

A content analysis of commercially prepared thinking skills programs
by Joan Viola Clary

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University
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Abstract:
The curriculum movement that focuses upon process thinking rather than product has given rise to a plethora of published thinking skills programs. These vary in focus, design, vocabulary, and application. Therefore, the purpose of this study was to conduct a content analysis of eight commercially published programs of the CoRT Program, Philosophy for Children, Odyssey, Building Thinking Skills, Methods of Inquiry: Learning to Learn, Thinking Skills: Making a Choice, Future Problem Solving, and Creative Problem Solving, totalling 1,656 thinking skills lessons, to determine (a) the presence and frequency of thinking skills lessons as determined and categorized by the Core Thinking Skills Framework subskills, (b) the viability of the Core Thinking Skills Framework as a comprehensive criterion of thinking skills to be used in planning thinking skills instruction within existing curriculum and examining other programs, and (c) the existence of a theoretical foundation of each of the published thinking skills programs.

The content analysis revealed seven of the eight programs did contain a high frequency of these thinking skills lessons. The Core Thinking Skills Framework, with its 21 subskills, appeared in six of the eight published programs and is a comprehensive taxonomy of thinking skills useful in curriculum planning of thinking skills instruction and in the analysis of other thinking skills programs. The research and background behind the development of each of the thinking skills programs contributed to a theoretical foundation of each program.

The thinking skills terms, variation of program design, and absence of an accepted knowledge base on thinking skills contributes to a dilemma for the teacher because of the diversity in theory and practice.

The inclusion in the curriculum of published thinking skills programs is not the only way to provide instruction in thinking skills. A teacher's knowledge of the Core Thinking Skills Framework is sufficient to develop effective, efficient thinking skills instruction. Published thinking skills programs and teacher initialed instruction both can meet the needs of students and should not be considered preferable over one another. Separate thinking skills programs instruction should be applied to curriculum subject areas so that students experience the pragmatic use of thinking skills in the curriculum.

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APPROVAL

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the college of Graduate Studies.

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Date May 1992

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ABSTRACT

The curriculum movement that focuses upon process thinking rather than product has given rise to a plethora of published thinking skills programs. These vary in focus, design, vocabulary, and application. Therefore, the purpose of this study was to conduct a content analysis of eight commercially published programs of the CoRT Program, Philosophy for Children, Odyssey, Building Thinking Skills, Methods of Inquiry: Learning to Learn, Thinking Skills: Making a Choice, Future Problem Solving, and Creative Problem Solving, totalling 1,656 thinking skills lessons, to determine (a) the presence and frequency of thinking skills lessons as determined and categorized by the Core Thinking Skills Framework subskills, (b) the viability of the Core Thinking Skills Framework as a comprehensive criterion of thinking skills to be used in planning thinking skills instruction within existing curriculum and examining other programs, and (c) the existence of a theoretical foundation of each of the published thinking skills programs.

The content analysis revealed seven of the eight programs did contain a high frequency of these thinking skills lessons. The Core Thinking Skills Framework, with its 21 subskills, appeared in six of the eight published programs and is a comprehensive taxonomy of thinking skills useful in curriculum planning of thinking skills instruction and in the analysis of other thinking skills programs. The research and background behind the development of each of the thinking skills programs contributed to a theoretical foundation of each program.

The thinking skills terms, variation of program design, and absence of an accepted knowledge base on thinking skills contributes to a dilemma for the teacher because of the diversity in theory and practice.

The inclusion in the curriculum of published thinking skills programs is not the only way to provide instruction in thinking skills. A teacher's knowledge of the Core Thinking Skills Framework is sufficient to develop effective, efficient thinking skills instruction. Published thinking skills programs and teacher initialed instruction both can meet the needs of students and should not be considered preferable over one another. Separate thinking skills programs instruction should be applied to curriculum subject areas so that students experience the pragmatic use of thinking skills in the curriculum.

CHAPTER 1

INTRODUCTION

Our changing world suggests new challenges for education to prepare our future citizenry for the expanding and demanding world of today and tomorrow. Factual information can no longer be taught in and for itself but must be a vehicle for igniting new ideas and choices. A critical curriculum area which schools and educational institutions should focus upon is the inclusion of thinking skills. Educational researchers and futurists are suggesting that there is a need to clarify the thinking skills area and that the components of a thinking skills curriculum should be regularly practiced in schools (Costa, 1989; Fergerson, 1980). A new concept of literacy is emerging, a literacy not only encompassing the traditional language arts but a literacy whose emphasis continues to be upon communication with the added ability to think more critically and creatively. Fergerson (1980) describes a paradigm shift from the old assumptions of education when describing the old assumption "of learning as a product, a destination, to learning as a process, a journey" (p. 289).

> What all literate citizens should know will no longer be a major concern. It is not possible to predict exactly the knowledge base required of productive citizens in the global/service-oriented/information age. It is also impossible to "cover" all the information in a human's lifetime. We can be sure, though, that all citizens will

> need to solve problems, to think creatively and to continue to learn. (Costa, 1989, p. vii)

The back-to-basics of the 21st century will require of students not only the "three Rs" of the past but also the ability to validate information while thinking critically and creatively.

> Rapid expansion of knowledge points to the importance of curriculums that empower students to locate and process knowledge rather than simply memorize facts. (Hughes, 1985, p. ix)

McTighe and Schollenberger (1985) conclude that the goal of teaching thinking skills should be:

> Particularly important for contemporary democracy as local, national, and international issues become increasingly complex . . . . The message is clear--educators need to take renewed action to bring about qualitative improvements in student thinking. (p. 5)

This new educational focus is also reflected in the popular press. Megatrends: Ten New Directions to Transform Our Lives (Naisbitt, 1982), itself a content analysis of a changing society; The Third Wave (Toffler, 1980), a prophetic view of society; and In Search of Excellence (Peters & Waterman, 1982), a description of contemporary businesses' needs, all point to a citizenry that must be equipped with the necessary skills not only to organize and manipulate information but to evaluate this information both critically and creatively.

Chance (1986) sums it up by writing, "There seems to be a growing realization among American educators that our society is in the midst of a profound cultural transformation, one that will provide a world in which high level thinking is a basic skill" (p. 2). Chance went on to describe, "[T]his transformation has given rise to an unprecedented interest in the teaching of thinking" (p. 2).

There are calls for all sections of the cultural arena to develop a more thinking society, a wiser consumer of information. Citizens of tomorrow will not be able to rely upon the competencies of yesterday to meet the challenges of the future.

In the mid-1980s, the Association for Supervision and Curriculum Development (ASCD), an international educational organizational leader, surveyed a sample of its members to determine the educational informational concerns the members requested. Eighty-two percent of the members who answered the survey indicated that the members wanted more information concerning instruction in thinking skills (Chance, 1986). Interest in the improvement of thinking skills also surfaced as the most important of 25 educational goals in the 1985 Gallup Poll on teachers' attitudes toward the public schools (Gallup, 1985).

Background of the Study

The evolution of this study itself became an additional need for this research. While attending classes at Montana State University the academic year 1983-84, professors in several classes stressed the need to include thinking skills within the curriculum. An ERIC search at that time revealed that it was almost impossible to locate pertinent literature because thinking skills had not been incorporated into the system as a descriptor.

The writer obtained a Regional Scholar Award granted by the Northwest Regional Educational Laboratory in Portland, Oregon, to pursue the development of the thinking skills area. The writer also attended the ASCD annual international conference entitled "Thinking

and Learning: A Bridge to the Possible" in San Francisco in 1986, to examine the existing published thinking skills programs. An examination of the displayed programs indicated to the writer the diversity of the thinking skills programs in instructional models, program designs, theoretical foundations, etc. Rather than selecting a specific program to pursue research, it became apparent that the greater contribution to the body of educational research would be to examine a sample of published programs to indicate the presence and patterns of thinking skills as categorized by "Core Thinking Skills Framework," (Marzano et al., 1988, p. 43) an existent criterion.

Statement of the Problem

The curriculum movement that focuses upon process thinking rather than product has given rise to a plethora of published thinking skills programs. These programs are developed upon different theoretical premises, philosophies, perceptions, and definitions of thinking. This has resulted in programs that vary in focus, design, vocabulary, and application. The teacher, the consumer, does not always have sufficient information about all of these programs to choose programs that best match his/her specific instructional needs.

The purpose of the study was:

1. To determine the relationship of the thinking skills as described in the Core Thinking Skills Framework and the thinking skills contained in eight published thinking skills programs.

2. To determine the presence and frequency of the thinking skills as categorized by the "Core Thinking Skills Framework" in the eight programs.

3. To determine the presence or absence of a theoretical foundation for each of the eight published thinking skills programs.

Research Questions to be Investigated

The major research questions asked in this study were:

1. Can thinking skills contained in each of the published programs as categorized by the Core Thinking Skills Framework be identified?

2. Will the use of the Core Thinking Skills Framework be specific enough and inclusive to register the thinking skills in each of the programs?

3. Do the thinking skills located within each program cluster around specific categories?

4. What theoretical foundation was each of the programs built upon?

Importance of This Study

The need for the content analysis of the sample of thinking skills programs is the aggregate of three areas of concern.

First, much attention and concern is being generated from the national surveys and assessments commissions.

> The recent and fairly sudden surge of interest in higher order thinking skills can be explained in part by the national concern over poor test results. A flurry of

> high-level government-sponsored reports has indicated that thinking in children has reached an abysmally low level. (Baron, 1987, p. x)

Organizations such as the Education Commission of the States reported, "The pattern is clear; the percentage of students achieving higher order skills is declining" (1982). The National Assessment of Educational Progress reported "Their (students') performance drops substantially when they are asked to infer, integrate and evaluate" (1983). The College Board (1983) and the Nation at Risk (1983) have reported deficiencies in higher level thinking as a major area of concern.

A second area of concern is the absence of substantial and systematic teaching of thinking skills in and through the curriculum. Beyer (1984) has attempted to identify why the teaching of thinking skills are not flourishing in classrooms:

> There are at least five major reasons why we educators have not put to better use the time that we devote to teaching thinking skills. First, we do not agree among ourselves which thinking skills we should teach. Second, too many educators and developers of instructional materials do not understand--or have not defined precisely--the skills that they have elected to teach. Third, despite their best intentions, most teachers never actually provide the kinds of instruction that research suggests are most productive in developing competent thinkers. Fourth, school curricula too frequently suffer from "skills overload"; they bombard students with one-shot exposures to literally dozens of skills at each grade level, apparently on the assumption that children can master these skills on first introduction. Finally, the achievement test currently in use in many schools may actually inhibit the teaching and learning of thinking skills; at the very least, they hinder the consistent evaluation of students' competence in these skills. (p. 486)

Third, the concerns of poor performance in higher level thinking skills coupled with absence of substantial instruction in these areas

prompts opponents to suggest that teachers need help to organize and unify the various thinking skills content inherent in published programs.

> What has been missing in current theory and practice is an organizing framework for teaching thinking a latticework to systematically examine themes common to the different approaches and relationships among them. An appropriate framework would allow practitioners in different subject areas and grade levels to develop a common knowledge base and a common language for teaching thinking. (Marzano et al., 1988, p. 3)

The diversity of available thinking skills programs, instead of offering teachers a gamut of curriculum choices, often restricts the teachers' choices.

> Currently, there is a great deal of interest in improving student thinking abilities, but there is also a great deal of confusion about what thinking is, the kinds of experiences or programs that advance it. (Presseisen, 1985, p. 43)

To indicate the extent of thinking skills programs available to teachers, ASCD published Developing Minds: A Resource Book for Teaching Thinking in 1985. This book describes thinking skills programs which are only a sample of all the programs in use.

> We are struck by the diversity of (thinking skills) strategies available to teachers. This raises the question of why strategies have not become an integral part of most teachers' practices. (Costa, Hanson, Silver & Strang, 1985, p. 181)

An outgrowth of the above areas of attention in the thinking skills arena is the need to provide educators with a common baseline or an organizing device--a framework. This kind of a unifying instrument would give practitioners in different subject areas and grade levels, "A common knowledge base and a common language for teaching thinking" (Marzano et al., 1988, p. 3).

In summary, (a) the existence of low test scores in thinking skills, (b) the need to provide more instruction in thinking skills, and (c) the need of information to help teachers in the planning of instruction in thinking skills provides the need for this investigation.

> Educators wanted a framework because they were hearing more and more about published programs designed specifically for teaching . . . . If schools were to integrate the teaching of thinking with regular academics instruction, they need to know what aspects of thinking to teach. (Knoll, 1988, p. viii)

General Procedures

Content analysis is a technique where media, print, and/or telecommunication is analyzed to identify specific characteristics. The content analysis in this study is an analysis of a selection of eight available thinking skills programs to: (a) identify the presence and patterns of thinking skills as described by the "Core Thinking Skills Framework," (b) determine whether the Core Thinking Skills Framework is a viable criterion to register a broad array of thinking skills, and (c) further analyze the theoretical foundations of each program.

Literature Search

The review of literature concentrated on current literature published during the 1980s related to the topics: the existence of thinking skills in the present school curriculum, thinking and learning, the problems teachers encounter when attempting to implement

thinking skills into the curriculum and the need to include thinking skills within the curriculum.

ERIC, Dissertation Abstracts, and an extensive bibliography from Developing Minds provided assistance in identifying and locating the critical information. Although a brief consideration of historical references was noted, the emphasis was given to current literature on thinking skills. A discussion of thinking skill areas, critical, and creative thinking is included. The research foundation of the Core Thinking Skills Framework is discussed. The premise for the selection of the published thinking skills programs is discussed. A brief examination of the research design content analysis is also included.

Design Steps

The population, that is, the written language to be analyzed (the text), is contained in the eight available thinking skills programs. These programs were selected and listed in the publication, Developing Minds (Costa, 1985). Using a predesignated list of programs frees the investigator from subjective selection.

Design Procedure

1. A request was sent to each of the publishing companies of the thinking skills programs cited in Developing Minds (Costa, 1985) to use the material on consignment. A sample copy of the request letter is included in Appendix A.

2. The lack of response prompted the investigator to purchase all available material (published material available to teachers and curriculum planners). Some of the programs cited in Developing Minds

were in the form of structured workshops by trainers and not available packages for examination. A criterion text needed to be located to perform the content analysis study on the thinking skills content within each of the published programs. The publication, Dimensions of Thinking: A Framework for Curriculum and Instruction, contained a "Core Thinking Skills Framework." Marzano et al. (1988) stated, "We refer to these more micro-level operations as core thinking skills. They are best described as basic cognitive operations used in metacognitive reflection and in the thinking process" (p. 4). The Core Thinking Skills Framework is contained in Chapter 2.

3. In order to obtain inter-rater reliability, two graduate students were presented a training program and then were given 10 thinking skills lessons to analyze and compare with the principal coder.

4. The reporting procedures are in the form of a narrative and a table indicating content analysis of each of the eight thinking skills programs, followed by a summary of the programs. A summary matrix of the Core Thinking Skills Framework with the percentage of relationship of each of the thinking skills programs is presented.

5. A summary report as to the theoretical foundation of each program is made.

6. Each of the research questions will be addressed in light of the findings of the content analysis.

Limitations of the Study

In the study, only the manifest content (see definition of terms) of the thinking skills program is examined. The researcher examined the most obvious, surface meaning of the thinking skills lessons; there was no attempt to judge the latent content in order to find more subtle meanings. Each of the thinking skills lessons is examined as to the "goodness of fit" to the criterion categories of the "Core Thinking Skills Framework." Many thinking skills lessons are not single-focus skills lessons but present several skills or embedded skills at one time. The thinking skill judged to be critical and the foundation of the lesson is categorized.

The Core Thinking Skills Framework is used as the criterion text (see definition of terms) or standard categories.

The Core Thinking Skills Framework contains eight general categories with 21 sub-thinking skills. Each skill is identified and discussed in Chapters 3 and 4.

The study was restricted to the analysis of the thinking skills programs available for hands-on review by the researcher. The eight thinking skills programs used in the study are described on three different levels in Chapters 3 and 4.

The study used only the thinking skills listed in the "Core Thinking Skills Framework." Each thinking skill lesson will be identified as either within the category or outside of the category, therefore, lessons devoted to other areas will not be treated.

The study makes no attempt to evaluate the quality of each program but rather is a survey of particular content. The study identifies the presence or absence of specific thinking skills. The study is descriptive in design and makes no attempt to measure its effectiveness when used with students.

Definition of Terms

The terms listed below will be used throughout the study and are defined as follows:

Categories: "Categories, the 'pigeonholes' into which content units are to be classified . . . should reflect the purpose of the research, be exhaustive, be mutually exclusive, independent, and be derived from a single classification principle" (Holsti, 1969, p. 95).

Coders: Coders were two trained graduate students who analyzed a sample of thinking skills programs.

Coding: Coding is the process whereby raw data are systematically transformed and aggregated into units which permit precise description of relevant content characteristics (Holsti, 1969, p. 94).

Cognition: "Cognition is related to the various thinking processes characteristic of human intelligence" (Costa et al., 1985, p. 312).

Content Analysis: "Content analysis is a research technique for the objective, systematic, and quantitative description of the manifest content of communication" (Berelson, 1971, p. 18). "Content analysis is a research technique for making replicable and valid inferences from data to their context" (Kruppendorff, 1980, p. 21).

Content Criterion: Content criterion is the standard text categories used to measure the presence or absence of thinking skills. "A standard with which an object is compared so as to establish what kind or how good" (Kruppendorff, 1980, p. 38).

Context Units: "Context units set limits to the contextual information that may enter the description of a recording unit" (Kruppendorff, 1980, p. 59). Context Units are the thinking skills lessons used to examine and categorize.

Core Thinking Skills: "Core thinking skills are cognitive operations used in thinking processes" (Marzano et al., 1988, p. 143).

Framework: "A framework is a general pool of constructs for understanding a domain, but is not tightly enough organized to constitute a predictive theory" (Anderson, 1983, p. 12).

Manifest Content: "Manifest content is the visible, surface content of a communication" (Babbie, 1983, p. 279).

Recording Units: "Recording units are separately described and can therefore be regarded as the separately analyzable parts of a sampling unit" (Kruppendorff, 1980, p. 58).

Sampling Units: "Sampling units are those parts of observed reality or the stream of source language expressions that are regarded independent of each other" (Kruppendorff, 1980, p. 57).

Thinking Skills: "Thinking skills is the mental manipulation of sensory input to formulate thoughts, reason about or judge" (Costa et al., 1985, p. 312). "Thinking is the operation skills with which intelligence acts upon experience" (debono, 1970, p. 703).

Thinking Skills Lessons: Thinking skills lesson is a set of experiences whereby, "There is the mental manipulation of sensory input to formulate thoughts, reason or judge" (Costa et al., 1985, p. 312).

Thinking Skills Program: Thinking skills program are any of the programs cited in the publication, Developing Minds.

Summary

Educators are seeking new ways to equip students with the thinking skills needed to process and manipulate the information deluge.

The background of the study describes the writer's personal refining of the study. The statement of the problem describes the dilemma that teachers find in selecting thinking skills programs to be used in the classroom. Research questions are presented, and the importance of the study is delineated under three general areas. The general procedures are described with the limitations of the study. The definitions of the terms in the study are presented.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

> Thought (thinking) is the basic ingredient in learning. It is also the basic energy in human history. Civilization is put together not by machines but by thought. Similarly, human uniqueness is represented not just by our ability to make objects but to sort them out and relate them . . . . The impotence of the brute alongside the power of the sage is represented by thought (thinking). (Cousins, 1986, p. 30)

Rodale's, The Synonym Finder, lists 172 synonyms for the verb "think" and 82 synonyms for the adjective "thinking" (1978, pp. 1129-1130). Who has not received the edict, "Think"? It is good advice, but if a person responded, "How?", one would have great difficulty imagining what a helpful answer would be. "Clearly, it is much more difficult to admonish people to think than to tell them how to do so" (Nickerson, Perkins, & Smith, 1985, p. 3).

It takes a great deal of instruction, coaching, and patience to become a skilled athlete. Like physical precision, thinking is hard work. "Unlike athletics, however, thinking is most often idiosyncratic and covert" (Costa, 1989, p. xi).

In discussing the current state of the teaching of thinking skills, Beyer (1984) stated, "The teaching of thinking skills is a lot like the weather, almost everybody talks about it, but few educators

seem to be able to do much to improve it" (p. 486). Perkins (1986) furthers this theme, as he writes, "The knowledge glut and knowledge obsolescence has in part inspired the current attention to the development of student thinking. Students need such skills to manage the flood of information in the modern world" (p. 4).

Educators as well as philosophers and psychologists all have claim to the concept of thinking. Each group has different purposes and approaches, but each helps one to be more concrete in one's thinking about attempts to foster a more purposeful thinking. Philosophers focus upon identifying methods such as comparison, classification, inference, and deduction that allows one to solve the abstract and practical problems of daily existence (Young, 1980, p. ix).

> Man's exploration of the nature of thought, like the rest of psychology, began life in the philosopher's armchair. The study of thought processes, however, took even longer than many other areas of psychology to pull loose from philosophy. It not only had to get up out of the armchair but out of the very head nestled therein. Because of the elusive, private, intensely personal nature of thought, on one hand, and because of its relation to "truth," "knowledge," and "judgment" on the other, the philosopher has been reluctant to part with this providence of the study of man. (Mandler & Mandler, 1964, p. 7)

Psychologists emphasize cognitive structures, metacognition, and suggest that a number of primary structures form the basis of intellectual activity (Young, 1980, p. ix).

Educators have focused on the objectives of formal education.

> Though necessarily attentive to cognitive and philosophical methods, those most concerned with curricula, teaching methods, and assessment of students have tried to define the goals of education in the realm of critical thinking and develop ways of achieving these goals. (Young, 1980, p. ix)

In discussing the integration of the present-day thinking skills content, Swartz (1990) notes, "It is perhaps unfortunate that the two camps (psychology and philosophy) have not met and mingled more. However, at the same time, there are benefits in the ways they contrast with and complement one another" (p. 7). Although there has been a renewed interest in the teaching of thinking skills, this is not new.

> The psychology of thinking and complex learning has held a regular, albeit modest, position in the mainstream of psychology ever since William James (1890) included a chapter on reasoning in his famous textbook. (Mayer, 1983, p. 8)

Dewey (1910) described the need to achieve balance between process and product (p. 217). Dewey also grappled with the formulation of a definition of thinking as he wrote: "No words are oftener on our lips than thinking and thought. So profuse and varied, indeed, is our use of these words that it is not easy to define just what we mean by them" (Dewey, 1910, p. 1). He further wrote, when describing the need to teach thinking skills:

> Since these habits (thinking skills) are not a gift of nature; since, moreover the casual circumstances of the natural and social environment are not enough to compel their acquisition, the main office of education is to supply conditions that make for their cultivation. The formation of these habits is the Training of Mind. (Dewey, 1910, p. 27)

Oswald (1964) noted another contributor to the expansion of a focus on thinking and cognitive activity in his essay, "The Modern Psychology of Thinking," when he noted:

> Probably the major turning point in the history of thinking came with the work of Otto Selz. Although Selz studied with some of the Wuzbury psychologists, his magna opesa were written . . . and published in 1913 and 1922 . . . . He deals with the problem of directed thinking but he is the first psychologist who is both willing and able to deal with the productive thinking. (Oswald, 1964, p. 215)

As the theory and practice of curriculum began to form, Taba (1962) (often characterized as the architect of theoretical curriculum development) also stressed the need to emphasize the "importance of critical thinking as a desirable ingredient in a democratic society" (p. 215).

The wide array of approaches to the teaching of thinking skills gives testimony to the fact that educators and researchers hold differing opinions as to what constitutes thinking skills and how best to incorporate them within the curriculum (Nickerson, 1984, p. 26). Nickerson, Perkins, and Smith (1985) identify the following features that contrast existing programs:

> Scope - Specific skills addressed - Ages and academic abilities of particular students - Amount and distribution of class time devoted to the program - Amount of special training given to teachers - Amount and type of program materials (instruction to teachers, students' exercises, or workbooks) - Latitude given to teachers - Completeness and availability of documentation - Degree of integration with other courses - Amount of emphasis on evaluation - Evaluation instruments used - Evidence of effectiveness. (Nickerson, Perkins, & Smith, 1985, p. 29)

In addition to the above distinguishing features, Nickerson, Perkins, and Smith further grouped the existing programs into:

> (1) Cognitive-process approaches, (2) heuristics-oriented approaches, (3) approaches that focus on the development of formal thinking in the Piagetan sense, (4) approaches that emphasize language and symbol manipulation, and (5) approaches that focus on thinking as subject matter. (Perkins & Smith, 1984, p. 26)

The added burden of describing thinking within the complex thinking processes such as critical thinking, creative thinking, problem solving, and decision making adds to the dilemma of teachers and curriculum planners. "Although there is no one glossary of thinking

terms that serves the many nuances of meaning association with cognitive operation" (Costa et al., 1985, p. 310), the following are definitions of the above terms taken from the glossary in Developing Minds: A Resource for Teaching Thinking; these provide a working framework for discussion.

> Creative Thinking: The act of being able to produce along new and original lines.
>
> Critical Thinking: Using basic thinking processes to analyze arguments and generate insight into particular meanings and interpretations; also known as directed thinking.
>
> Decision making: The process leading to the selection of one of several options after consideration of facts or ideas, possible alternatives, probable consequences, and personal values.
>
> Problem Solve: To define or describe a problem, determine the desired outcome, select possible solutions, choose strategies, test trial solutions, evaluate the outcome, and revise these steps where necessary. (Costa et al., 1985, pp. 309-311)

As Swartz and Perkins (1990) and others give another reason why the teaching of thinking is popular today, they note,

> Psychologists have turned somewhat away from animal experimentation and the technical nuances of isolated bits of human behavior and turned toward the kinds of complex contextual conduct that have significance in the real world. Learning, problem solving, writing, and other performances important in academic settings have been among their favorite concerns . . . . Philosophy, too has come out of the ivy to meet teachers and students in the corridors of school. (p. 7)

Swartz and Perkins (1990) and others aptly describe the dilemma to define different kinds of thinking skills as they write, "We suspect that there is no ideal taxonomy (of thinking skills) because the complex landscape of thinking can be partitioned in many different equally reasonable ways" (p. 36).

"In getting a sense of which important kinds of thinking are emphasized in a program and which are not, it may be helpful for practitioners to have a map of the domain of thinking which locates these various ingredients in relation to each other" (Swartz & Perkins, 1990, p. 108). "[These] are the categories of thinking that in fact are much used in everyday speech and in the current thinking skills movement" (Swartz & Perkins, 1990, p. 38). The general areas of the thinking domain scheme are creative thinking, critical thinking, decision making, problem solving, and retention and use of information (Swartz & Perkins, 1990, p. 109).

Furedy and Furedy (1985) noted, "Research into critical thinking is difficult, partly because there is no agreed-upon general definition of critical thinking" (p. 52).

In How We Think, Dewey (1910) described a reflective thought as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion which it tends" (p. 9).

Norris and Ennis (1990) include reflective thinking in this current definition, "Critical thinking is reasonable and reflective thinking that is focused upon deciding what to believe or do" (p. 3). The above definition contains critical words. First, "critical thinking" is defined as "reasonable thinking," that is not arbitrary thinking but relies upon the use of good standards. The term "reflective thinking" presupposes that one consciously seeks and uses good reasons. When thinking is focused, it generally is consciously directed. And lastly, the words "decisions about what to believe or

do" indicate that critical thinking evaluates statements (Norris & Ennis, 1990, p. 4). Proponents of critical thinking also suggest that one should possess certain attitudes that promote critical thinking. These abilities can be grouped into four general sets:

- Those involved in thinking clearly.
- Those involved in making and evaluating influences.
- Those needed to establish a sound basis for inference.
- Those involved in carrying out the critical thinking process in an orderly and effective way. (Norris & Ennis, 1990)

The word "creativity" (creative thinking skills) has been applied to accomplishments as minute as a youngster's art work to as grand as the work of Einstein. Psychologists studying creative thinking skills often contribute to the confusion because some define creative thinking skills by citing real-life accomplishments, while others rely on measuring a trait or set of traits central to creative thinking (Mansfield & Busse, 1981, p. ix).

Perkins (1986) sums up this confusion when he writes, "Creativity is a messy and myth-ridden subject. Many of our casual beliefs have prevented an adequate understanding of creative thinking and have thwarted efforts to nourish its development in schools, businesses, and homes" (p. 58). One myth is that creativity (creative thinking) is correlated to intelligence. Another myth is that creativity (creative thinking) implies "ideational fluency"--the ability to produce a large number of appropriate and unusual ideas efficiently (Perkins, 1986, p. 58).

As cited in Brown (1989), Guilford, whose address to the American Psychological Association is viewed as the foundation of contemporary research on creativity, hypothesized that at least eight abilities underlay creativity. He saw creativity as a result of the action of several more or less of the traits listed below.

1. Sensitivity to problems.
2. Fluency.
3. Novel ideas.
4. Flexibility.
5. & 6. Synthesizing and analyzing ability.
7. Complexity.
8. Evaluation. (Brown, 1989, p. 5)

More recently, Perkins (1985) places emphasis on output when he describes "Creative thinking is thinking patterned in a way that tends to lead to creative results" (p. 60).

As the diversity of definitions of creative thinking exist, authors also differ in describing components of creative thinking. Perkins (1985) categorizes six principles of creative thinking as follows:

1. Creative thinking involves aesthetic as much as practical standards.

2. Creative thinking depends on attention to purpose as much as to results.

3. Creative thinking depends on mobility more than fluency.

4. Creative thinking depends on working at the edge more than at the center of one's competence.

5. Creative thinking depends as much on being objective as on being subjective.

6. Creative thinking depends on intrinsic, more than extrinsic, motivation. (p. 59)

Marzano et al. (1988) presents yet another list of aspects of creative thinking that may be drawn from various theoretical bases as:

1. Creativity takes place in conjunction with intense desire and preparation.
2. Creativity involves working at the edge rather than the center of one's capacity.
3. Creativity requires an internal rather than external locus of evaluation.
4. Creativity involves reframing ideas.
5. Creativity can sometimes be facilitated by getting away from intensive engagement for awhile to permit free-flowing thought. (p. 27)

When studying schooling in general, there is a mixture of sentiment about the nurturing of creativity in that "Schooling generally presents knowledge as a given, rather than as the product of a creative effort to accomplish something. And schooling generally poses to students tasks that do not exercise or even allow creative effort" (Perkins, 1986, p. 61).

It becomes apparent that the breadth of this variation becomes a cause of frustration, rather than offering the teacher extensive opportunities for curriculum planning.

Literature citations expounding the need to infuse thinking skills into the curriculum extends from the commitment of professional educational associations to professional journals to government-sponsored reports on the state of education to the popular press.

The Association for Supervision and Curriculum Development (ASCD) has spearheaded information concerning the concept and the successful

implementation of thinking skills programs through their official organ Educational Leadership, 1986 National Conference, and regional workshops. ASCD also formed an Association Collaborative for Teaching Thinking representing 27 educational organizations. The members of this collaborative are listed in Appendix B.

ASCD also published three significant works, Developing Minds: A Resource Book for Teaching Thinking, Dimensions of Thinking: A Framework for Curriculum and Instruction, and Toward the Thinking Curriculum: Current Cognitive Research (1989 Yearbook of ASCD).

The expanded version of the ASCD 1984 resolution stated: "Further development and emphases are needed in teaching skills of problem solving, reasoning, conceptualization, and analysis, which are among the neglected basics needed in tomorrow's society" (ASCD, 1984).

Headlines appearing in the November 6, 1985, edition of Education Week read "Education Groups Join Forces To Improve Students' Thinking Skills." The news item detailed the formation of a "Collaborative on Thinking." This was in response to "decline in students' thinking skills." The list of leading academic societies and administrators' groups that form the Collaborative is contained in Appendix B.

The article stated that:

> Panels made up of representatives of cooperating organizations would be focusing on the following activities:
>
> - Refining the terms and definitions to describe thinking skills and processes so that they are more useful to curriculum planners;
>
> - Suggesting changes in preservice and inservice training for teachers so that they will be better able to develop thinking skills in their students;

- Asking publishers to design tests and textbook materials so that they contribute to the improvement of students' thinking skills;
- Promoting additional research about human thinking and the effectiveness of various instructional approaches and materials for development;
- Soliciting public support for teaching thinking by explaining the need for and value of such programs. (Olson, 1985, p. 4)

The cover article of a New York Times Education Supplement entitled "Teaching to Think: A New Emphasis" illustrates the widespread concern and growing educational response to the teaching of thinking skills. A Business Week article asked the question, "Are You Creative?: Research Shows Creativity Can Be Taught," and "Companies Are Listening" ("Are You Creative", 1985, p. 1).

As the diversity in published thinking skills programs continues to surface, writers and curriculum planners are now discovering that in order to assist teachers to better understand and select specific programs, there is a need to analyze and collect data in a format that could help teachers make more informed instructional decisions. Under the heading "V. Recommendations for Those Who Select or Construct Curricular Materials" (thinking skills program), a report of the Task Force on Thinking by the New Jersey Basic Skills Council cautions:

> It is very difficult to evaluate the effectiveness of individual instructional programs in thinking . . . . It is virtually impossible to compare the effectiveness of different programs . . . and many school districts have committed themselves to assessing and teaching long lists of thinking skills--with very little clarity on how each of those skills relates to the others, to an overall concept of the thinking process. (Department of Higher Education, 1986, pp. 34-35)

Although there are over 30 different thinking skills, programs, and instructional strategies, these programs are useful and show great strides to draw attention to foster thinking instruction--the number of options can be confusing (Marzano et al., 1988, p. 3). Rather than "polarizing debates," Quellmalz (1987) calls for a "focus instead on identifying a manageable framework of common (thinking) skills that clearly generalize across academic and practical areas" (p. 86).

Although literature points to the diversity of approaches and programs, the need for a unifying model, Young (1980), Presseisen (1985), and Costa (1989) reinforce the need to unify the thinking skill information into a manageable unit for effective and efficient instructional decision making.

The content used for examination in this study was taken from two publications of ASCD. The criterion categories selected to use as the measuring device were the thinking skills listed in the publication entitled Dimensions of Thinking: A Framework for Curriculum and Instruction called Core Thinking Skills Framework. The Core Thinking Skills Framework lists 8 general categories with 21 subskills as listed in Chapter 3 with an explanation. The 21 subskills were used as the text categories to identify and group the skills present published in the eight Thinking Skills Programs.

Attendance in 1986 of the ASCD National Convention entitled "Thinking and Learning: Bridge to the Possible" was made to identify a thinking skill program to work with for research. The writer noted the extent and variety of programs purporting to teaching all aspects of thinking. The material ranged from single booklets to extensive

programs. It was then that the writer sensed a need for some helping device for teachers. In order to narrow the examination of specific thinking skills programs, only the programs cited another ASCD publication, Developing Minds: A Resource Book for Teaching Thinking were used.

In addition to a content analysis of the cited programs, the investigator further examined each program as to the theoretical foundations of each program as suggested by Presseisen (1987, p. 71).

Summary

Chapter 2, The Review of the Literature, cites the contributions of philosophy and psychology to the present day thinking skills movement. The chapter also cites various proponents of discussion of thinking skills. A discussion of the general areas of thinking skills followed. The recent emphasis on the thinking skills movement is presented.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

Many authors, such as Costa (1989), Marzano et al. (1988), and Olson (1985), are requesting a shift in focus in American education to meet the challenges of the 21st century; this shift is from a focus upon the accumulation of knowledge to a focus upon the cognitive process of knowing. The current literature highlights the need to incorporate within the curriculum instructional opportunities that will provide experience whereby students have the possibility to develop various thinking skills, coupled with the need to provide assistance to teachers to meet these needs by identifying materials that provide such instruction.

The purpose of this study was to analyze eight published thinking skills programs to identify the presence and frequency of thinking skills as listed in the Core Thinking Skills Framework. The theoretical foundations of each program was described. The information acquired from this content analysis was collected and unified into a summary matrix in order to give to teachers a concise document highlighting the "thinking skills" strands contained in each program. This led to an explanation of the theoretical foundation behind the development of

each program and the content and design of the programs. The final summary matrix is a descriptive device to relate program content.

Procedures

This study utilized a descriptive research design. Specifically, content analysis was used to analyze and evaluate the thinking skills purported to be contained in established published programs. The Core Thinking Skills Framework was used as a criterion to identify specific thinking skills contained in each program.

Research Methodology and Descriptive Research

Descriptive research has been described as observation with insight. The researcher essentially does two things:

> S/he observes with close scrutiny the population which is bounded by research parameters; [and] second, s/he makes a careful record of what s/he observes so that when the aggregate record is made, the researcher can then return to the record to study the observations that have been "described" there. (Leedy, 1980, p. 133)

One method used in descriptive research is content analysis. "Content analysis is a formal system for doing something that we all do informally rather frequently, drawing conclusions from observations of content" (Stempel, 1981, p. 119). Analysis of content as a research technique "is a multipurpose research method developed specifically for investigating any problem in which the content of communication serves as the basis of inference" (Holsti, 1969, p. 2). "The problem of inference lies at the heart of all systematic inquiry, including that conducted by means of content analysis" (Holsti, 1969, p. 109).

The research schema of content analysis is flexible and involves several constructs. "Truly, communication is at the heart of civilization" (Kuhn, 1963, p. 151). The study of communication content has been analyzed from a variety of perspectives over the years. "As a research technique, content analysis involves specialized procedures for processing scientific data. Like all research techniques, its purpose is to provide knowledge, new insights, a representation of 'facts'" (Kruppendorff, 1980, p. 21). Budd, Thorp, and Donahew (1967) note that "the numerous uses of content analysis, and the wide range of materials amenable to these techniques and uses makes content analysis a tool which could be useful to almost everyone interested in communication research" (p. 11).

A review of technical literature indicates that the definition of content analysis "has largely grown as a result of the uses to which it has been put, and these have changed considerably over the years" (Carney, 1972, p. 22). An early and often-cited definition is Berelson's (1952): "Content analysis is a research technique for the objective, systematic, and quantitative description of the manifest content of communication" (p. 488). "There is a group which accepts the distinction between 'quantitative' and 'qualitative,' but which insists that systematic documentary studies of the latter type constitute an important, and perhaps more significant, form of content analysis" (Holsti, 1969, p. 6). Another long-standing definition of "content analysis is any technique for making inferences by objectivity and systematically identifying specified characteristics of messages" (Stone & Kirsch, 1966, p. 14); this indicates that inference is the

major purpose of content analysis. Thus, a suitable definition, derived from both definitions might be that content analysis is a technique for the description of a text that is objective, systematic, and quantitative and which can permit valid and reliable inferences from the analysis of the data. While content analysis may be flexible and adaptable to a variety of research needs, it is still a relatively precise, demanding research technique.

The steps or processes involved in the content analysis technique can vary according to the interest and design of the researcher and the complexity of the investigation. Bowers (1970) has described nine basic steps for conducting a content analysis:

> In general, content analysis consists of the following steps: (1) formulating general hypotheses; (2) selecting the sample of message to be analyzed; (3) selecting categories and units; (4) if necessary, selecting a control or normative sample of messages to be analyzed; (6) reformulating general hypotheses in terms of categories and units; (7) selecting the criterion for accepting or rejecting hypotheses; (8) tabulating; (9) applying the criterion. These steps do not necessarily occur in this order. (p. 293)

Similarly, Budd, Thorp, and Donahew (1967) describe content analysis studies as usually involving six stages:

> First, the investigator formulates the research question, theory, and hypotheses. Second, he selects a sample and defines categories. Third, he reads (or listens to or watches) and codes the content according to objective rules. Fourth, he may scale items or in some other way arrive at scores. Next if other factors are included in the study, he compares these scores with measurements of the other variables. And finally, he interprets the findings according to appropriate concepts or theories. (pp. 12-15)

Thus, the procedures for content analysis are designed for two ends. First, this method seeks to obtain answers posed by the research questions. Second, it does so in an objective, systematic, and precise

manner. In this study, the content of eight published thinking skills programs was analyzed using the categories listed in the Core Thinking Skills Framework.

Method of Selecting Sampling Units

The sample of thinking skills programs used in this study were the available programs presented in the ASCD publication, Developing Minds. This source listed eight programs. These were (a) CoRT, (b) Philosophy for Children, (c) Future Problem Solving, (d) Thinking Skills: Making a Choice, (e) Creative Problem Solving, (f) Odyssey, (g) Learning to Learn, and (h) Building Thinking Skills. A letter was sent to each publisher on two different occasions stating the nature of the study and requesting the use of the materials on consignment. Since only two companies responded, all of the companies cited in Developing Minds were contacted, and all of the programs available to teachers and curriculum planners were purchased. Thus, the sampling units for this analysis consisted of the eight programs which included a total of 1,637 thinking skills lessons. A brief description of each thinking skills program is presented here. Additional detailed program information is located in Chapter 4 and in Appendix C.

The CoRT Program, developed by Edward debono, M.D., consists of a series of six sets of student work cards or workbooks containing 60 teacher-directed, thinking skills lessons. The intended audience is "ages 8 to 22, all ability levels" (deBono, 1985, p. 204).

The Philosophy for Children Program, which was developed by Matthew Lipman, consists of a set of four children's novels with an

extensively prepared teacher's manual. It uses "structured discussion plans, exercises, and games" (Lipman, 1985, p. 213). One thousand fifty-five thinking skills lessons were examined. Each teacher's guide contained a teacher-directed lesson for every five sentences of the children's novel. For example, the children's novel, Suki, was 150 pages long. There were 185 teacher-directed lessons. Each lesson contained activities to be used with 20-25 sentences of the novel.

The Future Problem Solving Program consists of a set of teacher training/resource guide books. The guide book entitled "The Activity Book," which contains 87 thinking skills lessons, was examined. The intended audience for this program is "regular program grades 4-12, Primary division K-3" (Crabbe, 1985, p. 218).

The Thinking Skills: Making a Choice Program, which was developed by Charles E. Wales, Anne H. Nardi, and Robert A. Stager, consists of one teacher/student resource workbook containing eight thinking skills lessons. The intended audience for this program is "upper elementary through college and adult learners" (Nardi & Wales, 1985, p. 221).

The Creative Problem Solving: The Basic Course, which was developed by Sidney J. Parnes and based on the works of Alex E. Osborn, consists of a teacher/student resource/workbook containing 48 thinking skills lessons. The intended audience for this program is "middle [especially for the gifted] and secondary levels [all]" (Parnes, 1985, p. 231).

The Odyssey: A Curriculum for Thinking, which was developed by Bolt Beraneh, Harvard University research team, and Newman Inc., consists of a series of books containing 86 thinking skills lessons.

The intended audience for this program is "middle level students" (Wright, 1985, p. 224).

The Learning to Learn Program, which was developed by Marcia Heiman and Joshua Solmianko, consists of one teacher/student resource/workbook containing 28 thinking skills lessons. The intended audience for this program is "junior and senior high school students" (Heiman & Solmianko, 1985, p. 228).

The Building Thinking Skills Program, which was developed by Howard and Blach, consists of a series of student workbooks with an accompanying teacher's manual. Four workbooks were examined; they contained 265 thinking skills lessons. "The program fosters analysis skills at the elementary and secondary levels" (Baker, 1985, p. 236).

Method of Establishing the Core Thinking Skills Framework Categories

The categories identified to group the materials in the thinking skills lessons were chosen from Dimensions of Thinking: A Framework for Curriculum and Instruction (Marzano et al., 1988). This publication presents a Core Thinking Skills Framework--a register of 21 thinking skills areas or categories. In describing the rationale for the inclusion of skills within the "Framework," the authors state:

> We have tried to draw from many scholarly works to identify the "dimensions" that appear to be threads running through both research and theory-perspectives that can be used to analyze various approaches to teaching thinking and to provide directives for planning curriculum and instructions. (Marzano et al., 1988, p. 3)
>
> They [Core Thinking Skills Framework] are best described as basic cognitive operations used in metacognitive reflection and in the thinking process . . . . We chose them because

> they reflect the various domains of thinking as they are understood in terms of current research. (p. 4)
>
> The thinking skills are used on the criterion as follows: Each [skill] is documented in various strands of psychological research or in philosophy as important to learning or thinking. Each [skill] appears to be teachable, as established through research studies, field testing, or widespread use in the classroom. Each [skill] is valued by educators as important for students to learn. Using these criteria, we have identified 21 thinking skills grouped into 8 categories. (p. 69)

The authors stress that the skills included within the Core Thinking Skills Framework are not to be considered inviolate. "It is an effort to highlight skills that appear to be in the repertoire of the learner" (Marzano et al., 1988, p. 70).

The categories or criterion text of the Core Thinking Skills Framework were used in this study for two purposes. First, they served as an existing criterion to analyze and categorize the thinking skills lessons within each of the published programs. Second, they were used to determine whether the Core Thinking Skills Framework was specific enough to register the thinking skills within thinking skills programs.

The Core Thinking Skills Framework consists of 8 general areas and of 21 subskills. A brief description of each category is presented in Table 1.

The Core Thinking Skills Framework describes the various ways that information can be acted upon intellectually. Information can be selected, gathered, stored, recalled, arranged, clarified, connected, combined, assessed, and used to generate new ideas. The Core Thinking Skills Framework "are those essential to the functioning of other dimensions. They may be used in the service of metacognition, the

Table 1. Core Thinking Skills Framework.

A. Focusing Skills - Attending to selected pieces of information and ignoring others.

1. Defining Problems: Clarifying needs, discrepancies, or puzzling situations.

2. Setting Goals: Establishing direction and purpose.

B. Information Gathering Skills - Bringing to consciousness the relevant data needed for cognitive processing.

3. Observing: Obtaining information through one or more sense.

4. Formulating Questions: Seeking new information through inquiry.

C. Remembering Skills - Storing and retrieving information.

5. Encoding: Storing information in long-term information.

6. Recalling: Retrieving information from long-term memory.

D. Organizing Skills - Arranging information so it can be used more effectively.

7. Comparing: Noting similarities and differences between or among entities.

8. Classifying: Grouping and labeling entities on the basis of their attributes.

9. Ordering: Sequencing entities according to a given criterion.

10. Representing: Changing the form but not the substance of information.

Table 1. (Continued).

E. Analyzing Skills - Clarifying existing information by examining parts and relationships.

11. Identifying Attributes and Components: Determining characteristics or parts of something.

12. Identifying Relationships and Patterns: Recognizing ways elements are related.

13. Identifying Main Ideas: Identifying the central element; for example, the hierarchy of key ideas in a message or line of reasoning.

14. Identifying Errors: Recognizing logical fallacies and other mistakes and, where possible, correcting them.

F. Generating Skills - Producing new information, meaning, or ideas.

15. Inferring: Going beyond available information to identify what reasonably may be true.

16. Predicting: Anticipating next events or the outcome of a situation.

17. Elaborating: Explaining by adding details, examples, or other relevant information.

G. Integrating Skills - Connecting and combining information.

18. Summarizing: Combining information efficiently into a cohesive statement.

19. Restructuring: Changing existing knowledge structures to incorporate new information.

H. Evaluating Skills - Assessing the reasonableness and quality of ideas.

20. Establishing Criteria: Setting standards for making judgments.

21. Verifying: Confirming the accuracy of claims.

cognitive processes, or critical and creative thinking" (Marzano et al., 1988, p. 68).

The eight general discussions of the Core Thinking Skills Framework are built around the intellectual control and/or the manipulation of information. The thinking skill called Focusing Skills is defined as "attending to selected pieces of information and ignoring others" (Marzano et al., 1988, p. 147). Collecting and gathering information can be related to the thinking skill called Information Gathering Skills, which is defined as "bringing to consciousness the relevant data needed for cognitive processing" (Marzano et al., 1988, p. 147). Storing and recalling information can be related to the thinking skill called Remembering Skills, which is defined as "storing and retrieving information" (Marzano et al., 1988, p. 147).

Another manipulation of information is the "arranging information so it can be used more effectively" (Marzano et al., 1988, p. 147), which is the Organizing Skills thinking skill. The Analyzing Skills describes the "clarifying existing information by examining parts and relationship" (Marzano et al., 1988, p. 147), another management for information.

Information can be used to produce new information. The thinking skill which addresses this management of information is labelled Generating Skills, which is defined as "producing new information, meaning, or ideas" (Marzano et al., 1988, p. 148). "Connecting and combining information" (Marzano, 1988, p. 148) describes Integrating Skills and indicates another management of information. The last manipulation of information as described by the Core Thinking Skills

Framework is entitled Evaluating Skills. Within this thinking skill is the skill of "assessing the reasonableness and quality of ideas" (Marzano, 1988, p. 148).

Units of Analysis

"The first task of any empirical research is to decide what is to be observed, recorded, and thereafter considered a datum. Unitizing involves defining these units, separating them along their boundaries, and identifying them for subsequent analysis" (Kruppendorff, 1980, p. 57). The units of analysis to be used in this study were thinking skills lessons. This study was limited to the analysis of the instructional material, and it was not within the purview to designate other learning outcomes but only the presence of thinking skills as categorized by the Core Thinking Skills Framework.

Each of the eight programs had a different configuration. Therefore, that which constituted a thinking skills lesson was located under different labels. Each, consisting of a set of experiences whereby there is the mental manipulation of sensory input, was analyzed throughout that program. Each thinking skills lesson was read and then compared to each of the 21 sub-thinking skills to indicate whether there was a match or not. Each was then categorized and tallied on a tally sheet. The tally sheet was then summarized to indicate the presence, absence, or patterns of thinking skills lessons.

Each of the programs was examined to locate that area of the program devoted to thinking skills lessons. Other areas of the programs given to discussion, examples, or suggestions for the transfer

of the skill to another area of the curriculum were not analyzed. Each program was treated separately, indicating individual content analysis presentation. In order to show the relationship of these individual analyses, a summary matrix indicating the thinking skills patterns of all eight programs was constructed.

Another dimension of content analysis was to analyze each program to identify the theoretical foundation of each program. Presseisen (1987, p. 71) suggests that the theoretical underpinnings will effect a program's inclusion of thinking skills, teaching methods and implementation requirements; therefore, it is important for the teacher to know the learning theory upon which a program was built.

Method of Collecting the Data

Each of the eight thinking skills programs was examined to identify frequency of thinking skills as described by the Core Thinking Skills Framework. Each program was broken down into lessons. Each lesson was read to identify the lesson's main thinking skill. Although certain lessons occasionally had more than one skill embedded in the lesson, only the main thinking skill was tabulated.

Presentation of Data

Each of the thinking skills programs were reported separately. Interrated results were also reported.

> After it is known what the data mean or what they indicate, there is the need

- to summarize the data, to represent them so that they can be better comprehended, interpreted, or related to some decision the user wishes to make

- to discover patterns and relationships within data that the "naked eye" would not easily discern. (Kruppendorff, 1980, p. 909)

The analysis of each of the programs, the relationship to the Core Thinking Skills Framework, the theoretical foundation, and answers to research questions were described. The results from the analysis of each program was presented. The theoretical foundation of each program and the answers to each research questions are reported.

CHAPTER 4

ANALYSIS OF PROGRAM CHARACTERISTICS

Introduction

There is a growing concern for the greater incorporation of thinking skills within the curriculum. While the eight programs examined in this study address many of the situations, the sample used in this investigation is by no means exhaustive of the published thinking skills programs. However, those identified in Developing Minds: A Resource Book for Teaching Thinking (Costa, 1985) were used.

In order to present a commonality in the analysis of these programs, two criterion were followed: (a) only the text designated as student activities or lessons containing thinking skills lessons was examined because some programs contained information not part of the thinking skills lesson itself, and (b) only the major thinking skills lesson was recorded because of the unevenness of some thinking skills lessons, resulting in some lessons being very skill-focused while other lessons contained several embedded skills.

Reliability Data

Interrater reliability was used to establish the accuracy and dependability of the investigator in the categorizing of the thinking

skills programs. For this procedure, two graduate students from Gonzaga University were chosen. The graduate students were similar in the following characteristics: (a) both completed their bachelor's degree and returned to Gonzaga to obtain their teacher certificates, (b) both had been exposed to the incorporation of thinking skills within the curriculum through the course EDTE 452, Methods in Social Studies, (c) both had performed superior work in several of the investigator's classes, and (d) both were presently teaching school. The graduate students were dissimilar in the following ways: Graduate Student #1 could be considered a traditional student, age-wise. Upon the completion of the bachelor's degree, this student continued to pursue certification and a master's degree. Graduate Student #2, considered a non-traditional student, returned to school after raising a family. Graduate Student #2 is teaching in elementary school, while Graduate Student #1 is teaching in high school. Student #1 is teaching in a parochial school, and Student #2 is teaching in a public school. Both students have had the same professional development, yet each brought different experience to the activity. Both students expressed an interest in the investigator's study and viewed the interrater reliability experience as an opportunity to enrich their professional development.

During the training session, the scope of the investigation was explained, the Core Thinking Skills Framework was explained, and several lessons not included in the interrater reliability procedure were selected as a demonstration and practice exercise. Lessons 1-5 of the CoRT program and Lessons 1-5 of the Building Thinking Skills

(Primary) were used to measure the interrater reliability. Each of the graduate students categorized these 10 lessons into the general eight thinking skills areas. The actual ratings of the graduate students and the investigator are shown in Table 2.

Table 2. Interrater Reliability Results.

	CoRT					Building Skills				
Thinking Skills Lessons	1	2	3	4	5	1	2	3	4	5
G.S. #1	4	2	7	6	1	5	4	2	2	4
G.S. #2	4	2	8	6	1	4	6	2	2	5
Investigator	4	2	-	6	1	4	-	2	2	4

Overall, the ratings of the graduate students and that of the investigator were similar. The ratings of Graduate Student #1 and the investigator were identical for 70% of the lessons. In two of the lessons, there was a difference of categories because the investigator felt that the lesson did not contain any thinking skill to fit into the eight categories. The categories which were selected were different in only one lesson in Building Thinking Skills. The exact same pattern existed for the ratings of Graduate Student #2 and the investigator. Thus, the investigator's ratings were consistent with those of the Graduate Students analyzing the lessons. The ratings of the Graduate Students with each other are the same in six of the lessons; they only

differed by one in three of the lessons and by two in one lesson. Thus, the ratings between the Graduate Students and those between each of the Graduate Students and the investigator were comparable.

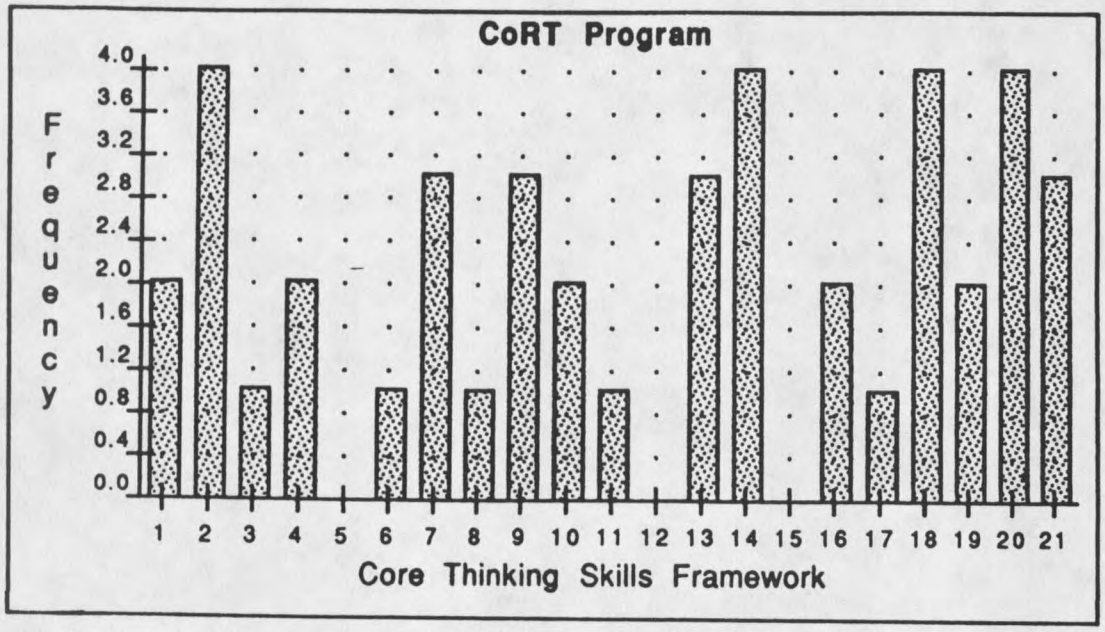
Content Analysis

Each of the thinking skills programs was individually analyzed for the presence of the 21 thinking skills of the Core Thinking Skills Framework included it.

The CoRT Program

The CoRT program consists of six books with accompanying workcards. The six books are entitled, CoRT-1: Breath, CoRT-2: Organization, CoRT-3: Interaction, CoRT-4: Creativity, CoRT-5: Information and Feelings, and CoRT-6: Action. Each book contains 10 lessons. It is suggested that 35 minutes be spent on each lesson. Of the 60 lessons examined, there were 44 lessons that could be categorized by the Core Thinking Skills Framework. Sixteen lessons did not fall within the criterion categories. For example, CoRT-5 Information and Feelings registered only five lessons identified by the Core Thinking Skills Framework. Lesson 4 of CoRT-5 deals with big guessing as opposed to little guessing. While this exercise can be helpful to students, this lesson is not identified by the Core Thinking Skills Framework. Lesson 8 of CoRT-5 deals with emotions, and Lesson 9 of CoRT-5 contains a lesson about high valuing and low valuing. These are examples of lessons that were not categorized by the Core Thinking Skills Framework.

The 44 thinking skills are distributed across the categories (see Figure 1), with the exception of three categories: encoding, identifying relationships, and inferring, in which there were no thinking skills lessons. The thinking skills lessons with the highest occurrence within the program with four thinking skills lessons in each were the subskills of setting goals, identifying errors, summarizing and establishing criteria.



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 1. CoRT Program.

Next in order of frequency was the thinking subskills of comparing, ordering, identifying, main ideas, and verifying, which categorized three lessons each in the program. The remainder of the thinking subskills occurred in one or two of the lessons within the program.

The material is very teacher-supportive. It suggests that the skills included in the program be transferred to different areas of the curriculum, but there are no suggestions on how to make this transfer. "[The program] allows it to be incorporated into the curriculum in any way that best suits the teacher" (Maxwell, 1991, p. 2). The lesson format allows for "at least two practice items so that the students understand the transferability of the thinking tool to different situations" (Maxwell, 1991, p. 2). This is an example of a stand-alone thinking skills program that does not use content-specific situations to teach the thinking skills. The guide states that teachers should always remember to "focus the lessons on the thinking process rather than on the content of any discussion" (Maxwell, 1991, p. 3).

While the program contains 60 35-minute lessons, this would average one add-on 35-minute lesson per week. Unless the teacher consciously incorporated the skill of the week within the curriculum, there might not be sufficient acquisition of the thinking skill.

The effectiveness of the CoRT program rests upon the teacher. The teacher has to be aware of the breadth of the program across so many skills and numbers of lessons to accomplish the acquisition of these skills. The CoRT program needs a strong teacher-support system.

The program guide describes the program's theoretical foundation as follows:

> [Dr. deBono's] background is in medicine, where he did research into the integrated systems in the human body. (He) describes how the brain works as a neural network that allows experience to self-organize into patterns of perception. . . . The mind tends to see only what it is prepared to see . . . . The program is designed to teach students a set of thinking tools that allows them to consciously break away from established patterns of thought, to see things more broadly and clearly, and to develop a more creative approach to problem solving . . . . Students become lateral thinkers. (Maxwell, 1991, p. 1)

The above quotation presents the theoretical foundation upon which the program is developed. The program focuses upon thinking as a skill in itself. The thinking situations in the program are referred to as "lateral thinking" and are defined as thinking "around" a problem, used to generate new ideas (compared with vertical thinking) (Costa & Presseisen, 1985, p. 311). Students are required to respond to the lesson situations with "lateral skills, unlike vertical thinking, is not necessarily sequential, is unpredictable, and is not constrained by convention" (deBono, 1985, p. 204).

Although this program is described as a stand-alone program, to ensure its effectiveness, the teacher has to supply several additions. First, the teacher will have to supply additional lessons to provide experiences for individual differences in learning rate. Second, the teacher will have to provide opportunities to transfer the program thinking skills to areas of the curriculum in order to ensure the concept of utility and not novelty.

Although the CoRT Program is well designed and provides a theoretical foundation, the teacher should not assume that the purchase

of a commercially prepared thinking skills program will be the answer to the incorporation of a complete thinking skills program within a curriculum.

Philosophy for Children

The Philosophy for Children program was prepared for primary, elementary, middle, and secondary school. There are alternative materials for certain levels, so only one book from each level was examined. These four books, which contained a section called "Leading Ideas," included 1,055 lessons.

The program is a series of children's novels. The novels take their names from the main character; thus, the novels examined were Suki, Elfie, Harry Slottlemeier's Discovery, and Kio and Gus. For example, a student is given the novel Suki. The text of each page of all novels are numbered every five lines. It is recommended that short segments of the novel be read as the basis of discussion, as suggested by the teacher's manual. The teacher's manual was examined to indicate the thinking skills addressed in each lesson.

The format for each lesson in each manual was not always consistent. The section entitled "Leading Ideas" was a consistent entry. This section was examined to categorize the lessons. The subtitle for "Suki" is "Writing: How and Why." The focus in this book is on literature, writing, and poetry. Many of the lessons are on areas of communication and other subject areas and not directly related to thinking skills.

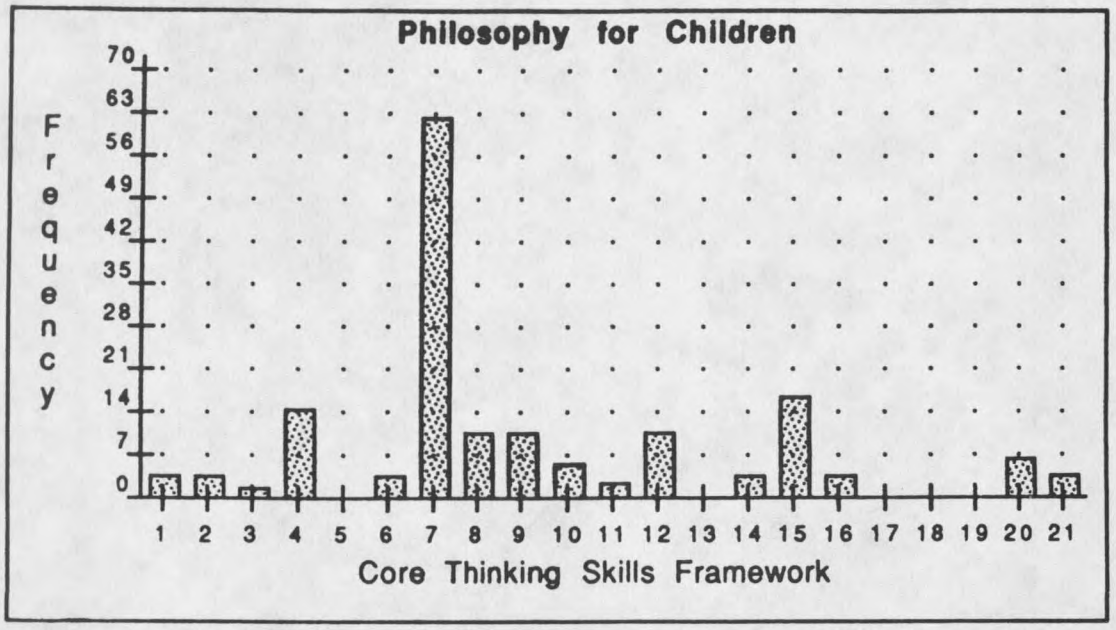
> Philosophy is the discipline that prepares students to think in the disciplines . . . . Thus logic, for example,

> illuminates and brings into focus the logical aspects of language arts, mathematics, science, physical education, social studies, etc. . . . In other words, every discipline can be viewed from a logical, ethical, epistemological aesthetic and metaphysical standpoint. (Lipman & Gazzard, 1988, p. v)

Thus, given 1,055 lessons called "Leading Ideas," there were 154 lessons categorized by the Core Thinking Skills Framework, while 901 lessons were not. The 154 thinking skills were distributed among 16 of the 21 categories (see Figure 2) with the highest number of thinking skills lessons using the subskill of comparing in 62 lessons. Sixteen of the lessons were devoted to inferring, and 14 lessons were on the formulating questions. The remaining 62 lessons had 1-3 lessons on the remaining categories of thinking skills.

The Philosophy for Children contain a variety of activities. For example, on page 34 the exercise suggested is to make a möbius strip, write a sentence that will come back on itself; or the exercise suggests the making of a chain poem. The suggestions in the teacher's manual are diverse and could be used to add to a teacher's repertoire of creative instructional experiences.

As the title indicates, the theoretical foundation of the program is built upon philosophy. Philosophy is defined in the Webster's New World-Compact School and Office Dictionary as "1. the study of the principles underlying conduct, thought and the nature of the universe; 2. the general principles or laws of a field of knowledge; 3. a particular system of ethics" (Neufeldt & Sparks, 1989, p. 322). To illustrate the breadth of the program, the teacher's manual for the children's novel "Mark" presents an exercise chart that indicates the



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 2. Philosophy for Children.

following categories: philosophical discussion plan, social application, problem situations for analysis, thinking skills exercise, knowledge acquisitions, and reasoning about generalization. Thinking skills is only one of the six general areas covered in one of the children's novels (Lipman, 1985, p. xiii). The content covered with each children's novel in keeping with the theoretical foundation focuses upon not only thinking skills but several other areas defined by philosophy. This is why a higher frequency of thinking skills was not categorized.

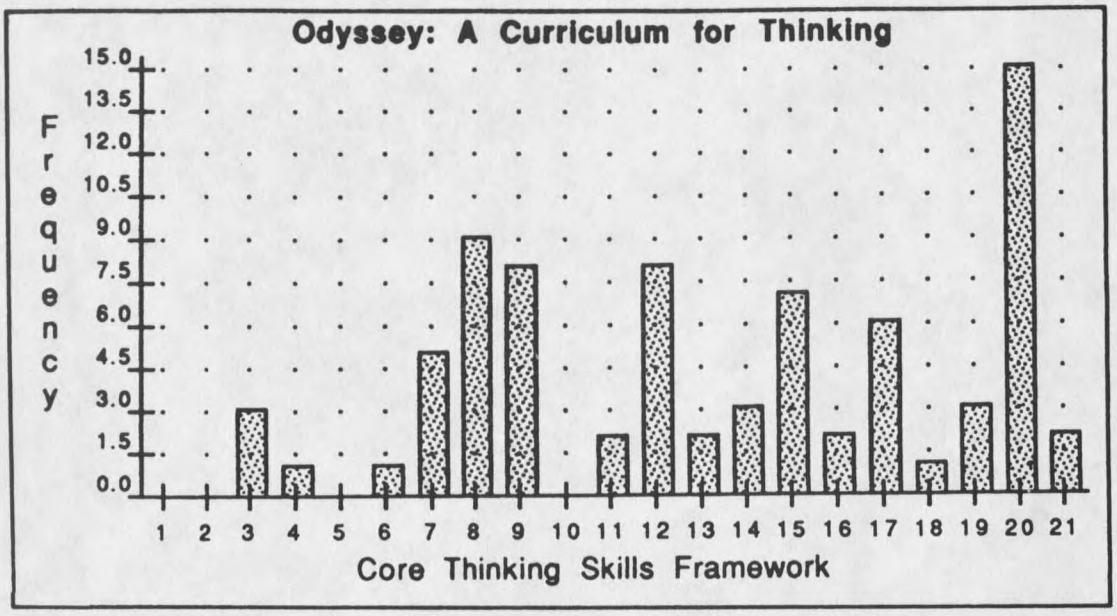
Teachers using Philosophy for Children should realize that the program contains lessons focusing on areas of ethics, epistemology, aesthetics, and metaphysics, in addition to the cognitive skills listed in the Core Thinking Skills Framework. The teacher's manual contains such extensive activities and discussion questions that the teacher has to be selective and choose wisely the number of activities to constitute a well balanced instructional lesson. However, if a teacher planned to incorporate the Core Thinking Skills Framework within the curriculum, the Philosophy for Children would not supply sufficient thinking skills lessons to include all the categories cited in the Core Thinking Skills Framework.

Odyssey: A Curriculum for Thinking

Odyssey is a compilation of student books with accompanying teacher's manuals. There is a discrepancy as to the total number of books in the series. One publication lists five books in the program, while another publication lists six books. The whole program received for analysis in the study contained five books.

Each book in the program is focused upon a different cognitive process. The titles of the books in the series are: Foundation of Reasoning, Decision Making, Understanding Language, Inventive Thinking, and Problem Solving.

In the program, there were 85 thinking skills lessons, and 78 of the thinking skills lessons were classified by the categories. The thinking skills lessons showed 17 of the 21 categories (see Figure 3). The categories with the highest frequency of lessons were the subskill



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 3. Odyssey: A Curriculum for Thinking.

of establishing criteria with 15 lessons, classifying with 9 lessons, and ordering and identifying relationships and patterns with 9 lessons each. The remaining categories were distributed over the remaining lessons. The program did not have any lessons on defining problems, setting goals, encoding, and representing.

The focus of each book in the program brings the specific thinking skills together in groups. The Odyssey program book "Understanding Language" used language as the content for thinking skills. For example, Lesson 1 entitled "Synonyms and Orderable Dimensions" has

for one of its target behaviors: "To order words describing a single semantic dimension in terms of intensity" (Adams, Buscaglia, de Sanchez, & Swets, 1986, p. v).

The program has 85 thinking skills lessons, each lesson has 6-10 pages of exercises in the student workbook for additional application of the thinking skill. Each thinking skill lesson is organized under four headings: lesson rationale, objectives of the lessons, target behaviors, and classroom procedure. The presentation of the lessons is scripted for the teachers in the teacher's manual. The program does not draw from the content area of the curriculum but focuses on the process of thinking itself.

Odyssey would be considered an add-on program because, as it is designed, it would not be part of any specific curriculum area. The structure of each lesson might assist a teacher in delivering a thinking skills lesson however, it will depend upon the teacher to make a transfer from the program to a specific content area.

There are no suggestions as to the length of time to be spent upon a single lesson or how much material to be presented in a segment of time. Odyssey is a package of sequenced lessons within each book ready to be used at the teacher's discretion. The multiple pages in the student's workbook could provide ample opportunity to learn each skill. "Odyssey is built on the premise that the quality of intellectual performance can be affected by four factors: (1) abilities, (2) strategies, (3) knowledge, and (4) attitudes" (Adams et al., 1986, p. v). Odyssey differs from other programs in the focus upon

attitudes, the affective aspect of learning. The program lists the following as examples of such attitudes:

> A strong belief in the importance of learning and in the usefulness and intrinsic value of knowledge.
>
> A lively sense of curiosity and inquisitiveness.
>
> An interest in trying to figure out why things are the way they are.
>
> A proper regard for one's own intellectual potential, and also for one's own fallibility.
>
> A respect for opinions that differ from one's own.
>
> A sense of pride in one's work and an appreciation of the importance of careful listening, reading, and writing.
>
> A feeling of accomplishment and competence. (Adams et al., 1986, p. vi)

Although there are scripted lines for the teacher in the teacher's manual, the role of the teacher is cast as a facilitator and not as a direct instructor. The teacher sets the environment for the students to work in their workbooks. The program does not purport to teach the curriculum but is a program wherein the main focus "is to enhance the ability of students to perform a wide variety of intellectually demanding tasks" (Adams et al., 1986, p. v).

The program is an add-on program. Time would have to be made to add it to the class schedule. The teacher would have to develop additional exercises to provide a transfer of the thinking skills to a curriculum area. If the teacher is using the Core Thinking Skills Framework as a criterion for teaching thinking skills, it must be noted that Odyssey contained no lessons on the subskills of defining problems, setting goals, encoding, and representing.

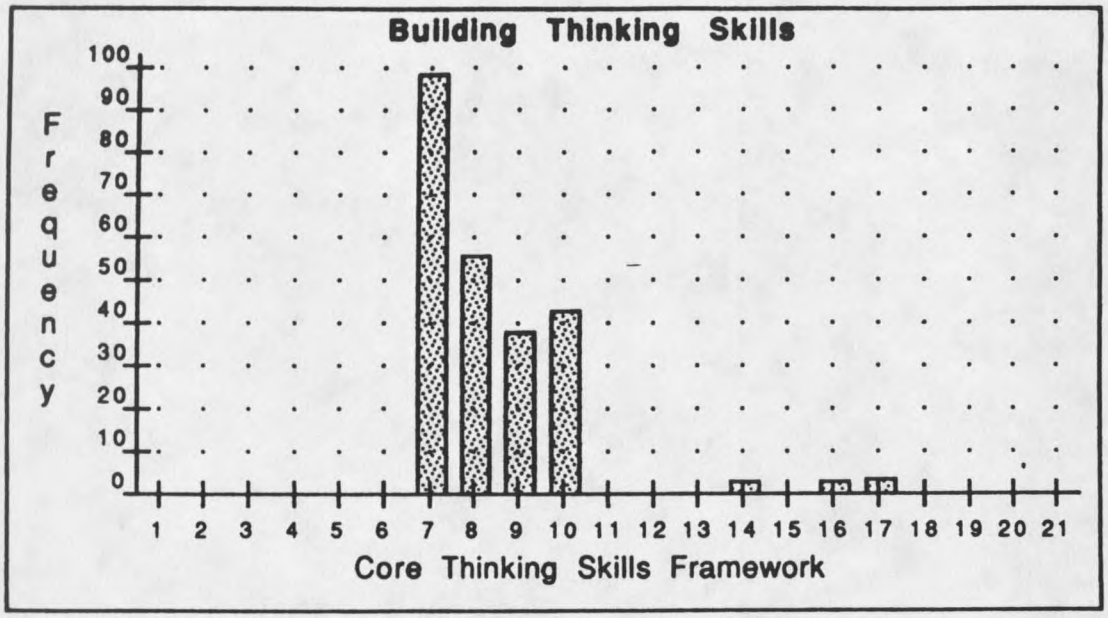
Building Thinking Skills

Building Thinking Skills is a series of four paperback student workbooks with accompanying teacher manual. The teacher's manual for each of the workbooks was examined. The workbooks contained 265 thinking skills lessons. Of these lessons, 239 were categories identified by the Core Thinking Skills Framework (see Figure 4). In the Primary Building Thinking Skills book, the skill areas listed for each lesson are cognitive skills, creative skills, and affective skills. Selected lessons have a greater focus upon the affective rather than the cognitive skills. Primary Thinking Skills books have 10 lessons under the category "Feelers--Affective Awareness." Twenty-six lessons were not categorized by the Core Thinking Skills Framework.

The thinking skills lessons clustered around four subskill categories with 98 lessons on comparing, 55 lessons on classifying, 42 lessons on representing, and 37 lessons on ordering. The categories of identify errors and of predicting each had two lessons while the category of elaborating identified three lessons.

The lessons contained a script for the teacher to follow. There are three or four practice pages in the student workbook for each lesson. The section titled "Extending Activities" suggests alternative resources to extend the skills of each thinking skills lesson.

Curriculum applications in each lesson offers suggestions to transfer the skill to language arts, mathematics, science, social studies, and enrichment areas. Building Thinking Skills can be



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 4. Building Thinking Skills.

considered an add-on program because all of the thinking skills lessons can be performed outside a regular curriculum area. Yet, the Curriculum Application section of the teacher's manual provides the opportunity to incorporate the skill in a specific curriculum area.

For example, Building Thinking Skills Book 1 lesson strand is "figural similarities." The Curriculum Application section suggests examples to apply the thinking skill of the lesson to specific curriculum areas as follows:

> Language Arts: visual discrimination exercises for reading readiness; discrimination among punctuation marks.
>
> Mathematics: distinguishing geometrically different shapes.
>
> Science: sorting leaf, shell, or insect collections by shape.
>
> Social Studies: distinguishing among land forms according to size and shape.
>
> Enrichment Areas: distinguishing among purposes of road signs by shape. (Black & Black, 1986, p. 32)

The Building Thinking Skills program provides an example of a program that clusters its lessons around selected thinking skills as in this program around the categories of comparing, classifying, representing, and ordering. Speaking to the cognitive model upon which the Building Thinking Skills Program is built states:

> Many activities in the series have their origin in the cognitive development model delineated by Jean Piaget. A basic tenet of Piaget's cognitive model is that learning is an interactive process. Piaget maintained that the goal of education should be to provide settings and opportunities for the learner to become actively involved in the learning process. (Hill & Edwards, 1987, p. iv)

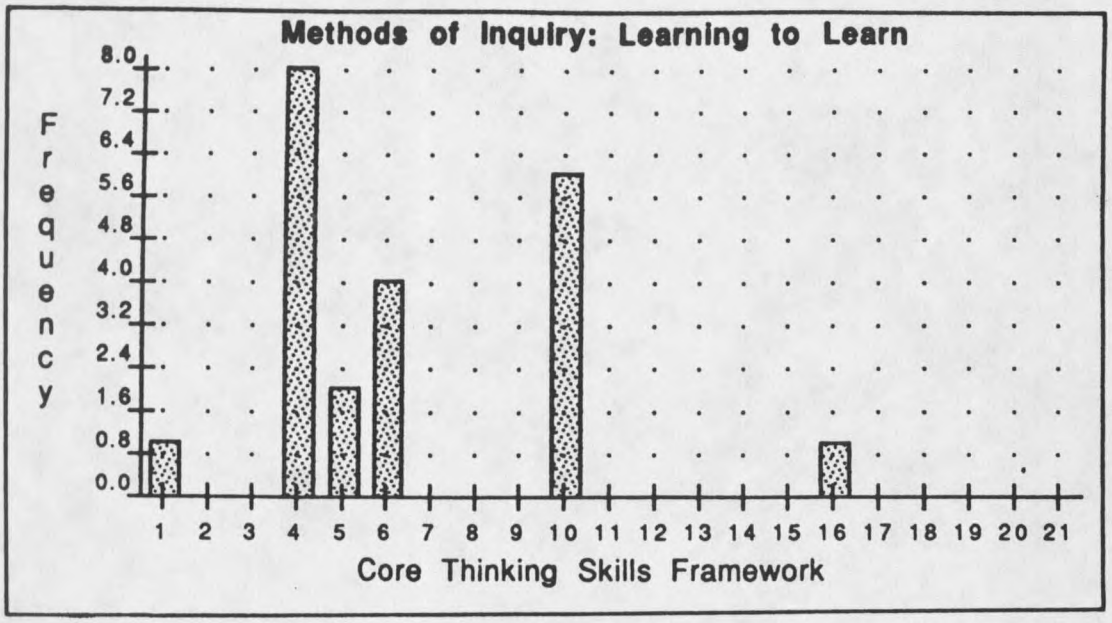
Although the program consists of a teacher's manual and student workbooks of work sheets, most of the lesson plans suggest concrete, manipulative materials to be used with the worksheet to provide that interaction described by Piaget. At first examination of the program, it would appear that the program is a paper-pencil workbook program. However, as one examines the accompanying teacher's manual, it becomes apparent that the program contains suggestions of material and discussion that the program does conform to Piaget's cognitive model of a learner's interaction with learning.

A teacher using this program to develop these thinking skills has ample exercises with suggestions to incorporate these skills within the curriculum. However, a teacher using the criterion Core Thinking Skills Framework for lesson planning would have to develop lessons to provide learning opportunities for the remaining 14 thinking skills not used in the program.

Methods of Inquiry: Learning to Learn

Methods of Inquiry is a single paperback workbook/textbook that is used by both teacher and student. There are 48 thinking skills lessons in the program. Of the 48 thinking skills lessons, 22 of the lessons were categorized by the Core Thinking Skills Framework. The 22 lessons cluster around three categories entitled formulating questions, representing, and recalling, and has 1-2 lessons in defining problems, encoding, and inferring (see Figure 5).

Fifteen of the thinking skills lessons were not identified by the Core Thinking Skills Framework. Methods of Inquiry workbook purports to assist the high school/college student with study skills. It is informal in nature with cartoons and testimonials from former users of the system. The program is an add-on type of program or could be used in a study skills course. The workbook presents strategies for thinking skills and study skills but relies on the student to transfer these strategies to specific curriculum areas. For example, Chapter 3, "Reading Techniques," page 32, presents Reading



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 5. Methods of Inquiry: Learning to Learn.

Methods Across the Curriculum--a chart contained with the following information:

RT = Reading Textbooks
RSUM = Writing summary reading questions
RWOH = Reading books without headings
RP = Reading graphs and diagrams
REX = Reading for examples
PS = Reading to solve problems
VARS = Writing variations of models problems presented in text
IM = Informal mapping. (Heiman & Solmianko, 1988 p. 32)

This is followed by a chart listing subjects and where the above reading skills would be used. The student is expected to take this information and transfer it to the subject areas. The "Learning to Learn" Thinking Improvement System is based on the critical learning strategies of successful students. The author states that these students typically use the following learning tools. They:

1. Ask questions of new material presented in lectures and books--thinking about which questions the material answers, and which it does not;

2. Break up large tasks and complex ideas into smaller;

3. Test themselves informally, to see how much they're learning;

4. Direct their study to their instructor's objectives. (Heiman & Solmianko, 1988, p. xii)

The exercises of the workbook do not formally teach thinking skills in such areas as literature, math, and/or biological sciences, however, the workbook denotes exercises in how to use the thinking skills strategies in specific curriculum areas. The use of thinking skills are treated as learning to learn strategies. The strategies used through the workbook are grouped into three areas which are:

Input: Generating questions (from lecture notes and books).

Organization: Arranging what you've learned into Information Maps and breaking your homework assignments into a series of small tasks.

Output: Testing yourself, using the questions you generate and the information you organized. Creating products, papers, and exams. (Heiman & Solmianko, 1988, p. xii)

The workbook is informal in nature and follows no particular format. It can be used as a class text for a group or as a study guide

for individuals. If the teacher is using the Core Thinking Skills Framework as a criterion for the incorporation into the curriculum, lessons will have to be developed for the 15 skill lessons not included in the program.

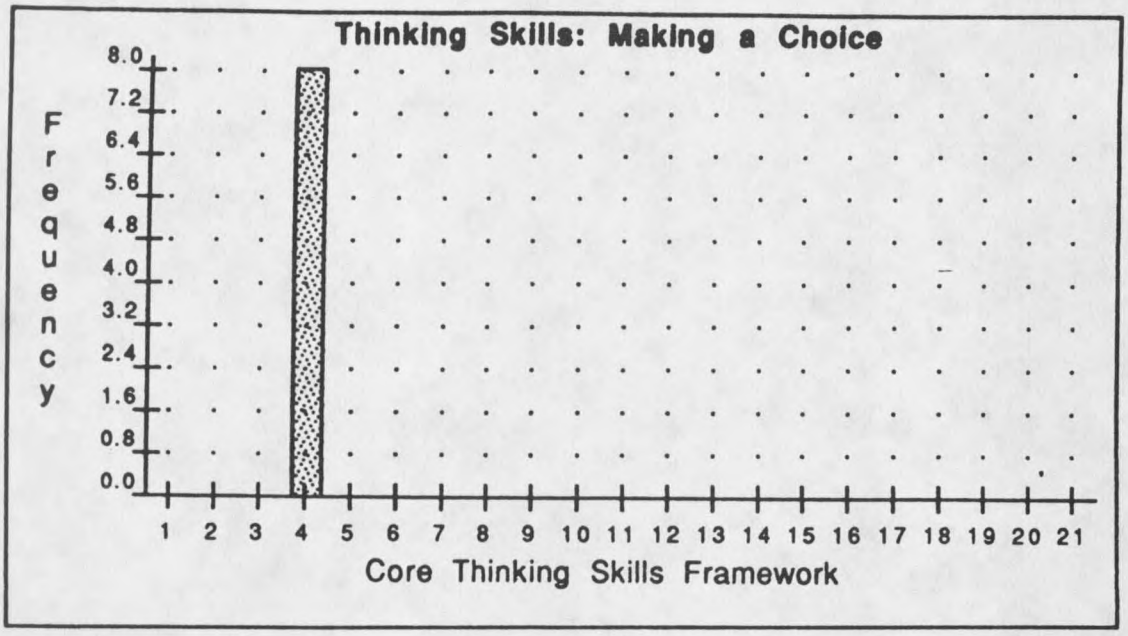
As a study skill resource, the teacher may find this program effective. As a thinking skills program, there is not sufficient breadth and depth of thinking skills lessons.

Thinking Skills: Making a Choice

Thinking Skills: Making a Choice is a single paperback workbook/ teacher guide. The cover of the workbook presents decision making as the center of a puzzle with all the pieces that contribute to decision making placed around the center.

The eight thinking skills lessons identified within the program are not single-skill focused but contain several embedded skills within each lesson. In order to use the same criterion and categories of analysis, the initial skill of the set of decision making steps was used. The first focus for each lesson was "Defining the Situation" through a series of questions. Thus, the thinking skill category "Formulating Questions" was used to categorize the skill (see Figure 6). The other 20 categories of the Core Thinking Skills Framework were not used.

The content of the program presents realistic situations that the students are expected to work through with the suggested steps of decision making. Although the first section of the book presents "man" as an unnatural decision maker, there are no suggestions to transfer



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 6. Thinking Skills: Making a Choice.

decision making strategies to other aspects of personal or academic life.

The program is built upon the premise that students will benefit in decision making situations and is an example of a heuristic five-step approach to the teaching of thinking skills. The program is a narrow focus using the Core Thinking Skills Framework as a criterion. The introduction of the workbook develops in detail the need for decision making strategies in all aspects of society but does not

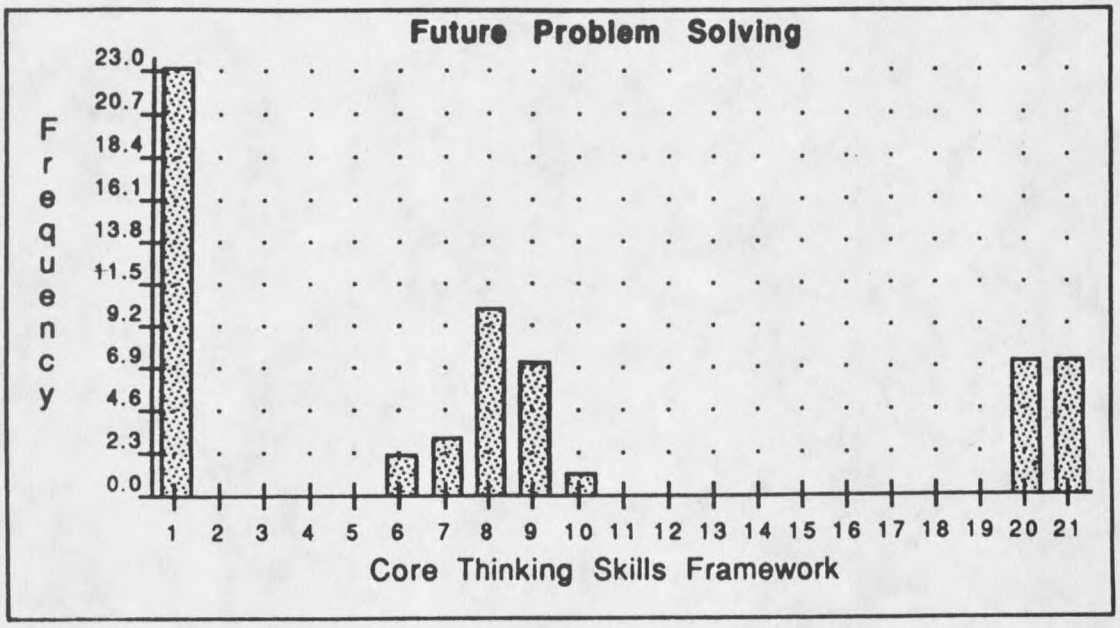
develop a foundation upon how the program selected the thinking skills to use in the program.

The program is a stand-alone program. The program might be used in a Social Studies area and construct historical situations or future situations and have the students apply the steps of decision. Since this program is listed under thinking skills programs, teachers should not use this program and assume that all aspects of thinking skills are covered. The program contains lessons on decision making. When the teacher is aware of a program's focus, he/she can better implement that area of thinking skills.

Future Problem Solving

The Future Problem Solving program is a teacher-initiated program. There are no student specific materials. Problems are published yearly to be used as the content for student practice of problem solving skills. The bulk of the materials published in the program are teacher training and resource materials.

The book chosen for analysis was the text "The Activity Book" because it contained 87 thinking skills activities. Of these skills, 60 of the thinking skills lessons were categorized by the Core Thinking Skills Framework with a cluster of 23 thinking skills on observing and 10 thinking skills lessons on classifying (see Figure 7). The program presents a specific set of steps for future problem solving. The lessons in "The Activity Book" provide practice on some of the steps involved in the Future Problem Solving process.



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 7. Future Problem Solving.

The program is built on the work of Alex Osborn and Sidney Parnes.

> In the 1950s Osborn wrote [applied imagination] about the importance of imagination and creativity in solving problems . . . . The power of Osborn's ideas was recognized early by Sidney J. Parnes, who extended those basic concepts into a systematic approach to creative problem solving which could be used effectively in training and instruction. (Isaksen & Treffinger, 1985, p. 7)

In 1975, E. Paul Torrance developed a creative problem solving model. "His primary motives were to encourage youngsters to think creatively and to help them develop richer images of the future"

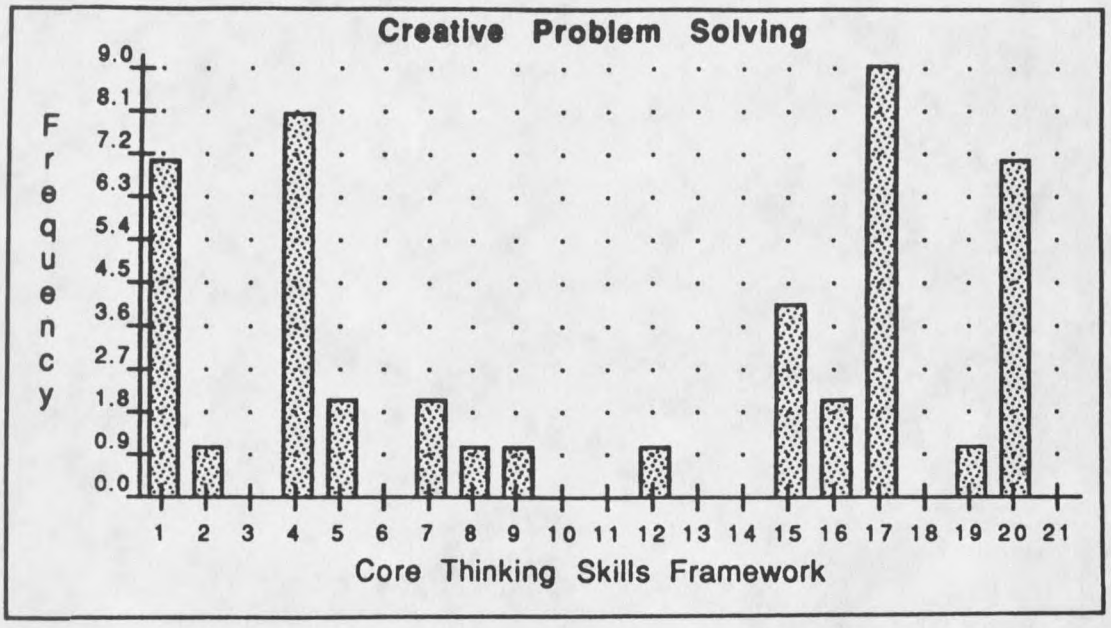
(Crabbe, 1985, p. 218). Teams of students participate in practice problem sessions. There are several levels of competition within the program.

The Future Problem Solving program requires teacher training for the implementation of the program. This program is not readily available to classroom teachers because the program is established as a school-wide program involving gifted students from schools throughout a district.

Creative Problem Solving

The Creative Problem Solving program is one paperback teacher/student resource workbook. The resource book contains 48 thinking skills lessons. Forty-six of the thinking skills lessons were categorized among 13 of the subskills of the Core Thinking Skills Framework (see Figure 8). The subskills that had the highest frequency were elaborating with nine lessons, formulating questions with eight lessons, and establishing criteria with seven lessons. The remaining lessons were categorized among eight subskills. Eight of the categories described by the Core Thinking Skills Framework are not present in the Creative Problem Solving program.

Each of the chapters begins with a discussion of some specific aspect of creative problem solving. It is generally following by some open-ended exercise. The activities or lessons are generally creative, yet there are very few opportunities to apply the strategies to one's personal or academic life. For example, one lesson, DDF-2,



1 - Defining Problems
2 - Setting Goals
3 - Observing
4 - Formulating Questions
5 - Encoding
6 - Recalling
7 - Comparing
8 - Classifying
9 - Ordering
10 - Representing
11 - Identifying Attributes and Components
12 - Identifying Relationships and Patterns
13 - Identifying Main Ideas
14 - Identifying Errors
15 - Inferring
16 - Predicting
17 - Elaborating
18 - Summarizing
19 - Restructuring
20 - Establishing Criteria
21 - Verifying

Figure 8. Creative Problem Solving.

pages 48 and 49, is to observe a peanut and to list your observations. Then a list of words is supplied to trigger new and unusual observations (Isaksen & Treffinger, 1985).

The content in the workbook exercises is creative and unusual. The instruction and exercises are whimsical in nature and are designated to be nonthreatening to students of all levels. The teacher is expected to develop instruction to bridge the theory of Creative Problem Solving to specific areas of the curriculum. The program

has the same original developers as the Future Problem Solving program--Dr. Alex F. Osborn and Dr. Sidney J. Parnes.

"In the 1970s there was also an increasing focus on the affective and interpersonal aspects of creativity--dimensions often overlooked in theories emphasizing the cognitive, rational and semantic origins of creativity" (Isaksen & Treffinger, 1985, p. 8). This focused people's thinking about the dimensions of creative thinking.

The teacher/student workbook can be used individually. The teacher, however, could use some of the activities with a group. Teachers could profit from doing or using the Creative Problem Solving program. However, the appearance of thinking skills lessons is not sufficient enough to constitute a broad thinking skills program.

Assessment of Core Thinking Skills Framework

Each of the eight thinking skills programs contained some of the subskills of the Core Thinking Skills Framework, but none of the programs contained all of the 21 subskills. Because of the specificity of each program, each focuses upon a certain set of thinking skills. While the Core Thinking Skills Framework suggested 21 subskills for thinking skills, these programs contained lessons dealing with other content; these were only noted and counted, and no attempt was made to make a judgment about the "other" lessons. Each of the 21 subskills are recognizable; each is definable and can be identified if they are in each lesson. "Thinking skills are relatively specific, cognitive operations that can be considered the building blocks of thinking" (Marzano et al., 1988, p. 147).

Each of the Core Thinking Skills Framework categories were identified in two or more of the published programs (see Table 3). The categories that had the lowest occurrences were the subskills of identifying main ideas and of summarizing. The categories that had a high frequency of occurrence within the six programs were the subskills of defining problems and of predicting. Formulating questions, recalling, comparing, classifying, ordering, and establishing criteria occurred in five programs. The remaining categories appeared in three or four programs. Even though the subskills of identifying the main idea and of summarizing indicated low occurrence, these two subskills may be embedded skills and were not the first focus skill of a lesson. Therefore, even though they were not found in this analysis, they should not be deleted from the Framework.

Table 3 presents a summary matrix of the distribution of the Core Thinking Skills Framework among the eight published programs. Table 4 presents the percentage of Core Thinking Skills within each program.

Research Question #1

Can thinking skills contained in each of the programs as categorized by the Core Thinking Skills Framework be identified?

Using the eight programs in the study as the content of analysis, the Core Thinking Skills Framework, as a criterion, served to categorize the thinking skills lessons of each of the eight programs. Although there was diversity among each of the eight programs, the Core Thinking Skills Framework contains sufficient thinking subskills to be used as a criterion when examining the thinking skills program. The

Table 3. Distribution of the Core Thinking Skills among the Eight Published Programs.

Subskills	CoRT	Philosophy for Children	Odyssey-Curriculum for Thinking	Building Thinking Skills	Methods of Inquiry Learning to Learn	Thinking Skills Making a Choice	Future Problem Solving	Creative Problem Solving
N=	44	154	78	85	22	8	60	46
1	2	3	0	0	1	0	23	7
2	4	3	0	0	0	0	0	1
3	1	1	3	0	0	0	0	0
4	2	14	1	0	8	8	0	8
5	0	0	0	0	2	0	0	2
6	1	3	1	0	4	0	2	0
7	3	62	5	98	0	0	3	2
8	1	10	9	55	0	0	10	1
9	4	10	8	37	0	0	7	1
10	2	5	0	42	6	0	1	0
11	1	2	2	0	0	0	0	0
12	0	10	8	0	0	0	0	1
13	3	0	2	0	0	0	0	0
14	4	3	3	2	0	0	0	0
15	0	16	7	2	0	0	0	4
16	2	3	2	3	1	0	0	2
17	1	0	6	0	0	0	0	9
18	4	0	1	0	0	0	0	0
19	2	0	3	0	0	0	0	1
20	4	6	15	0	0	0	7	7
21	3	3	2	0	0	0	7	0

Table 4. Percentage of the Core Thinking Skills Categories within the Eight Published Programs.

Program	Percentage
CoRT	71
Philosophy for Children	14
Odyssey - Curriculum for Thinking	91
Building Thinking Skills	90
Methods of Inquiry: Learning to Learn	45
Thinking Skills: Making a Choice	100
Future Problem Solving	68
Creative Problem Solving	95

CoRT Program contained 60 thinking skills lessons with 44 lessons categorized by Core Thinking Skills Framework. Philosophy for Children contained 1,055 thinking skills lessons with 154 lessons categorized by Core Thinking Skills Framework. The Odyssey Program contained 85 thinking skills lessons with 78 lessons categorized by Core Thinking Skills Framework. Building Thinking Skills Program contained 265 thinking skills lessons with 239 lessons categorized by Core Thinking Skills Framework. Methods of Inquiry: Learning to Learn contained 48 thinking skills lessons with 22 lessons categorized by Core Thinking Skills Framework. Thinking Skills: Making a Choice contained 8 thinking skills lessons with 8 lessons categorized by Core Thinking Skills Framework. Future Problem Solving Program contained 87 thinking skills lessons with 60 lessons categorized by Core Thinking Skills Framework. Creative Problem Solving contained 48 thinking skills lessons with 46 lessons categorized by Core Thinking Skills Framework. Thus, the Core Thinking Skills Framework, when considered as a basic framework of thinking skills, is inclusive enough to assist teachers when examining thinking skills programs and when planning thinking skills curriculum.

Research Question #2

Will the use of the Core Thinking Skills Framework be specific and inclusive enough to register thinking skills in each program?

There are some thinking skills programs that are multi-focused either on content or in having several skills embedded in one lesson and appear not to have thinking skills lessons as categorized by the

Core Thinking Skills Framework. Of the eight programs analyzed in this study, two could not be categorized sufficiently for two different reasons. Philosophy for Children Program contains a broad array of content areas; as a result, many lessons focused on content rather than thinking skills programs. Thinking Skills: Making a Choice Program thinking skills lessons had several embedded thinking skills in each lesson; only the first or the skill that was critical for the foundation of the lesson was categorized. However, when considering the Core Thinking Skills Framework as a primary or basic or micro set of thinking skills, they are specific and inclusive enough to serve as categories for registering thinking skills.

Research Question #3

Do the thinking skills located within each program cluster around specific categories?

Eight thinking skills programs indicate great diversity in many areas. Half of the programs contained thinking skills lessons that were clustered around specific categories, and half of the programs contained a broader array of the thinking skills lessons categorized by the Core Thinking Skills Framework. The eight published thinking skills programs can be divided into two groups. CoRT, Creative Problem Solving, Odyssey, and Philosophy for Children present a diversity of thinking skills as labelled by Core Thinking Skills Framework. However, the programs of Methods of Inquiry--Learning to Learn, Building Thinking Skills, Future Problem Solving, and Thinking Skills:

Making a Choice indicate clustering of thinking skills around specific skills.

Research Question #4

What programs are developed upon a theoretical foundation?

Each of the thinking skills programs within the study presented the origin of the program, the research that contributed to the development and/or the principles that formed the foundation of the programs. Each program manual indicates the program's philosophical basis.

The CoRT program manual describes the developer's (Dr. deBono) background as a doctor in brain research:

> [He] describes how the brain works as a neural network that allows experiences to self-organize into patterns of perception . . . . The mind tends to see only what it is prepared to see . . . . The program is designed to teach students a set of thinking tools that allows them to consciously break away from established patterns of thought, to see things more broadly and clearly, and to develop a creative approach to problem solving . . . . Students become lateral thinkers. (Maxwell, 1991, p. 1)

The Philosophy for Children bases its foundation on the logical, ethical, epistemological, aesthetic, and metaphysical aspects of philosophy. The Odyssey program "materials were originally developed by use in Venezuela" (Wright, 1985, p. 226). Building Thinking Skills takes its origin from the cognitive development model of Piaget (Hill & Edwards, 1987, p. iv). Thinking Skills: Making a Choice was developed with a freshman engineering class.

Methods of Inquiry: Learning to Learn has its roots in research conducted on successful students by Heiman and others at the University

of Michigan in the 1960s. The group attempted to isolate critical learning skills by studying the learning behavior of successful students. When these skills were identified, the group began applying them to a wide range of students, both successful and academically deficient (Heiman & Solmianko, 1985).

Future Problem Solving and Creative Problem Solving base their foundations on the early pioneers in creative thinking--the work of Osborn and Parnes and Torrance (Crabbe, 1985, p. 218).

Although all programs mentioned briefly the foundations and chronological development, only two programs, CoRT and Philosophy for Children, presented a theoretical background for their specific program.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS FOR ACTION

Conclusions

The purpose of this study was to analyze the content of eight published thinking skills programs as categorized by the Core Thinking Skills Framework. The objects of this analysis were to determine (a) if the thinking skills lessons within the eight published thinking skills programs could be identified and categorized, and (b) if the Core Thinking Skills Framework was a broad enough array of identifiable thinking skills to be used in its own right as a guide to evaluate programs or to build new formal and informal thinking skills.

The following conclusions can be drawn:

1. Thinking skills programs need to be examined to judge the merit of the program itself and to judge the match of a program to a student population. When teachers and curriculum planners examine curriculum materials for specific areas of the curriculum, there is a traditional body of knowledge that the examiner has as a criterion to measure against. The absence of an accepted knowledge base on thinking skills contributes to a dilemma for the teacher because of the diversity in theory and practice.

2. Thinking skills programs are generally added instructional materials to the normal curriculum materials. Thinking skills programs should be "teacher friendly," that is, the implementation and management of these programs should be straightforward and direct so that the teacher can readily see how to use the program. Programs that at first glance appear difficult to manage and/or require additional training to implement will not draw the teacher's desire to test out the material with his/her students. Published thinking skills should be straightforward enough so that the management of the program is immediately evident to the teacher.

3. Teachers cannot place the burden of instruction in thinking skills upon a particular program. First, each of the programs focused upon a specific set of skills. Secondly, the effectiveness of a program depends upon the orchestration of the teacher. The teacher should investigate the content of available programs and with this knowledge build an efficient and effective program.

4. Thinking skills programs used as an add on to a curriculum program or as integrated into a specific curriculum can serve a purpose. The use of a thinking skills program will depend upon the teacher's intention and the needs of the students. The implementation of the program for either purpose serves a particular need and should not be considered preferable over one another.

5. Thinking skills programs should be integrated into a subject area as soon as possible. When a thinking skills program is treated as a separate entity, students may not connect the thinking skills

processes to a specific curriculum content area. Students may also view these lessons as a novelty and not see their pragmatic use.

6. Thinking skills can be taught without the purchase of commercial materials. The Core Thinking Skills Framework is a clear, concise, and straightforward taxonomy of thinking skills. Knowledge of these thinking skills is sufficient for a teacher to plan her/his instruction including these skills.

7. Individual thinking skills programs should offer suggestions to assist the teacher in bridging from a program to specific content area. Additional suggestions would lessen the demands of instructional planning upon the teacher.

8. Thinking skills programs should offer suggestions for additional skill lessons on a particular thinking skill. One lesson or exercise on a particular thinking skill is not always sufficient for all student needs. If the lesson is a demonstration lesson and it is suggested that the teacher expand upon the lesson, this should be stated. If this is the case, several examples to expand the lesson should be added.

9. Thinking is the management or manipulation of information. The teacher and student might be better served if the thinking skills programs would focus upon the manipulation of real information rather than presenting fictitious situations for students to solve.

Recommendations for Action

The term "thinking skills" is described in different ways by different people, so it is not surprising that there is such a variety

of practices that are identified as thinking skills programs and teacher-directed instruction. The language of thinking skills as indicated in schools, professional books, magazines, conferences, and published materials is often ambiguous and contradictory and obscures the essentials of an understanding thinking skills.

If a language barrier as such continues, this could contribute to imprecision and inconsistency. The theory and practice of thinking skills could miss its mark and degenerate into what educators often call a curriculum "frill." It is suggested that there be an attempt to develop a consistency in the language of thinking skills to make it more "user friendly." Scope and Sequence chart could be organized to show similarities and differences between and among available thinking skills programs. Professional organizations should also strive to unify and codify language and practices of thinking skills in their publications.

Publishers should include more explanation to the teacher of the background of the program, about how to use it with different student populations, suggestions for additional experience with each thinking skill, and about how best to make a transfer to a specific curricula area. Teachers magazines could carry a column sponsored by publishers of thinking skills programs, presenting the bridge between theory and practice.

In conjunction with the process approach of instruction to many areas of the curriculum, the teaching of thinking skills instruction should be included in preservice and inservice training of teachers.

A thinking skills clearinghouse could be established as a repository of information on thinking skills material and national, successful thinking skills programs.

Applications could be made to professional organizations and foundations for grants to establish workshops to illustrate how thinking skills can be incorporated into specific curriculum areas.

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APPENDICES

APPENDIX A

REQUEST LETTER

July 19, 1990

As partial requirement for the completion of an Ed.D. at Montana State University, I am attempting to perform a Content Analysis of the Thinking Skills cited in the publication, Developing Minds, edited by Art Costa. The summary of the results would be compiled into a Resource Guide for teachers.

The study is to highlight the thinking skills curriculum contained within the program. No judgment will be made about the program. I will send you a summary of my findings.

I would, however, request that you send me a copy of «program» for examination in August and September 1990. I will be responsible for shipping expenses and will return material in good condition shortly after my examination of it. Please send copies of the program to the following address as soon as conveniently possible.

Joan V. Clary
Gonzaga University
Boone & Sharp Streets
Spokane, WA 99208

I am sure you know that teachers need support in incorporating thinking skills into their curriculum. It is my hope that this project will provide help to teachers.

Thank you in advance for any help that you might be able to offer me, and I look forward to receiving the copies of your program in the near future.

Sincerely,

Joan V. Clary
Assistant Professor of Education
School of Education
Gonzaga University
Spokane, WA 99208

APPENDIX B

MEMBER ORGANIZATIONS OF THE ASSOCIATION COLLABORATIVE FOR TEACHING THINKING

American Association of Colleges of Teacher Education
American Association of School Administrators
American Association of School Librarians
American Federation of Teachers
American Educational Research Association
Association for Supervision and Curriculum Development
Council for American Private Education
Council of Chief State School Officers
Council of Great City Schools
Home Economics Education Association
Institute for Development of Educational Activities
International Listening Association
International Reading Association
Music Educators National Conference
National Art Education Association
National Alliance of Black School Educators
National Association of Elementary School Principals
National Association of Secondary School Principals
National Association of State Universities and Land-Grant Colleges
National Congress of Parents and Teachers
National Council for the Social Studies
National Council of Teachers of English
National Council of Teachers of Mathematics
National Education Association
National Middle School Association
National Science Teachers Association
National School Boards Association
North Central Regional Educational Library

APPENDIX C

PROGRAM DESCRIPTIONS

Descriptors

Name:	The CoRT Thinking Program
Developer:	Edward deBono, M.D.
Goals:	"Teach thinking skills useful to everyone in and out of school" (deBono, 1985, p. 204).
Materials:	The program consists of a series of six sets of student word cards or workbooks with accompanying Teachers handbooks. There is a total of 60 thinking skills lessons.
Audience:	"Ages 8 to 22, all ability levels," (deBono, 1985, p. 204).
Instructional Delivery:	"The lessons are designed to help students begin to purposefully direct their thoughts rather than to simply react to information and circumstances presented to them," (Maxwell, 1991, p. 4). The word cards contain situations upon which the students are directed to apply specific "tools" thinking skills. "Students practice 'operations' following 'lesson notes.' Teachers present and monitor the exercises," (deBono, 1985, p. 204).
Product Availability:	SRA, MacMillan McGraw-Hill, Chicago
Price:	$329.25 - Manuals and instructional material for 10 students

Descriptors

Name:	Philosophy for Children
Developer:	Matthew Lipman, PhD
Goals:	"Improve children's reasoning abilities by having them think about thinking as they discuss concepts of important to them" (Lipman, 1985, p. 213).
Materials:	The program consists of a detailed teacher's guide for each level to accompany an individual booklet called a children's novel. There are alternative materials for certain levels. The entire program contains seven teacher's manuals and seven children's novels.
Audience:	"Children kindergarten through high school" (Lipman, 1985, p. 213).
Instructional Delivery:	"The manual aims to help children confront, recognize and explore the problematic aspects of their experience. The program is in the form of children's novels. [The] six novels currently available . . . emphasize reasoning about nature" (Lipman, 1985, p. 212).
Product Availability:	Institute for the Advancement of Philosophy for Children Montclair State College Upper Montclair, NJ.
Price:	$338.50 - Manuals and a children's novel for one student.

Descriptors

Name:	Odyssey: Curriculum for Thinking
Developer:	A team of researchers from Harvard University. Bolt Beranth and Newman Inc., and the Venezuelan Ministry of Education
Goals:	"To teach a broad range of general thinking skills" (Wright, 1985, p. 225).
Materials:	"There are six teacher's manuals, each with a corresponding student book. The teacher's manuals are divided into two or more units . . . The introduction to the units explains how the lessons that follow relate both to each other and to the book as a whole" (Adams et al., 1986, p. ix).
Audience:	Middle level students.
Instructional Delivery:	"Each lesson includes the following five parts: rationale, objectives, target behaviors, materials, and classroom procedures" (Adams et al., 1986, p. ix).
Product Availability:	Mastery Education Corporation, 85 Main Street, Watertown, MA 02172
Price:	$95.00 - Five teacher's manuals.

Descriptors

Name:	Building Thinking Skills
Developer:	John D. Baker, President, and several authors
Goals:	"This series provides activities for cognitive skill development and analytical reasoning instruction in a carefully sequenced instructional plan" (Baker, 1985, p. 236).
Materials:	The program consists of four paperback student workbooks with accompanying teacher manuals.
Audience:	"The program fosters analysis skills at the elementary and secondary levels and critical thinking at the middle and high school levels" (Baker, 1985, p. 236).
Instructional Delivery:	"[The] activities should not be viewed as worksheet tasks for the learner to complete, but rather as vehicles for generating class discussion. True thinking and reasoning abilities are acquired only by communicating and sharing ideas with others" (Hill & Edwards, 1987, p. v). Each lesson plan provides the teacher with background materials, often a scripted presentation, and suggestions for class activities plus suggestions for the transfer of that skill to other curriculum areas.
Product Availability:	Midwest Publications, P.O. Box 448, Pacific Grove, CA 93950
Price:	$171.18 - Sample program of teacher's manuals.

Descriptors

Name:	Creative Problem Solving: The Basic Course
Developer:	Sidney J. Parnes
Goals:	"Develop abilities and attitudes necessary for creative learning, problem sensing, and problem solving," (Parnes, 1985, p. 231).
Materials:	The instructor's guide list background information for the teacher plus suggested lesson to be used with students to develop a creative problem solving model. There is also a small accompanying workbook to assist the students with some of the lessons.
Audience:	"Middle (especially for the gifted) and secondary levels," (Parnes, 1985, p. 231).
Instructional Delivery:	"Students use activity books for practice exercises to strengthen CPS processes, under direction of the teacher using an instructor's guidebook. This guidebook offers additional exercises, readings, film listings, bibliographic sources, and test sources. Alternatively, students do independent self- or group-study and practice with specially designed test. Transfer of learning is emphasized in all materials," (Parnes, 1985, p. 231).
Product Availability:	Bearly Limited, 149 York Street, Buffalo, New York 14213
Price:	$35.20 - One workbook.

Descriptors

Name:	Thinking Skills: Making a Choice
Developer:	Charles E. Wales, Anne H. Nardi, and Robert A. Stager
Goals:	"To teach students the decision-making process and how to apply the subject matter they learn," (Nardi & Wales , 1985, p. 21).
Materials:	The program consists of "a teaching guide to Thinking Skills: Making a Choice, to the structure of a primary metacognitive thinking process--decision-making--and to the way that process can be taught to students," (Nardi & Wales, 1985, p. vii). The program describes "five thinking operations: Defining the Situation, State the Goal, Generate Ideas, Prepare the Plan, and Take Action," (Nardi & Wales, 1985, p. 16). Throughout the teacher's guide, there are example lessons that a teacher may use to illustrate the steps of the thinking skill model. The example lessons throughout the guide were used for analysis.
Audience:	"Upper elementary through college and adult learners," (Nardi & Wales, 1985, p. 221).
Instructional Delivery:	"The 'complete' decision-making process is modeled step-by-step in slow motion using printed instruction-feedback materials. Students use current subject matter as they make decisions. The teacher is a mediator and manager," (Nardi & Wales, 1985, p. 221).
Product Availability:	The Center for Guided Design Engineering Science Building, West Virginia University, Morgantown, WV 26506-6101
Price:	$16.00 - One teacher/student workbook.

Descriptors

Name:	Learning to Learn: Methods of Inquiry
Developer:	Marcia Heiman and Joshua Solmianko
Goals:	"To improve students' academic performance in content areas across the curriculum; and to improve students' skills in reasoning, reading, writing, and listening," (Heiman & Solmianko, 1985, p. 228).
Materials:	It is suggested in the text that the student workbook will be used in a class with a Learning to Learn instructor. The workbook is a combination of instruction and exercises. The exercises throughout the workbook were analyzed.
Audience:	"Junior and senior high students," (Heiman & Solmianko, 1985, p. 228).
Instructional Delivery:	Workbook exercises "Generate questions from notes, books, handouts; constructing information maps and flowcharts; . . . . using and editing checklist for math problem solving and written composition" (Costa, 1985, p. 228).
Product Availability:	Learning Skills Corporation Box 493 Cambridge, Massachusetts 02138
Price:	$18.50 for Teacher/Student Workbook

Descriptors

Name:	Future Problem Solving
Developer:	E. Paul Torrance (based on the work of Alex Osborn and Sidney Parnes)
Goals:	Develop creative problem solving skills while thinking about the future.
Materials:	"Practice Problems are the heart of the program. Early in the school year, teams of four students receive a set of practice problems . . . . The first practice problem directs the students to complete the first four steps of the problem-solving process. The second and third problems add more steps so that by the third problem students are negotiating the full process developed by Osborn and Parnes" (Crabbe, 1985, p. 217).
Audience:	Regular programs: Grades 4-12; Primary Division: K-3
Instructional Delivery:	Teacher-directed practice activities for students. "Students in teams of four follow a multiple step problem-solving process" (Crabbe, 1985, p. 218).
Product Availability:	Future Problem solving Program, Coe College, Cedar Rapids, IA 52402
Price:	$8.50 for Activity Book

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