of doing things". Skepticism, as a major affective outcome of critical thinking, was described by Brookfield (1987) as the testing of an idea or practice against an individual's experience--"being wary of uncritically accepting an innovation, change, or new perspective simply because it is new" (p. 2) and "a readiness to test the validity of claims made by others" (p. 22).

Further, Brookfield (1987) claimed that critical thinking involves "exploring and imagining alternatives" (p. 8), an activity which he felt leads to "reflective skepticism" (p. 9). Thus the conceptual framework exhibits "explore and imagine alternatives" as a sub-component of skepticism.

The proposed framework depicted in Figure 1 is one possible way to conceptualize critical thinking. It is hoped adult educators will evaluate the merit of the framework and build upon it.

Conclusions

There is a paucity of research reports related to critical thinking in adult education. This exploratory study queried adult educators in the area of teaching critical thinking skills to determine current status and provide insight for future research. Since

critical thinking skills are considered essential for living and working successfully in a rapidly changing world, this study provides direction of efforts for more research in this crucial area of adult education.

Lack of an agreed-upon definition of critical thinking can impede research efforts related to effective teaching and learning. Indeed, as McMurray et al. (1989) pointed out, "efforts to teach critical thinking presume the ability to diagnose needs and measure intervention effects, and measurement, in turn, presumes the ability to define the construct being measured" (pp. 1-2).

Until a standard definition of critical thinking has been ascertained, adult educators will not be certain what to teach or how to teach it. Furthermore, adult educators will not be able to measure growth effectively. Knowledge of any construct, including critical thinking, can only come from rigorous evaluation results.

Although no single agreed-upon definition of critical thinking emerged from this study, respondents indicated consensus on a number of characteristics of critical thinking:

1. Critical thinking is a process, not a set of discrete skills or proficiencies.
2. Critical thinking is a cognitive, not a behavioral skill.
3. Critical thinking involves both cognitive skills and cognitive and affective dispositions.
4. Critical thinking includes attitudes and values.

Based on these results, a framework of critical thinking is posited for consideration by the adult education community. Critical thinking is comprised of two

dimensions: (1) cognitive skills, and (2) dispositions. Cognitive skills consist of higher order thinking skills, problem solving, metacognition, and reflective thinking. Dispositions include both cognitive and affective dispositions. From this study, only one affective disposition was identified; that is, skepticism (McPeck, 1981) with a sub-disposition of exploring and imagining alternatives (Brookfield, 1987). It is possible to measure each of these indicators of critical thinking.

In addition to the dimensions of critical thinking identified above, the current study yielded results related to instructional methods and evaluation. From the study, it appears adult educators use experiential and participatory methods when teaching critical thinking skills. This confirms adult education literature which emphasized learner-centered techniques that draw on students' experiences. To evaluate growth in students' critical thinking skills, adult educators in the current study used a variety of qualitative measures, but they did not use standardized tests. This differs from the results of other studies (e.g., Ruminski & Hanks, 1995) and may indicate a difference in measurement techniques by adult educators as compared to educators in other disciplines.

Recommendations for Future Study

Based on the results of this study, the following are suggestions for future research.

1. While the results of this study showed agreement among adult educators related to pre-selected definitions of critical thinking, no standard

definition of critical thinking emerged. More research should be conducted to develop or adapt a uniform and comprehensive definition of critical thinking by adult educators or more clearly delineate dimensions of critical thinking. Preliminary work was begun with this study. An agreed-upon definition, consistent with the philosophy of adult education, is needed to provide guidance regarding the curriculum, instructional methods, and evaluation techniques related to critical thinking. A related question is: Are those skills considered "critical" in adult education different from the skills considered "critical" in other fields?

2. Once consensus has been reached on a definition of critical thinking, research could proceed to determine effective instructional methods used to teach critical thinking skills in adult education. This study investigated which instructional methods were used by adult educators but did not address the question of the effectiveness of these methods because effectiveness cannot be determined at this time.

3. Results of this study indicated adult educators used a variety of qualitative approaches to evaluate growth in critical thinking skills. Again, once a workable definition of critical thinking has been established, research should investigate validity and reliability issues related to these qualitative approaches. Further, no standardized tests were used by participants. Research is needed to determine if there are reasons beyond the lack of

definition why adult educators do not use standardized tests or other quantitative measures to evaluate gains in students' critical thinking skills. Finally, despite the problems with measuring critical thinking skills, do adult learners who show improvement in their ability to think critically maintain these gains over time? Longitudinal studies are needed.

4. An additional research question merits further study: How does training in critical thinking in the field of adult education transfer to other disciplines, to employment settings, and to social/interpersonal situations?

This exploratory investigation has revealed a strong need for further research that would benefit adult educators and adult learners. However, it seems to have generated more questions than answers.

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Appendix A

COVER LETTER TO ADULT EDUCATORS

October 15, 1997

Dear Adult Educator:

I am a graduate student in the Adult Education Program at Drake University. As part of my graduate thesis, I am conducting a survey of adult educators who are currently teaching or have previously taught adult education classes at the graduate level.

I am investigating several components of critical thinking skills in adult education, including definitions, instructional methods, and evaluation techniques. **Whether or not you include critical thinking as an intentional part of your teaching or curriculum, your responses are very important to my investigation.**

The questionnaire will require 15 minutes of your time. A postage paid envelope has been included for your convenience. Please return the completed questionnaire by October 31. As an incentive for assisting with this study, I can offer you a copy of the results. To receive the results, please include your name and address in the space provided on the questionnaire.

Participants in the survey will not be identified by name or other characteristics that may reveal their identity.

Please call me (515-281-5108) or Dr. Charles Greenwood (515-271-2120), my advisor, if you have questions regarding the questionnaire. Thank you for your professional cooperation with my research efforts. I look forward to receiving your responses.

Sincerely,

Joann M. Vaske

Enclosures: Questionnaire
Stamped self-addressed envelope

Appendix B

Questionnaire – Critical Thinking Skills

Note: Whether or not you include critical thinking in an intentional way in your teaching/curriculum, please complete the entire questionnaire. Thank you.

A. Please respond to questions regarding your position.

What percent of your course load is spent teaching adult education courses? _____%

How many years of experience have you had in teaching adult education courses? _____years

What is your rank: ____Instructor ____Asst. Professor _____Associate Professor
_____Full Professor _____Other (specify)_____

B. Please respond to these general questions about critical thinking skills.

Is critical thinking (CT) included in your adult education curriculum? _____Yes _____No

If yes, please respond to the remaining questions in Part B. If no, please proceed to Part C.

To what extent do you teach critical thinking skills:
_____seldom _____occasionally _____frequently _____all the time

If you do instruct students on how to think critically, do you:
_____1. offer specific courses or units within courses on CT skills? (direct approach)
_____2. integrate CT into subject-matter units? (indirect approach)

C. Please use the scale below to indicate your agreement or disagreement with the following statements. Please circle your responses.

Strongly Agree SA	Agree A	Uncertain U	Disagree D	Strongly Disagree SD

	SA	A	U	D	SD
1. Critical thinking is a set of discrete skills or proficiencies rather than a process.	1	2	3	4	5
2. Critical thinking includes "identifying and challenging assumptions, and exploring and imagining alternatives" (Brookfield).	1	2	3	4	5
3. Critical thinking is a synonym for problem solving.	1	2	3	4	5
4. Critical thinking involves higher order thinking, problem solving, and metacognition.	1	2	3	4	5
5. Critical thinking is a behavioral, not a cognitive skill.	1	2	3	4	5
6. Critical thinking includes "reasonable, reflective thinking that is focused on deciding what to believe or do" (Ennis).	1	2	3	4	5
7. Critical thinking includes attitudes and values.	1	2	3	4	5
8. Critical thinking involves "a certain skepticism toward given statements, established norm or mode of doing things" (McPeck).	1	2	3	4	5

Questionnaire, Page 2

D. Please use the scale below to indicate the extent to which you use each of the following instructional methods to teach critical thinking skills to your students. Please circle your responses.

Do not use N	Occasionally Use O	Frequently Use F

	N	O	F		N	O	F
1. small groups	1	2	3	11. simulation	1	2	3
2. case studies	1	2	3	12. demonstration	1	2	3
3. lecture	1	2	3	13. reflection	1	2	3
4. logs/journals	1	2	3	14. role play	1	2	3
5. guided inquiry	1	2	3	15. discussion	1	2	3
6. open-ended inquiry	1	2	3	16. brainstorming	1	2	3
7. debate/logic	1	2	3	17. games	1	2	3
8. think aloud interviews	1	2	3	18. programmed instruction	1	2	3
9. critical incidents	1	2	3	19. others (please specify and indicate extent to which you use each):			
10. drill and practice	1	2	3	a. _____	1	2	3
				b. _____	1	2	3
				c. _____	1	2	3

E. Please use the scale below to indicate the extent to which you use each of the following to evaluate students' critical thinking. Please circle your responses.

Do not use N	Occasionally Use O	Frequently Use F

	N	O	F
1. essay tests	1	2	3
2. in-class discussion	1	2	3
3. teacher-made tests	1	2	3
4. interviews with students	1	2	3
5. subjective observations	1	2	3
6. standardized tests (please name the standardized test(s) you use): a. _____ b. _____	1	2	3
7. other evaluation methods you use (please specify and indicate extent of use):			
a. _____	1	2	3
b. _____	1	2	3
c. _____	1	2	3

Questionnaire, Page 3

F. Using the following scale, please indicate your agreement or disagreement with the following statements. Please circle your responses.

Strongly Agree SA	Agree A	Uncertain U	Disagree D	Strongly Disagree SD

	SA	A	U	D	SD
1. One of the goals of adult education should be to develop students' critical thinking skills.	1	2	3	4	5
2. Most adult educators agree on a common definition of critical thinking.	1	2	3	4	5
3. The goal of critical thinking instruction should be to produce students who are better thinkers in real-world contexts.	1	2	3	4	5
4. There is considerable evidence that critical thinking skills can be taught in adult education classes.	1	2	3	4	5
5. Most adult educators have a clear idea of what critical thinking is.	1	2	3	4	5
6. Critical thinking skills can be facilitated but not taught.	1	2	3	4	5
7. Critical thinking is best taught by direct, systematic instruction.	1	2	3	4	5
8. Critical thinking in adult education is rarely dealt with systematically.	1	2	3	4	5
9. Instruction in critical thinking should be based on some conceptual definition that is comprehensive and measurable.	1	2	3	4	5
10. Many students in adult education classes lack fundamental critical thinking skills.	1	2	3	4	5
11. Most students learn to think critically without explicit instruction in how to do so.	1	2	3	4	5
12. Students generally perceive critical thinking as an important skill they can take into the "real world".	1	2	3	4	5
13. Critical thinking is a major objective in your curricula.	1	2	3	4	5
14. Most textbooks you use in your classes explicitly instruct students in ways to think critically.	1	2	3	4	5
15. Critical thinking is a major objective in your evaluation plans.	1	2	3	4	5
16. Growth in critical thinking skills can best be measured using standardized tests.	1	2	3	4	5
17. There is a high correlation between the number of adult education classes taken and students' ability to think critically.	1	2	3	4	5

If you would like a copy of the research results, please complete the following:

Name: _____

Address: _____

Thank you for completing this questionnaire. Please return it in the enclosed envelope.

Appendix C

DEFINITIONS OF CRITICAL THINKING – INDIVIDUAL RATINGS

Item	SA	A	U	D	SD	N	Mean	Std. Dev.
Critical thinking is a set of discrete skills or proficiencies rather than a process.	0.0%	20.3%	10.9%	43.8%	25.0%	64	3.73	1.06
Critical thinking includes "identifying and challenging assumptions, and exploring and imagining alternatives" (Brookfield).	54.4%	44.1%	0.0%	1.5%	0.0%	68	1.48	.58
Critical thinking is a synonym for problem solving.	0.0%	16.4%	16.4%	53.7%	13.4%	67	3.64	.92
Critical thinking involves higher order thinking, problem solving, and metacognition.	42.6%	51.5%	1.5%	4.4%	0.0%	68	1.68	.72
Critical thinking is a behavioral, not a cognitive skill.	0.0%	1.5%	18.5%	56.9%	23.1%	65	4.01	.70
Critical thinking includes "reasonable, reflective thinking that is focused on deciding what to believe or do" (Ennis).	29.4%	54.4%	11.8%	2.9%	1.5%	68	1.93	.82
Critical thinking includes attitudes and values.	39.7%	54.4%	1.5%	4.4%	0.0%	68	1.70	.71
Critical thinking involves "a certain skepticism toward given statements, established norm or mode of doing things" (McPeck).	19.1%	66.2%	7.4%	5.9%	1.5%	68	2.04	.80

Notes.

SA - Strongly Agree
A - Agree
U - Uncertain
D –Disagree
SD – Strongly Disagree
N - Number of respondents
Std. Dev. – Standard Deviation

Appendix D

INSTRUCTIONAL METHODS – INDIVIDUAL RATINGS

Item	Do Not Use	Occasionally Use	Frequently Use	N
Small groups	3.0%	11.9%	85.1%	67
Case studies	9.0%	52.2%	38.8%	67
Lecture	22.4%	65.7%	11.9%	67
Logs/journals	13.6%	37.9%	48.5%	66
Guided inquiry	14.1%	39.1%	46.9%	64
Open-ended inquiry	6.3%	41.3%	52.4%	63
Debate/logic	24.2%	51.5%	24.2%	66
Think aloud interviews	63.5%	28.6%	7.9%	63
Critical incidents	7.5%	53.7%	38.8%	67
Drill and practice	87.9%	10.6%	1.5%	66
Simulation	13.6%	57.6%	28.8%	66
Demonstration	20.0%	61.5%	18.5%	65
Reflection	1.5%	21.2%	77.2%	66
Role play	25.8%	62.1%	12.1%	66
Discussion	0.0%	20.9%	79.1%	67
Brainstorming	12.1%	53.0%	34.8%	66
Games	29.2%	55.4%	15.4%	65
Programmed instruction	89.4%	9.1%	1.5%	66

Note.

N – Number of respondents

Appendix E

INSTRUCTIONAL METHODS:

RESPONSES TO OPEN-ENDED QUESTIONS

One section of the questionnaire asked respondents to indicate the extent to which they used the specified 18 instructional methods. In addition, respondents were invited to list other instructional methods they used for teaching critical thinking skills.

Nine respondents added the 13 instructional methods listed below.

Respondent	Response(s)
1	Autobiographies; Real world projects
2	Readings
3	Reading
4	Experiential learning
5	Issues; Participatory presentations; Structured interviews
6	Logs/journals
7	Instrumentation
8	Contracts; Assessments
9	Critique literature

Appendix F

EVALUATION METHODS – INDIVIDUAL RATINGS

Item	Do Not Use	Occasionally Use	Frequently Use	N
Essay tests	26.2%	29.2%	44.6%	65
In-class discussion	2.9%	16.2%	80.9%	68
Teacher-made tests	54.7%	21.9%	23.4%	64
Interviews with students	18.5%	50.8%	30.8%	65
Subjective observations	13.4%	43.3%	43.3%	67
Standardized tests	100.0%	0.0%	0.0%	61

Note.

N – Number of respondents

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Appendix G

EVALUATION METHODS:
RESPONSES TO OPEN-ENDED QUESTIONS

One section of the questionnaire asked respondents to indicate the extent to which they used the specified six evaluation methods. In addition, respondents were invited to list other evaluation methods they used for measuring gains in students' critical thinking.

Thirty-six respondents added the 56 evaluation methods listed below.

Respondent	Response(s)
1	Student reports; Field work
2	Papers/projects
3	Portfolio
4	Projects; Field experiences
5	Extended papers
6	Essays (different from essay tests)
7	Projects
8	Learning portfolios
9	Journaling
10	Journals; Written assignments (papers); Oral presentations
11	Video taping presentations; Journals
12	Reflective logs; Projects; Papers
13	Self-assessment; Peer feedback
14	Project reports

(table continues)

Respondent	Response(s)
15	Research papers/projects; Article critiques; Policy critiques
16	Essays that can't properly be called tests; Oral presentations by students
17	Peer (evaluation); Self (evaluation)
18	Class projects (individual); Class projects (teams)
19	Case incidents
20	Papers; Reaction papers; Small group presentations
21	Papers
22	Position papers; Literature review
23	Written papers
24	Portfolios
25	Self-assessment; Logs/journals
26	Written assignments
27	Portfolios/essays
28	Case study analysis
29	Portfolio evaluation; Learner profiles
30	Portfolio
31	Student presentations
32	Projects
33	Logs/reflective journals; Portfolios
34	Critical papers; Analysis of case studies
35	Writing exercises
36	Critique/reflection paper to accompany class project

Appendix H

ADULT EDUCATORS' PERCEPTIONS – INDIVIDUAL RATINGS

Item	SA	A	U	D	SD	N	Mean	Std. Dev.
One of the goals of adult education should be to develop students' critical thinking skills.	65.7%	34.3%	0.0%	0.0%	0.0%	67	1.34	.48
Most adult educators agree on a common definition of critical thinking.	0.0%	7.5%	25.4%	52.2%	14.9%	67	3.75	.80
The goal of critical thinking instruction should be to produce students who are better thinkers in real-world contexts.	31.3%	62.7%	6.0%	0.0%	0.0%	67	1.75	.56
There is considerable evidence that critical thinking skills can be taught in adult education classes.	10.4%	47.8%	31.3%	7.5%	3.0%	67	2.45	.89
Most adult educators have a clear idea of what critical thinking is.	0.0%	13.4%	20.9%	61.2%	4.5%	67	3.57	.78
Critical thinking skills can be facilitated but not taught.	6.1%	21.2%	18.2%	48.5%	6.1%	66	3.27	1.06
Critical thinking is best taught by direct, systematic instruction.	0.0%	9.0%	20.9%	47.8%	22.4%	67	3.84	.88
Critical thinking in adult education is rarely dealt with systematically.	4.5%	37.3%	32.8%	25.4%	0.0%	67	2.79	.88
Instruction in critical thinking should be based on some conceptual definition that is comprehensive and measurable.	0.0%	19.7%	28.8%	42.4%	9.1%	66	3.41	.91
Many students in adult education classes lack fundamental critical thinking skills.	11.9%	49.2%	10.4%	28.4%	0.0%	67	2.55	1.03

(table continues)

ADULT EDUCATORS' PERCEPTIONS – INDIVIDUAL RATINGS

Item	SA	A	U	D	SD	N	Mean	Std. Dev.
Most students learn to think critically without explicit instruction in how to do so.	0.0%	32.8%	16.4%	46.3%	4.5%	67	3.22	.97
Students generally perceive critical thinking as an important skill they can take into the "real world".	4.5%	59.1%	12.1%	21.2%	3.0%	66	2.59	.98
Critical thinking is a major objective in your curricula.	29.8%	49.2%	10.4%	10.4%	0.0%	67	2.01	.91
Most textbooks you use in your classes explicitly instruct students in ways to think critically.	0.0%	6.0%	7.5%	73.1%	13.4%	67	3.94	.67
Critical thinking is a major objective in your evaluation plans.	18.8%	56.2%	7.8%	15.6%	1.6%	64	2.25	.99
Growth in critical thinking skills can best be measured using standardized tests.	0.0%	0.0%	9.0%	34.3%	56.7%	67	4.48	.66
There is a high correlation between the number of adult education classes taken and students' ability to think critically.	0.0%	9.1%	45.4%	34.8%	10.6%	66	3.47	.81

Notes.

SA - Strongly Agree
A - Agree
U - Uncertain
D – Disagree
SD – Strongly Disagree
N – Number of respondents
Std. Dev. - Standard Deviation

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