UNIVERSITY OF ALBERTA

THE ESSENTIAL QUESTION: BEYOND FORMAL REASONING IN ADULT DEVELOPMENT

BY

ALICE KIENHOLZ 

A thesis submitted to the Faculty of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA
SPRING 1994

ISBN 0-612-11254-3

Canada

UNIVERSITY OF ALBERTA

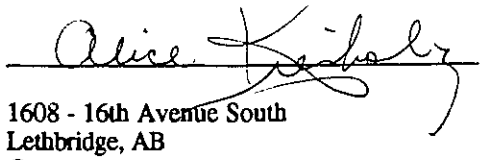
RELEASE FORM

NAME OF AUTHOR: Alice Kienholz

TITLE OF THESIS: The Essential Question: Beyond Formal Reasoning in Adult Development

DEGREE: Doctor of Philosophy

YEAR THIS DEGREE GRANTED: 1994



1608 - 16th Avenue South
Lethbridge, AB
Canada

April 20, 1994

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled The Essential Question: Beyond Formal Reasoning in Adult Development submitted by Alice Kienholz in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Dr. R. F. Mulcahy (Co-supervisor)

Dr. R. H. Short (Co-supervisor)

Dr. L. L. Stewin

Dr. C. R. Yewchuk

Dr. B. C. Bain

Dr. J. Fris

Dr. J. E. Birren (External Reader)

April 20, 1994
Date

DEDICATED TO

MOTHER

in all her manifestations

and

THE THREE WISE MEN

from out of the East

ABSTRACT

A summary of current research in adult development by Birren and Fisher (1990) indicated that wisdom is a multidimensional construct involving mainly a blend of cognitive, affective, and conative elements, together with a cognitive style component, and some other less well-defined elements. The present study, in building on Birren and Fisher's conclusions, draws on the work of Arlin (1975-76, 1989, 1990) and others, in order to operationalize wisdom as the "art of problem finding". 100 graduate level subjects volunteered to complete the battery of six measures used in the study. These included the Cognitive Problem Finding Task (CPFT), the Arlin Test of Formal Reasoning (ATFR), the Inquiry Mode Questionnaire - Revised (InQ-R), the Range of Emotions Scale (RES), the Affect Intensity Measure (AIM), and the Goal Orientation Index (GOI). Demographic information was also obtained, together with a question requesting students to list their creative achievements. Descriptive statistics, t-tests and an ANOVA were used to describe the sample in terms of age, gender, graduate level (master's or doctoral), and the disciplines (administration, natural sciences, and humanities). An additional analysis was conducted on the business students versus the other graduate subjects in the study. Particularly noteworthy among these exploratory analyses for developmental theory were the results for master's and doctoral level students. Doctoral students performed better than students at the master's level on their ability to ask a higher order question in the problem finding task, and they also preferred the Synthesist mode of inquiry. A Pearson correlation matrix across 25 variables provided information on the relationships among all variables as well as support for the discriminating ability of the instruments. A six factor analytic solution was generated for this multidimensional construct that accounted for > 71 per cent of the variance. Using a principal components analysis with a varimax rotation, measures of Positive Emotions (Affection) and Conation loaded highest (> .71) on Factor 1, with the Analyst mode of inquiry loading highest (> .80) on Factor 2. Formal reasoning (Cognition) also loaded on Factor 2, at > .60. The remaining four factors were comprised of measures of inquiry modes, affect, problem finding, and creativity and were characterized by high loadings (> .70). These results therefore support Birren and Fisher's proposition concerning the multidimensional nature of wisdom. No significant differences were found between extreme groups on high and low problem finding ability for those variables not measuring problem finding itself (problem finding ability was measured using three different methods). Implications and recommendations for research and education are discussed.

ACKNOWLEDGEMENTS

Special thanks are due to many individuals and groups for their contributions to the completion of this complex and involved work.

I wish to thank my supervisors, Dr. Robert Mulcahy and Dr. Robert Short for bearing with me as I struggled to operationalize this most elusive topic. Their guidance, support and insights were most appreciated.

Thanks are also extended to my committee members Dr. Leonard Stewan, Dr. Bruce Bain and Dr. Carolyn Yewchuk from the Department of Educational Psychology, and Dr. Joe Fris from the Department of Educational Administration for their support and interest in my research.

Dr. James E. Birren, my external examiner from the University of California, Los Angeles, is to be thanked for the appreciation he showed for the complexity of my research, and for his thoughtful and constructive evaluation of my dissertation.

I also wish to thank Dr. Rama K. Mishra, Dr. Terry Taerum and Olive Triska for their excellent statistical assistance.

I am most grateful to all those who, in various ways, provided for the instruments used in this study: Nicholas Parlette in San Francisco; Dr. Patricia K. Arlin at the University of British Columbia; Dr. Kathryn Atman at the University of Pittsburgh; Dr. Randy Larsen at the University of Michigan; and Dr. Joseph de Rivera at Clark University.

My sincere gratitude is also extended to my colleagues/friends Joyce Engel and Pat Hayes in Nursing for their constant support and encouragement over the years.

A special thanks goes to all the Graduate students and Pilot project volunteers who so generously gave of their time to participate. Their interest in, and appreciation of the importance of this work, have helped to make it all worth while.

Sincerest appreciation is also extended to my brother John Kienholz, whose enduring enthusiasm and probing questions have certainly influenced this project. My deepest gratitude is extended to all of my family and friends for their constant understanding, support and encouragement throughout the duration of this long and arduous marathon.

TABLE OF CONTENTS

TABLE OF CONTENTS CONT'D.

TABLE OF CONTENTS CONT'D

LIST OF TABLES

TABLES CONT'D

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Prior to the 1970s, the study of human development had focused on childhood and the elderly. Development during the intervening years, between about age 20 to age 65, had therefore been largely ignored. A notable exception can, however, be found in the seminal works of Erik Erikson (1950, 1959, 1978, 1982). Following the early work of Arlin (1975) and others (see Alexander & Langer, 1990; Commons, Richards & Armon, 1984; Commons, Sinnott, Richards & Armon, 1989; Commons et al., 1990), a viable body of knowledge has begun to emerge. Therefore, since adult development is still becoming a legitimate field within psychology and the other human sciences, further research is needed to establish an integrated body of theory and research. The holistic, integrated approach proposed for explaining the development of higher order reasoning in this paper is intended to contribute to this body of knowledge. Alexander and Langer (1990) refer to such approaches as contributing to "mature intelligence", since they include other forms of cognition and other domains of development beyond formal operations.

According to Levinson (1990), adult development is an idea whose time has come. Increasing longevity, together with advances in education, technology and occupational specialization are requiring that adults know more, and that they acquire progressively greater responsibility and better judgment, become more universal in outlook, and generally develop beyond the logico-deductive, adolescent form of thought outlined by Inhelder and Piaget (1958).

With the advent of the new millenium and its concomitant change and uncertainty for our global society, it is becoming increasingly apparent that 'business as usual' won't work anymore. What is needed are entirely new ways of thinking - new paradigms (Barker, 1985, 1992; Dalla Costa, 1991; de Bono, 1992, 1993; Drucker, 1992; Mitroff, 1988). This is true not only for business and the professions, but even in every day life. Current research, in the higher stages of human development and higher order reasoning, is providing some promising inroads for delineating those concepts and innovative approaches necessary for dealing with the unstructured and intractable conundrums that are being anticipated. Such research has been referred to as post-formal thinking (Commons, Richards & Armon, 1984), metasystematic reasoning (Commons, Richards & Kuhn, 1982), dialectical thinking (Basseches, 1980; Riegel, 1973), relativistic logic (Arlin, 1984a; Kramer, 1983), higher order reasoning (Sternberg, 1984), higher stages of human development (Alexander & Langer, 1990), and problem finding (Arlin, 1975, 1990). These various perspectives on higher order mental processing appear to be interrelated. Thus, while this study focuses on what Arlin (1975) refers to as problem finding, it is assumed that these other

aspects of thought are also involved in the process. The abilities to focus on essential elements, and to define them, are critical to asking the essential question in the problem finding process.

Whereas in problem solving, attention is directed at the solution to a problem, in problem finding, it is directed at the question being asked. Research to date suggests that being able to ask that essential question assumes that logical thought and problem solving ability are firmly established (Arlin, 1975, 1990; Schwartz, 1977; Smilansky, 1985). Sternberg (1988) appears to support this position when he states that in most fields, science drives technology. As he points out, most of the great technological innovations of the twentieth century - the telephone, the television, and the computer - have developed out of a solid foundation of basic research. Such research requires logic and analysis.

In his theory of developmental stages, Piaget (1952a) was concerned with understanding and explaining how logical thinking and problem solving ability develop to the level used by scientists. The concerns of Merton (1945) and Mackworth (1965), however, were with how problem finding develops to the level found among the great scientists. The difference implies that some higher form of mental process is involved. The ability to ask the essential question, as is required for problem finding, would therefore probably develop after logical thought and problem solving abilities are established. The present study proposes that, in addition to cognition, the elements of affect, conation, and cognitive style are also necessary for the development of higher order reasoning. The present framework further proposes a transcendent factor - such as that which emerges when science becomes art - for elevating thinking beyond mere problem solving.

Statement of the Problem

This study was based on Arlin's (1975, 1975-76, 1989, 1990) assumptions that problem solving is a necessary but not sufficient condition for problem finding. As a psychological construct, "the art of problem finding" has been situated between problem solving, which Arlin uses as a metaphor for Piaget's (1952a) formal operations stage of development, and wisdom. According to Birren and Fisher (1990) wisdom basically consists of the balanced and integrated elements of cognition, affect and conation, together with a cognitive style component. Using these two frameworks, then, the present study sought to explore the possibility of furthering both Arlin's (1990) model of problem finding and Birren and Fisher's (1990) proposal by knitting the two together. As Arlin (1990) points out, one of the problems with problem finding is that there is no way of determining whether one's judgement of the problem that one finds, or defines, is correct, as there is in problem solving. Therefore, by using a framework that incorporates these elements of wisdom in the process of problem finding, perhaps some recognition of the noncognitive elements of wisdom can become more prevalent in the problem finding process.

By integrating the main elements of wisdom, as outlined by Birren and Fisher (1990) in their summary of current theories of wisdom, with the problem solving - problem finding - wisdom developmental sequence proposed by Arlin (1990), the present framework provides a synthesis of current theories that are both authoritative and relevant for elaborating Arlin's model of problem finding and for operationalizing Birren and Fisher's definition of wisdom. The current framework was tested using six measures. Problem finding was assessed using a paper and pencil adaptation of Arlin's (1975) method. In her Cognitive Problem Finding Task (CPFT), subjects were asked to generate questions concerning a set of problem-rich stimuli. Problem solving, as the measure for cognition, was assessed using the Arlin Test of Formal Reasoning (ATFR) (Arlin, 1982). Conation was measured using the Goal Orientation Index (GOI) (Atman, 1986). To measure affect, two measures of emotions were used: the Range of Emotions Scale (RES) (Kienholz, 1991) and the Affect Intensity Measure (AIM) (Larsen, 1985). Cognitive style was determined using the revised version of the Inquiry Mode Questionnaire (InQ-R) (Harrison and Bramson, 1988). A listing of the abbreviations for these six instruments is provided for ready reference following the Definitions list at the end of this chapter.

The main purpose of this study then, was two fold: 1) to determine what the preferences and abilities of these graduate students were, in terms of the variables hypothesized here to constitute "wisdom: the art of problem finding," and 2) to analyze the relationships among the variables and determine the pattern by which the variables contributed to a factor analytic solution for "wisdom: the art of problem finding." A further analysis compared high and low problem finding ability across all variables.

Future leaders, such as the graduate students that constituted the sample for this study, are increasingly being called upon to deal with the kind of unstructured or ill-defined problems that can only be addressed using innovative forms of higher order reasoning, such as the problem finding approach. As one of a number of important forms of postformal reasoning, it is thought that problem finding is associated with metasystematic (Commons, Richards & Kuhn, 1982), reflective (Brabeck & Wood, 1990; King, Kitchener, Davison, Parker & Wood, 1983), and dialectic reasoning (Basseches, 1980), as well as relativistic logic (Arlin, 1984a; Kramer, 1983; Sinnot, 1981). Because problem finding is so central to this study, it must be understood that Arlin's definition of it does not equate it to creativity or originality, nor is it a function of divergent thinking. **Problem finding, she states, must be understood in terms of fundamental developmental and mental processes, which provide a means of describing wisdom in terms of both competence and performance that transcend its use in studies of creativity and problem solving (Arlin, 1990). She distinguishes such problem finding as the "art of problem finding."** Arlin's model of the "art of problem finding" stresses the role of problem finding in mediating between the

descriptors of postformal reasoning - metasystematic, reflective, dialectic and relativistic forms of logic, involving simultaneous expansions and contractions of thought (complementarity) - and the descriptors of wisdom, such as good judgement and advice. These terms, along with others are defined below to clarify their meanings in the present context.

It is interesting to note that de Bono (1993), in discussing problem finding prefers to use the broader term of "task setting." As he explains, "problem definition" is very important in order to determine what the "real problem" is. However, he has observed that the only time you can really find the best problem definition is after you have found the solution. Therefore, the emphasis should not be so much on the right problem definition, as on alternative problem definitions, with both broad and narrow being considered. Thus, in setting yourself a task for which there is no routine solution, creative thinking may be needed to carry it out. This perspective appears to reflect what Arlin and others before her have referred to as the generation of many generic questions from an ill-defined or ill-structured problem situation. Therefore, de Bono differentiates problem finding (task setting) and creative thinking, with problem finding or task setting preceding creative thinking - which may then be what is needed to carry out the task. He further suggests that the more confident you become with creativity, the more willing you will be to set "apparently impossible" tasks.

Definitions

Affect "a feeling, emotion or desire, especially as leading to action".*

Affection "goodwill; fond or kindly feeling".*

Affective "1. concerning the affections, emotional 2. relating to affects".*

Cognition "1. knowing, perceiving, or conceiving as an act or faculty distinct from emotion and volition. 2. a result of this; a perception, sensation, notion, or intuition".*

Conation "1. the desire to perform an action. 2. voluntary action; volition".* See pages 21-24.

---

*from Allen, R. E. (Ed.) (1990). The Concise Oxford Dictionary: The New Edition for the 1990s. New York, NY: Clarendon Press.

Inquiry Modes (Styles of Thinking) (Harrison and Bramson, 1982)

Synthesist Is characterized by an integrative world view. Synthesists seek conflict and synthesis, and are speculative and interested in change. They are apt to appear challenging, skeptical and amused.

Idealist Is characterized by a holistic view. They seek ideal solutions, through long-range goals and high standards They are apt to appear attentive and supportive.

Pragmatist Is characterized by an eclectic view. They seek the shortest route to a payoff, and are adaptive. They are apt to appear open, sociable and humorous.

Analyst Is characterized by a deductive view. They seek the "one best way", are prescriptive, and interested in scientific solutions. They are apt to appear cool, studious, and hard to read.

Realist Is characterized by an empirical view. They seek solutions that meet current needs, are results oriented, and efficient. The are apt to appear direct and forceful.

Additional Wisdom-Related Terms

Postformal reasoning basically involves the ability to take a multidisciplinary perspective (Cavanaugh & Stafford, 1989). It consists of a variety of interrelated abilities or perspectives for higher order mental processing, including metasystematic reasoning, problem finding, dialectic thinking, relativistic logic, and probably some others.

Problem finding is here defined as the discovery of many general or generic questions from an ill-structured, ill-defined or wicked-decision kind of problem. Such problems have no known method by which they may be solved, or their solutions verified. The ablity to focus on essential elements, and to define them are critical to the problem finding process.

Reflective reasoning/judgement (King, Kitchener, Davison, Parker & Wood, 1983) - The reflective judgement model sets forth seven sets of assumptions about knowledge and reality, each related to distinct ways that beliefs are justified in the intellectual domain. Based on these reorganizing sets of assumptions, each of the resulting stages represent a more complex, and effective form of justification.

Metasystematic reasoning (Commons, Richards & Kuhn, 1982) is "the set of operations necessary to construct the supersystem and to execute the analysis of the systems contained therein (p. 1059)". They also propose paradigmatic and cross-paradigmatic fields as higher forms of reasoning.

Dialectical thinking (Basseches, 1980) "Either knowledge or existence may be viewed as fundamentally a process of dialectic, where dialectic is defined as developmental transformation (i.e. developmental movement through forms) which occurs via constitutive and interactive relationships"(p . 405). Dialectical thinking/reasoning, is therefore thinking which looks for and recognizes instances of dialectic, and which reflects this orientation in the way in which it engages in inquiry.

Relativistic logic may be defined as the complex transformations which describe relative-position-in-developmental-space/time-of-interacting-individuals-and-environmental factors (Sinnott, 1981).
Kramer (1983) defines relativism as involving an acceptance of mutually incompatible systems of knowledge and an awareness that one's conceptual tools influence the knowledge obtained about the world.

Differentiating Intelligence, Creativity and Wisdom

Intelligence Inhelder and Piaget (1958) define adult intelligence in terms of the ability to perform formal operational thinking: the individual demonstrates logical patterns of reasoning about abstract ideas and problems as well as reflexive thought.
Sternberg (1988) defines human intelligence in the broad sense, through his triarchic mind theory, as those mental self-management skills that enable people to succeed in their particular environment better than others do. Intelligence "is purposive adaptation to, and selection and shaping of, real-world environments relevant to one's life" (p. 72). As Sternberg points out, the degree to which we succeed at this depends on how well we capitalize on our strengths and compensate for our weaknesses. This definition is the most current and widely accepted.

Creativity Is here defined in terms of the quality and quantity of the students creative achievements. Students were asked to list these in response to a question on the demographic questionnaire provided during the administration of the assessment battery. Thus creativity is defined in terms of an end product, versus a process or the person, as is sometimes the case. See Appendix C and page 42 for further explanation.

Wisdom Birren and Fisher (1990) define wisdom as "...the integration of the affective, conative and cognitive aspects of human abilities in response to life's tasks and problems. Wisdom is a balance between the opposing valences of intense emotion and detachment, action and inaction, and knowledge and doubts. It tends to increase with experience and age but is not exclusively found in old age (p. 326)."

Arlin (1990) defines wisdom briefly as being closely associated with "the art of problem finding", a fundamental cognitive process of reflection and judgment. (Further elaboration is provided on page 3.)

Another interesting definition is found in that of Csikszentmihalyi and Rathunde (1990), whose work has much in common with Arlin's. They state that wisdom has three main dimensions: 1) as a cognitive process, in which ultimate consequences and causes of events are sought; 2) as a guide to action for, being a virtue, it seeks to relate the broadest spectrum of knowledge for bringing us in closer harmony with the laws of the universe; and 3) as an intrinsic reward, because it presents the greatest challenge of any mental activity and hence, presumably, also the most profound enjoyment.

Sternberg (1990) defines wisdom as a metacognitive style plus sagacity, knowing that one does not know everything, seeking the truth to the extent that it is knowable.*

Abbreviations for the Six Instruments Used in this Study

CPFT Cognitive Problem Finding Task

ATFR Arlin Test of Formal Reasoning

GOI Goal Orientation Index

InQ-R Inquiry Mode Questionnaire - Revised

RES Range of Emotions Scale

AIM Affect Intensity Measure

* It is here suggested that, in possibly erring on the side of caution, what is really being addressed in these definitions may be closer to higher order reasoning than it is to actual wisdom per se.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction to Postformal Cognitive-developmental Theory and Research

Alexander and Langer (1990) identify three major areas under debate in determining the nature and process of adult development: 1) the question of whether development proceeds in discrete or continuous stages; 2) the endpoint or highest level that is attainable in human development; and 3) the mechanisms directing this growth in the various developmental domains.

The Question of Stage Theory

Whereas Piaget contends that his structural stages are global in nature, information processing theorists (i.e. Siegler, 1991) hold that levels of skill vary across domains. This is apparent in older children who may appear more advanced, due more to domain-specific knowledge or expertise, than to qualitative advances in cognitive mode. This increasingly popular information processing approach still, however, retains some notion of cognitive structure, through the development of elaborate networks of knowledge.

Flavell (1985) also questions Piaget's stage theory, suggesting that rather than abrupt, global structural changes occurring during stage transitions, such advances tend to be gradual, making the stage concept a more dynamic, extended process. He further contends that the idea of stage sequence is also doubtful, since there is strong evidence that functionally meaningful relationships can and do develop between early and late occurring cognitive entities. Nevertheless, the concept of hierarchy and developmental stages or some type of stage theory, continues as a viable area of research.

Problems With Endpoint Theory

While few question that adolescents are more systematic and logical than younger children in their problem solving, Piaget's formal, logical models for describing these differences have been regarded as inappropriate and incomplete (Brainerd, 1978; Broughton, 1984; Bynum, Thomas & Weitz, 1972; Flavell, 1982). Such formal modeling has been rejected as being simplistic and reductionistic, and alternative models have been offered (e.g. Keats, Collis & Halford, 1978).

In addition, the universality of formal operations has been questioned. Alexander and Langer (1990) point out two other major shortcomings of formal operations. They question whether formal operations might also involve other forms of knowing besides deductive,

syllogistic reasoning. Furthermore, the variety of authors referred to in the Introduction have offered a number of potential endpoints for adult development.

Mechanism Theory

Piaget's emphasis on children, as active participants in their own process of development, has been well received. The central role that Piaget gives to the equilibration mechanism has, however, prompted some concern. For Piaget, cognitive conflict propels subsequent re-equilibration. But, as Flavell (1985) points out, in order to first recognize and then resolve such conflicts, some fundamental competencies not included in Piaget's model would be required. The critical role attributed to cognitive conflict in describing the major milestones in cognitive development has also been questioned. Flavell (1985) states that Piaget's preoccupation with the child's external world denies the internal interactions, which, he suggests, may be of equal importance for development, especially in the case of adults.

Establishing a Developmental Sequence: A System of Abililties

The current study focuses upon the question of endpoints. In discussing developmental endpoints, Richards and Commons (1990) differentiate between those that define them as states and those that define them as abilities. A developmental endpoint might therefore be described in terms of the state of maturity, involving the feelings, attitudes and values of mature people. It might, however, also describe what a mature person can or should be able to do, where developmental endpoints are conceptualized as a system of abilities. Because abilities can be detected in activities, they are considered to be the cause of actions. This assumes a developmental sequence, where abilities at a higher level replace those at a lower level. The abilities approach, with these additional requirements, is more theoretically adequate than the state approach.

The predecessor-successor relation between abilities in a developmental sequence can be tested by focusing on abilities. Such components of developmental theory explain how, rather than what a developing organism learns. According to Piaget (Beth & Piaget, 1966) the hierarchical relation that he has observed between abilities supports his interpretation of learning as a complex process of assimilation and accommodation, that is autoregulated by equilibrium. However, Brainerd (1978) argues that if abilities are found to be simply different from other abilities, this relation can support more traditional learning theory.

The body of knowledge that examines the postformal period of the life-span is referred to as post Piagetian, and has largely developed in the last ten years (Commons, Richards & Armon 1984; Commons, Sinnott, Richards & Armon 1989; Commons et al, 1990). It attempts to resolve apparent contradictions within Piaget's framework and between Piaget's and other researcher's frameworks, with what is considered to be the "true" core of Piaget's framework. In

attempting to describe post-formal stages of cognitive development, this research typically specifies a group of intellectual abilities that develop out of formal-operational, or other parallel and related abilities, such as moral reasoning.

In explaining the predecessor-successor relation between concrete and formal operations, Piaget (Beth & Piaget, 1966) associates the logic of concrete operations to the phenomena of classes and relations. When objects are grouped in terms of similarity across differing characteristics, they are described as classes. In relations, objects share a common characteristic which distinguishes them. The end of the concrete stage occurs when the subject develops operations that relate objects in classifications and seriations. The integration of these two systems of operations gives rise to formal operations. In this process, for example, the operations of addition and subtraction are abstracted from their concrete form. Thus, in formal operations, the restrictions of contiguity and tautology, that characterize concrete operations, are replaced with more general and flexible abstract and associative operations.

Piaget integrates the logical structures of classes and relational operations using propositional logic. Propositional logic was developed to reason about other forms of reasoning, and is therefore useful to reason about the logic of classes and relations. As Richards and Commons (1990) explain, Piaget ties the logic of propositions to the Boolean system of combination. In this system, nuclear propositions are combined into larger molecular propositions using the connectives not, -; and,&; or, v(ver=and/or); if...then,--; if and only if, y. It is these connectives that form the operations.

Furthermore, the ability to construct negation and reciprocal relations simultaneously in formal operations makes it possible to reason about a vast range of more complex phenomena. In addition to connecting every nuclear proposition to the remaining propositions, the Boolean connectives relate larger compound propositions to create the logic of hypothetico-deductive reasoning. However, as Richards and Commons (1990) point out, Piaget's use of the term hypothetico-deductive, to describe formal operational thinking, refers to a style of scientific reasoning that is not truly deductive or logical. The difference lies in the fact that in classical, or deductive reasoning, a conclusion follows strictly from a major and minor premise. "The conclusion is true because the major premise is known to be true and the a priori status of logic is granted. However, in hypothetico-deductive reasoning, the major premise is not known to be true; it is a hypothesis. Given the hypothesis, a chain of minor premises, or deductions, leads to conclusions about what would be true if the hypothesis were true. Observing such evidence leads to a conclusion that the hypothesis is true" (p. 146).

As Richards and Commons (1990) observe, the success of hypothetico-deductive reasoning can be attributed to the success with which it integrates deductive ways of knowing with empirical ways of knowing. As a tool of both deductive truth and empirical confirmation,

hypothetico-deductive reasoning is central to the formal operations of Piaget's genetic epistemology.

Broughton (1984), however, argues that there is no integration of formal and empirical reasoning at this stage. Because the formal structure of reasoning becomes preeminent at formal operations, the empirical structure is prevented from functioning in its negating and ultimately dialectical role. Consequently, the construct of formal operations is no longer adequate to reason about phenomena of a non-Boolean nature. Broughton thus concludes that Piaget's developmental sequence should be completely abandoned.

Richards and Commons (1990) counter this argument by proposing that Broughton's contention about the closure that is inherent in formal operations is unfounded. They cite Piaget's (1970) discussion of the activity of negating key axioms in formal structures as a means of transforming and keeping open hypothetico-deductive structures. They further cite Piaget's discussion of the decomposition of systems into more basic systems, and the subsequent recombination of basic systems into new systems, as cognitive activities that prevent the ossification of the formal-operational structures.

These latter activities, however, are more like postformal operations, and their appearance can be explained as a cognitive development that is necessary because of the limitations of formal cognitive structure. According to Richards and Commons (1990), formal operations, "instantiated in propositional operations and employing the system of Boolean connectives mentioned, are adequate to formulate and analyze linear logical and causal relations" (p. 148). They further suggest that these processes, referred to as functional analysis, are especially suited to reasoning about situations involving dependent and independent variables. Richards and Commons pursue the subject further, suggesting that developmental conceptions of phenomena require the representation of states of phenomena as "systems". Because systems are characterized by relations that are not only functional, but also transformational, these transformations require nonlinear conceptions of causality. Richards and Commons provide a variety of references in which they explicate the inadequacies of formal operations at this level of complexity.

They therefore propose that postformal operations, which form, relate, and describe different systems, can formulate developmental conceptions of phenomena. This is because these operations arise out of an integration of structural and functional modes of analysis into transformational modes of analysis. Since notions needed to describe systems cannot belong to formal operational systems, the coordination of systems cannot be reduced to formal operations (Commons, Richards & Kuhn, 1982). Richards and Commons therefore advocate that formal operations be rigorously transformed and extended. This must occur in such a way that the resulting operations can be shown to account for the ability to relate different states of complex

phenomena, and hence the more imaginative products of scientific thought. Otherwise, they say, Piaget's formal operations can correctly be thought of as ossified in formalism.

Problem Finding as One Form of Postformal Reasoning

The recent interest in problem finding, as one form of postformal reasoning, can be traced back to Merton (1945) and Wertheimer (1945). Merton (1945) described the problem finding questions asked by scientists that led to breakthroughs in their fields. Wertheimer (1945), while not actually mentioning problem finding per se, nevertheless acknowledged that "often in great discovery, the most important thing is that a certain question is found (p.123)". Mackworth (1965) defined success in problem finding as "... the discovery of many general questions from many ill-defined problems (p.52)". He also distinguished the true scientist from the highly trained technician by attributing problem finding to the former, and complex problem solving to the latter. Getzels (1964), in defining ill-defined problems, distinguished between what he referred to as presented problems and discovered problems. Discovered problems are the kind of problems that exist, but which must first be discovered. There is no standard method for solving them. Since the problem does not have any known formulation, there is no known solution. According to Getzels and Csikszentmihalyi (1970), with no predetermined standard of right or wrong, any solution to the problem can only be evaluated as you would with a work of art.

Brabeck and Wood (1990) also discuss ill-structured problems through Kitchener and King's (1981) Reflective Judgment Model. As a model of adolescent and adult cognitive development, it describes seven stages of sequential changes in justifying one's beliefs. Based on results from the Reflective Judgment Interview, high school students were found to reason at the lower levels of the scheme, while college students reasoned in the middle range. Only advanced graduate students reasoned at the highest levels of reflective judgment. As with the Dialectical/Hegelian inquiring system, all elements of the problems posed in the interview are not known or are not known with certainty, and so judgments must be made based on whatever is believed to be true. As Brabeck and Wood (1990) explain, reflective judgment therefore extends beyond metacognition to 'epistemic cognition' in which the individual monitors the epistemic nature of problems and the truth value of alternative solutions. Such judgment is required in cases where, for example, physicians must make judgments about the best available treatment for their patient, without knowing with certainty the consequences. Other ill-structured problems occur when predicting the economic, social or political impact of implementing programs in government, business and industry. Judges and juries also must make judgments of guilt or innocence based on the less than complete evidence presented.

Similarly, research into problem finding has been concerned with what cognitive processes and developmental prerequisites might be associated with problem finding. Three

investigators have studied the process of problem finding with the hope of finding other non-domain specific (generic) variables with which it might be related. Most notable among these are Arlin's (1975, 1975/76) attempts to show the systematic relationships between problem finding and other aspects of human thought. Following this line of research, Schwartz (1977) investigated problem finding in the social domain. When subjects were given the same interpersonal dilemmas, their individual transformations revealed quite different problem formulations. Smilansky (1985) in turn found wide variations in the form in which school related problems were posed by students, even when the content of those problems was the same. He found measures of the quality of problem positing to be positively correlated with measures of problem solving. Smilansky concluded that competency in problem solving must precede competency in problem finding. This assertion supports the stage proposition of Arlin (1975) which differentiates problem solving and problem finding.

Arlin's work found formal operational reasoning to be one of the best predictors of quality questions being raised in an ill-defined, problem situation. It was obvious that the formal operational reasoning questions used involved problem solving measures, as they were well-defined and had one correct answer. As Arlin (1990) pointed out, problem finding situations are by definition ill-defined, with no known method by which they may be solved or their solutions verified.

Since Piaget's (1952) theory of intelligence is basic to Arlin's work on problem finding, and this study as well, a brief description of the stages of cognitive development for logical thinking that constitutes this theory is provided. Piaget's developmental theory is grounded in the assumption that the thought processes of adolescents and adults differ qualitatively from those of childhood. Thus, the stage of formal operations, which emerges during adolescence, is preceded by several stages in the course of development. While the sequence of these stages is fixed for all individuals, the age-spans simply suggest a time frame within which most children will display the corresponding intellectual characteristics, unless there is some form of intervention. Formal operational thought is logical thought. By applying this generalized orientation toward problem solving, a person is capable of exploring all possible hypotheses and checking on their validity. According to Piaget, the adolescent can, in this last stage of cognitive development, or equilibrium, organize thinking into higher order operations. Such operations may then be applied in finding the rules necessary for solving not only the problem at hand, but all other similar problems with this one standard method. Eight specific abilities characterize this stage of development and are outlined later in describing the ATFR.

From Plato to Piaget and Beyond

In extending Piagetian stage theory, Arlin (1990) proposed a cognitive developmental model to explain postformal operations in adult intellectual functioning, and its role in the development of wisdom. The present author proposes a framework where this cognitive aspect of mental activity is paired with affection and conation, to better represent the complexity of mental life, and its role in the development of problem finding and ultimately wisdom. The rationale behind such a proposition is based on the recurrence of this theme throughout history. This three-part conceptualization of the mind can be traced back to "The Republic" of Plato (translated by Cornford, 1945). For Plato, affection included affect, appetite, sensation, feeling and emotion. Cognition included thought, reason, reflection, knowing and understanding. Conation included will, striving, spirit, volition and acting. Plato believed that people differ by degree of balance or imbalance between the three aspects. The extent to which one or the other of appetite, reason or will dominates, led him to advocate particular regimes of upbringing and instruction for each of the three groups. Thus, each would do what they were best predisposed to do, and would be protected from distractions resulting from those faculties in which they were deficient. Plato assumed that there was no point in trying to counter or resist such imbalance. Therefore, in order to ensure societal stasis and justice for all, the best match between individual strengths and social situations was sought.

The prime concern for both Plato and Piaget was balance. However, as Travis and Cote (1989) pointed out, the difference between the propositions of the two lies in Piaget's assuming that a natural tendency exists to balance whatever is out of balance in the structure of the mind. Affect thus acts as an energizing force emerging from the disequilibration. Cognition provides structure for this energy between assimilation and accomodation. Piaget advocated self-regulation wherein reason progresses triumphantly, whereas Plato advocated social regulation in which reasoning power was impeded by the demands of appetite, spirit or will.

Piaget's predominant concern with regularities in human progress toward formal operations may account for the apparent neglect of affect in his research. As Travis and Cote (1989) explain, Piaget regarded sensed inadequacy, usually in the form of perturbation or conflict, to be the major motivational force in acquiring new knowledge structures. Such perturbations could arise from any of four sources: 1) organic growth, 2) social experience, 3) physical interactions, and 4) the self-regulations or equilibrations. Because Piaget's research was directed at explaining how thinking or intellect developed to the level of propositional logic, or scientific and philosophical thought, the possibility of a post formal stage involving dialectic thinking and relativistic logic was denied. The present framework therefore associates Piaget's stage of formal operations with the cognitive element of wisdom, and uses the ATFR to measure it. Perhaps this study can serve to locate Piaget's monumental, though admittedly problematic work, in its proper

place - as one of the necessary but not sufficient conditions for the development of problem finding ability, and, in turn, higher order reasoning and the attainment of wisdom.

The present author proposes that such higher forms of thought as problem finding, dialectical, and relativistic reasoning are dependent upon more than just the cognitive aspect of mind. While it is here acknowledged that Piaget addressed the affective and conative aspects of mind, his concern with them paled in comparison to his emphasis on cognition (Piaget, 1981; Travis & Cote, 1989). His work in this area will, however, serve to inform the present framework, and act as a starting point for bringing the three aspects of mental activity into a more equitable balance for a more comprehensive approach to understanding and explaining higher order reasoning and adult development.

The Trilogy of Mind, the Enlightenment and Inquiry Modes

According to Hilgard (1980), the modern origin of the concept of the tripartite mind in which it was assumed that mental activity consisted of cognition, affection and conation, may be traced back to eighteenth century German faculty psychology. This period of time between the appearance of Leibniz (1646-1716) and Kant (1774-1804) occurred during the Enlightenment, and provided an increase in the interest in the individual, her/his consciousness and the powers of one's mind. As Hilgard (1980) explains, this tripartite classification was later adopted by the association psychologists of the nineteenth century of Scotland, England and America. This threefold division was revived continually, and through the writing of William McDougall, its influence even extended into the twentieth century. Hilgard (1980) points out that current literature in scientific psychology has focused on cognitive psychology to the relative exclusion of affection and conation.

Building on this, or related to it are the five basic inquiring systems outlined by Churchman (1971) and operationalized by Mitroff and Pondy (1974). These modes of inquiry consist of five distinct approaches which have historically characterized inquiry in the western world. Briefly, these five paradigms include: Leibniz' Analytic mode requiring a methodical, thorough ordering of data, with a need for predictability and for focusing on concrete detail; Kant's Idealist mode with its high standards, long range goals, values and aspirations; Singer's Pragmatist mode concerning incremental, tactical thinking for short-term pay-off; Hegel's Synthesist mode encompassing essential factors, underlying assumptions and abstract concepts; and Locke's Realist mode with its focus on immediate and apparent facts and efficiency (Churchman, 1971; Mitroff & Pondy, 1974; Harrison & Bramson, 1982).

Because one or more of these five main modes of inquiry are used by people when solving problems, making decisions or asking questions, they serve much like cognitive styles, although their inclusive nature might better be described by the term epistemic cognitive styles. In

explaining the development of problem finding as an evolutionary process based in problem solving, the balancing of the growth of cognition, conation and affection may be accomplished through the judicious and situationally responsive application of these various stylistic approaches to problem solving, problem finding, and decision making, and to the asking of essential questions.

Affect

Affect is generally regarded as a generic term which subsumes a wide range of feelings and emotions. It encompasses more specific terms like emotion, mood, and feeling (Arnold, 1960; Fiske and Taylor, 1984). Affect may be differentiated or undifferentiated. According to Arnold (1960), Clark and Isen (1982), and Fiske (1981) differentiated affect is aroused by a specific target, person or situation. Thus, an individual's emotional reaction toward that target or stimulus may be described in terms of such differentiated affect (Fiske, 1982; Zajonc, 1980). Differentiated affect is also thought to be associated with specific cognitive processes such as attribution (Weiner, 1986), arousal or attention (Schacter & Singer, 1962; Mandler, 1975), and/or schematic processing (Leventhal, 1980; Clark Isen, 1982; Lang, 1984). Undifferentiated affect or mood, however, has no specific target (Clark Isen, 1982; Fiske, 1981). Being pervasive and ongoing, for at least some period of time (Zajonc, 1980; Clark & Isen, 1982; Bower & Cohen, 1982), it permeates all one's experiences (Fiske, 1981).

Current theories of affect include cognition, and the two are generally regarded as separate yet interrelated, interactive and interdependent systems. The on-going debate over the primacy of affect and cognition can be traced back to Wundt's (1907) idea of affective primacy. He wrote:

> When any physical process rises above the threshold of consciousness, it is the affective elements which as soon as they are strong enough, first become noticeable.They begin to force themselves energetically into the fixation point of consciousness before anything is perceived of the ideational elements...the clear apperception of ideas in acts of cognition and recognition is always preceded by feelings. (pp. 243-244)

In his seminal article entitled Feeling and Thinking, Zajonc (1980) noted that the words affect, attitude, emotion, feeling and sentiment were scarcely to be found in the indexes of any of the major works on cognition that were available during the 1970's. He cited a few notable exceptions, including Mandler's (1975) book on thought and emotion and Neisser's (1976) essay. Miller & Johnson-Laird (1976), in discussing language perception, also admitted that their information processing system was fearfully cognitive and dispassionate. They thereby

acknowledged that people have feelings as well as perceptions, memories, and intentions, but nevertheless devote only minimal attention to them. As Zajonc (1980) points out, this apparent contradiction is curious, when one considers that they have recognized that feeling is a vital part of any complete psychology. It appears even more contradictory, given their further understanding that feelings lie closer than "perceive, remember, and intend" to the basic sources of energy that keep the whole system running.

Zajonc (1980) argues along with Wundt that objects need to be cognized only minimally to arouse affect. He further purports that while feelings and thoughts both involve energy and information, the feelings are heavier on energy, whereas thoughts are heavier on information. He builds his case for the form of experience that we know as feeling to accompany all cognitions, proposing that it arises early in the registration and retrieval process, albeit weakly and vaguely at times, and derives from a parallel, separate, and partly independent system in the organism. In building support for his position that affective reactions are primary, Zajonc (1980) also cites Bartlett (1932) who, in delineating the process of remembering, notes that when a subject is asked to remember, the first thing that emerges is something concerning the nature of the attitude. Attitude is largely a matter of feeling, or affect.

Zajonc (1980) addresses those aspects of affect and feeling that are generally involved in preferences. In dealing with some of the "hot cognitions" (see Abelson, 1963), Zajonc considers the class of feelings involved in the general quality of behavior that underlies the approach-avoidance distinction, and tries to distinguish them from the cold ones. In the process, however, he ignores other emotions such as surprise, anger, guilt, or shame.

It is important to note that almost all social phenomena implicate affect in some important way. This is exemplified in de Rivera's (1984) taxonomy of 96 emotion terms which are based on social relationships, and which are basic to the Range of Emotions Scale developed by the present author for use in this study. In our daily exchange of information about our opinions, preferences and evaluations, affect is transmitted by both verbal and nonverbal means. According to Schneider, Hastorf and Ellsworth (1979), inferences based on nonverbal cues are largely inferences about relationships and feelings. Nonverbal cues are therefore among the most important inferences. Thus, while experimental psychologists in contemporary cognitive psychology generally ignore affect, social psychologists are increasingly concerned with both affect and hot cognitions.

Royce and Diamond (1980), in addressing this issue, suggest that the argument over the causal precedence of affect and cognition may be bypassed, if not overcome, by referring to the phenomenon using language such as the "cognitive basis of emotion" and "affect laden cognition". Practically speaking, the implications for how affect and cognition interact to influence patterns of behavior may lead to findings of how judgments and decisions are made. If, as Zajonc (1980)

suggests, affect is fundamental and instantaneous, judgements may often be made quite subconsciously.

Thus, recent research concerning how affective state or mood affects memory, thinking, social learning and social judgment, suggest that one's immediate affective state or mood may influence judgment. Bower (1981) for example, describes two ways in which undifferentiated affect or mood might influence cognitive processes through mood-state-dependent retention. In the first, events having an emotional tone that matches an individual's mood are most attended to and best learned. The second is characterized by heightened memory when the mood state at the time of recall corresponds to that during learning, whether positive or negative.

Other research of a similar vein has focused on how affect influences problem solving, decision-making, judgment, and/or evaluation. Lead by Isen and her colleagues, (Isen, Shalker, Clark, & Karp, 1978; Isen, Means, Patrick, & Nowicki, 1982; Isen & Means, 1983), this research has largely involved normal ranges of emotional intensity typical of everyday life, with effects of positive affect predominating. Their findings suggest that when subjects feel good, they are more likely to be efficient decision makers, by using information most relevant to making a decision. Isen, Daubman and Nowicki (1987) also found that a person who is feeling good will generally be more able to create solutions to problems requiring ingenuity.

In exploring the influence of affect on risk-taking, Isen, Means, Patrick and Nowicki (1982) and Isen and Patrick (1983) found that positive affect increases risk-taking tendency when risk is low. Where risk is high, however, the influence of affect is not conclusive. They do suggest that through its influence on memory and judgment, positive affect may lead to more optimism about possible outcomes which in turn will lead to increased risk-taking behavior (Isen & Shalker, 1982; Isen, Shalker, Clark & Karp, 1978).

One final area of affect-related research to be presented here concerns attribution and affect. The affective consequences of achievement-related attribution have been studied by Weiner and his colleagues. For them, achievement-based emotion is a function of performance outcome and the specific cause ascribed for this outcome. Two kinds of affect are described by Weiner (1986): outcome-dependent affect and attribution-dependent affect. Outcome-dependent affect consists of broad positive or negative affective reactions, such as happy or upset which, regardless of the causes of these performance outcomes, stem from success or failure. Attribution-dependent emotions are determined by the cause of a desired goal. According to Weiner (1986), most emotion theorists with a cognitive persuasion conceive of emotions as a temporal sequence which contains cognitions of increasing psychological complexity. Surprise, as an emotion, is labelled as attribution-dependent, being determined by the perceived cause of the previous outcome. The greater the cognitive complexity, the more differentiated is the emotional response. Attribution-dependent affect is most probably a sharply differentiated affect like anger, pity, guilt, or surprise.

It appears to be a longer lasting affective state, that may be more strongly influenced by cognitive mediation than outcome-dependent affect. Therefore, in cases when failure of others is considered to be due to external causes such as task demands, pity or sympathy are more likely to be expressed.

In summarizing the research, then, it appears that all of these conceptual frameworks can be categorized as either schema-triggered, or as affect resulting from volitional, cognitive processes. The schema-triggered conceptual framework is exemplified by Zajonc's cognition-affect preference, with affect taking precedence over cognition, as well as in Fiske's schema-triggered affect, and Weiner's outcome-related affect. On the other hand, affect resulting from volitional cognitive processes provides the conceptual basis for such processes as Wiener's attribution-induced affect.

Thus, with the recent proliferation of research concerning the various aspects of affect, the importance of affect as a major set of variables that influence individual behavior is, once again, becoming evident. The recent theoretical and empirical developments in the study of affect and cognition described here shed some light on the problem of unravelling the complex psychological processes underlying evaluative judgments involved in decision-making.

Affect and Creativity

Given this understanding of affect, the question of how creative thinking constitutes an index of affective ability will now be addressed. In defining creativity, Torrance (1988) points out that creativity is almost infinite, and therefore defies precise description. Much of it is unseen, nonverbal, and unconscious, and involves every sense - sight, smell, hearing, feeling, taste and perhaps even the extrasensory. That affect is an integral part of the creative process is attested to by Torrance (1988). As he points out, the essence of creativity is being in love with what one is doing. He further asserts that it has become increasingly apparent that this characteristic makes possible all the other personality characteristics of the creative person: courage, independence of thought and judgment, honesty, perseverance, curiosity, willingness to take risks, and the like. It is when one's work becomes a labor of love, involving the blazing drive to achieve, that creativity ensues. Amabile (1983) supports this observation, stating that extraordinary talent, personality, and cognitive ability do not seem to be enough. In addition to Torrance's longitudinal studies attesting to the essential nature of the emotions (the blazing drive) in creativity, numerous studies concerning the influence of affect or emotion support affect or feeling as an integral part of creativity.

Wang (1984) discusses the development of the emotional characteristics of all aspects of the performing arts in actors as they learn emotions from internal and external experiences during creative performances. Through the strong urge and affinity for beauty, emotional development in

performing artists is encouraged. It is the creation of the proper emotion which helps actors to achieve artistic perfection.

Vaughan (1982) discusses the functions of creativity. Thus, creativity may be either social or personal, and can be either adaptive, elaborative or developmental. Vaughan, however, emphasizes the essential role of emotional involvement in all creativity. It is emotion, he states, that fires the process and sustains it. He further suggests that this may explain why creative children cannot work at subjects that do not interest them.

Vaughan (1985) further argues that the creative process is a complex interaction of thinking, emotion, and intuition, with the major characteristic of creativity being the balancing of opposites that integrate the process, supposedly through a thesis - antithesis - synthesis approach. Furthermore, Isen, Daubman, and Nowicki (1987) found that positive affect induced by showing university students a few minutes of comedy film or giving them some candy, improved their creative problem solving performance. The influence of positive affect on creativity was discussed in terms of the impact of positive affect on overall cognitive organization.

Koestler (1964), in The Act of Creation, suggests that the roots of creativity lie in what he called 'bisociation' - the combining of concepts that were previously unrelated or even opposite. Unlike routine thinking which occurs on a single 'plane', the creative act always operates on more than one plane. Such a 'double-minded' transitory state of unstable equilibrium involves the disturbance of the balance of both emotion and thought.

Doctoroff (1977) discusses emotion in the creative act as it applies to synergistic management. He suggests that human beings are instinctively driven to do those things that evoke pleasant emotions, and creative work is one of them. Emotion is the main driving force of both the individual and the group in the act of creating. Emotion may be evident through a general sense of euphoria, jumping up and down for joy, singing, jubilant conversation, feeling good, and an urge to tell everyone. Doctoroff likens the emotions associated with the creative process to motherhood, with similar emotions forming the basis of what motivates the creator to labor with great passion so as to elaborate his/her creation.

Affect: Intensity and Frequency of Emotional Experience

As Diener, Larsen, Levine and Emmons (1985) point out, the importance of including dimensions of both intensity and frequency when assessing affect is supported by reports in several areas of psychology. In psychophysics, where it is recognized that the two basic dimensions of a stimulus are its frequency and intensity, these two dimensions combine to produce the psychological experience of perception. Allport (1961), in personality psychology, describes two defining characteristics of a trait response as frequency and intensity. Murray (1938) also describes physiological and psychological needs in terms of their periodicity (frequency) and

strength (intensity). Frequency and intensity thus appear to represent separate processes that contribute to affective experience. The Affect Intensity Measure (Larsen, 1985) and the Range of Emotions Scale (Kienholz, 1991) referred to in the introduction will therefore be administered in the present study to tap the intensity and frequency of emotions experienced.

Conation

According to Kornhuber et al. (1989), it has been clear throughout the history of philosophical thought that, without will, reasoning can not be transduced into behavior. Thus, it is only by means of a will, with goals beyond our ego, that reason, conscience and good plans can determine priorities among our needs and actions. It has been shown by those who have thought profoundly on the subject, from Plato and Aristotle through Thomas Aquinus, Descartes, Erasmus, Leibniz, Kant, Wundt and others, that a person becomes humane through the possession and refinement of reason and good will.

A hundred years ago, when conative psychology was last in vogue, William James (1890) was careful to explicate and explain just what was meant by the psychology of volition. He stated that voluntary acts, being desired and intended beforehand, are of course done with full prevision of what they are to be. Furthermore, the major point to understand about this prevision of anticipatory image, is that it represents an intended sensory consequence of muscular activity and not the muscular activity itself. Thus, according to James, it appears that volitional actions are intended self-controlled inputs as opposed to emited or elicited outputs.

Because behavioristic psychologists, such as B. F. Skinner, have defined overt behavior as comprising only emitted and elicited outputs versus intended self-controlled inputs, it is not surprising that they have been unable to find any intentional responses or volitional actions in human behavior. Their definition excludes the very overt behavior that James had recognized as basic to volitional action; that being intended, self-controlled input (Hershberger, 1989).

As Kornhuber et al. (1989) point out, the suppression of conation as a viable field of study can be traced back to Schopenhauer who did not believe in free will, and therefore tried to eliminate the concept by extending it to equate with drive. Freud then tried to explain what constituted drive by claiming that a person is driven by a search for pleasure (hedonism), making will a narcissistic illusion. The theoretical significance of will therefore diminished until, by 1965, the terms 'will' and 'volition' no longer appeared in the Psychological Abstracts.

The impact of hedonism reached its hiatus in 1968 with a European cultural revolution, when hedonism (Freudo-Marxism) became the leading ideology. A sharp increase in the consumption of alcohol, cigarettes and drugs by the young European generation marked this period. The conative research described here by Kornhuber and his colleagues was initiated in Germany, and was in opposition to the morality and the academic mentality of that time. They

believed the will to be important for human behavior when society and the individual confronted difficult circumstances.

According to Kornhuber et al. (1989), scientists probably repressed the concept of the will, since it belongs to freedom in the sense of free will and good will. Although many scientists consider the idea of freedom an illusion, it is important to realize that there are two kinds of freedom: 1) freedom from something (independence), and 2) freedom to or for something (ability, performance). It is important to consider the causal connection between the two, for freedom from is invariably based on freedom to. For instance, freedom from illusion depends on the ability to reason, on the ability of the brain to function normally, etc. Because this positive freedom, freedom to or for, is a relative freedom, it is not contrary to nature. Of the many abilities that contribute to it, will holds a central position among them. This relative freedom of will is apparent when administrators, educators, or psychologists, for example, take on the task of helping others to become more free. Thus, we become 'just' by doing what is just; 'wise' by doing what is wise. What Aristotle called virtue compares closely with this positive freedom, or freedom for. While chance events in our brain may contribute to freedom via phantasy when creativity is required; it is through higher mental functions, by intelligence, reasoning, conscience, authenticity, by learning, practice, creativity, constructive cooperation and training of will, that we become more free (Kornhuber et al., 1989).

Kornhuber et al. further state that what differentiates a chimpanzee and a rat, and again a homo sapien and a chimpanzee, is the large development of the cortical association areas, of which nearly half subserve volitional functions. The importance of consideration, planning, reasoning and associated volitional functions in responsible human behavior is apparent in our reasonable will, which has higher goals - goals beyond our ego. This more humane philosophy is in better agreement with human brain physiology than hedonism, which would have the whole brain serve a minor diencephalic function.

> The more mind, the more good will is necessary to make mind effective for constructive and responsible behavior. In this endless task of mental and volitional development, more than intelligence matters, for mankind is always in danger of drifting away from those ideals that hold the greatest promise for humanity. Because of human creativity, man needs moral education by educated persons. (Kornhuber et al. 1989, pp. 151, 154)

In the same manner that psychological research based on control theory has had to struggle with presuppositions that the will, by its very definition, may not be suitable for scientific study, so too has volitional psychology met with resistance. However, as Kornhuber et al. point out, when contemporary cognitive psychologists reviewed the history of pre-behavioristic psychology, they discovered that it had been cognitive all along. They believe that the impending 'conative revolution' may well follow the same pattern.

Conation as Goal Orientation

The remainder of this section will explicate and explain how goal orientation or self-regulatory behavior may serve as an index of conative ability. As was pointed out in the Introduction, conation is generally defined in terms of an individual's striving behavior. Terms such as volition, ego-strength, will power, self-regulation and mental self-management have been used in the literature to describe people's persistence in their goal-directed activities. Kuhl (1985) uses the terms volitional control, action control, and self-regulation interchangeably for referring to those processes which ensure that a current intention is not replaced by a competing tendency before the intended action is completed. That such processes exist is evident in the persistence that people show within goal-directed activities. This phenomenon of achievement motivation suggests that such processes prevent competing tendencies from becoming dominant before the present goal is achieved.

For more than 40 years, theories of human action have assumed that cognition and action simply constitute two sides of the same coin, thus ignoring Aristotle's discerning insight of conation as a separate entity. Recently, however, many investigators from several subfields of psychology have discovered a variety of factors that contribute to the discrepancies occurring between cognition and behavior. In addition to the nonpsychological factors that can reduce cognition-behavior consistency, a set of complex psychological mechanisms which intervene between action-related cognitions, such as beliefs, expectancies, values and intentions, and the performance of the behavior that such cognitions would suggest, have also become apparent. Studies of social psychologists have revealed attitude-behavior inconsistencies. Clinical psychologists are becoming more aware of the disruptive effects of deficits in the self-regulatory process for the individual, in behaving according to his/her preferences, feelings, and beliefs. Personality psychologists have studied the various strategies that people use when carrying out their intentions, such as in resisting temptation or delaying gratification. Cognitive psychologists have also been concerned with aiding the enactment of intentions in difficult situations, through the construction of increasingly complex computer models for simulating problem solving mechanisms (Kuhl & Beckmann, Preface, 1985).

The Goal Orientation Index (Atman, 1986) used in the present study was designed to determine personal/professional behaviors associated with goal achievement. Atman's theoretical model of goal accomplishment is based on the Conation Cycle, consisting of twelve steps associated with goal accomplishment. For purposes of the Conation Cycle, Atman defines conation as vectored energy, i.e. personal energy that has direction and magnitude. In some respects, the model resembles other problem solving/decision making models (see Assagioli, 1973; Locke & Latham, 1984; and Kepner & Tregoe, 1976). As Atman & Atman (1983) point out, however, the Conation Cycle is unique in the manner in which time, energy and stress management are highlighted throughout the model. Success in keeping one's act together, as one strives from goal setting to goal accomplishment, depends on one's competence in four operational processes. Each process is domain-related and involves the management of knowledge and information (cognitive), the management of psychic energy (affective), the management of the body to keep it well and fit (psychomotor), and the management of time (conative). Conation is, therefore, both a separate domain and a metadomain which interacts with the other three domains. Atman explains the interrelated nature of these four operational processes through the conation cycle. Thus, the goal set by an individual or organization is vested with psychic energy which in turn increases the likelihood of that person using goal-related time effectively. The efficient use of knowledge and information increases the likelihood of a problem-free implementation of the plan. Atman's problem solving/planning model therefore is based on four inexorably linked domains which result in the metadomain of conation: a synergistic condition wherein the whole is greater than the sum of the parts.

Inquiry Modes or Thinking Styles

The inquiry modes or thinking styles (Churchman, 1971; Harrison & Bramson, 1982) in this study consist of preferred sets of strategies, both innate and learned, that people use when asking questions, solving problems, and making decisions. As the five main ways in which people in the Western world have thought throughout history, they are based on several fundamental assumptions: that human beings approach thinking and problem solving in different ways; that individuals tend to use some sets of thinking strategies more than others; and that these strategies include, to varying degrees, specific perceptual qualities that have been referred to as cognitive styles. Thus, a given attribute such as impulsivity could be a partial determinant of one or more thinking styles, along with other qualities, some of which are identified and others of which are as yet unknown.

The current use of Churchman's inquiring systems approach to fulfill the cognitive style requirement of Birren & Fisher's (1990) components of wisdom follows from earlier work done by Wood (1983; 1990) and Brabeck & Wood (1990). In reviewing the research on formal reasoning in

adults, King (1986) refers to Wood's (1983) use of the inquiring systems approach, to analyze different types of problems, as a refinement in thinking about the basic nature of problems themselves, or how we define their solutions. As Wood (1983) points out, there exist problems which do not allow for a single correct answer. Thus, although young adults may be able to function adequately with Leibnizean and Lockean inquiring systems (IS), in some situations, they are not therefore automatically able to accept the inherent relativity of multiple intellectual perspectives referred to by Labouvie-Vief (1980) and others, which the more adequate Kantian, Hegelian or Singerian inquiring system functioning requires.

Development of a Framework for Wisdom: the Art of Problem Finding

As was stated in the Introduction, the "art of problem finding" is defined as the necessary but not sufficient condition for wisdom. The present framework therefore encorporates the elements of wisdom outlined by Birren and Fisher (1990). According to Birren and Fisher (1990), "The etymology of "wisdom" and "wise" suggests that they have always denoted or connoted high or elevated forms of behavior" (p. 318). Wisdom would thus be placed at the apex of "a hierarchically organized system in which wisdom is a complex compound of elements blended with experience" which, over time results in superior human qualities. In diagramming wisdom as a multidimensional construct blending cognitive, affective and conative elements, Birren and Fisher (1990) provide a basis for model building for wisdom (see Figure 1).

Figure 1 The Elements of Wisdom

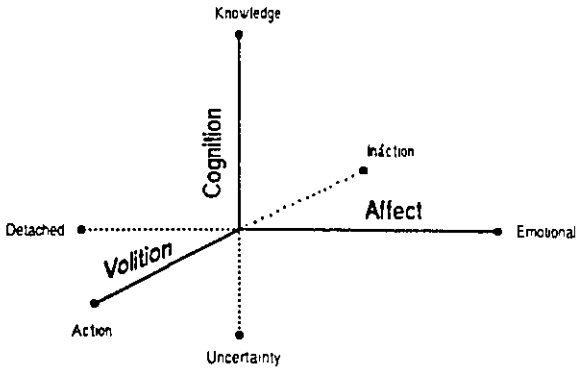


Figure 14.1. Throughout life, wisdom develops as a balance of cognition, volition (conation), and affect. The process of wisdom results in wise products, such as planning, decisions, and advice.

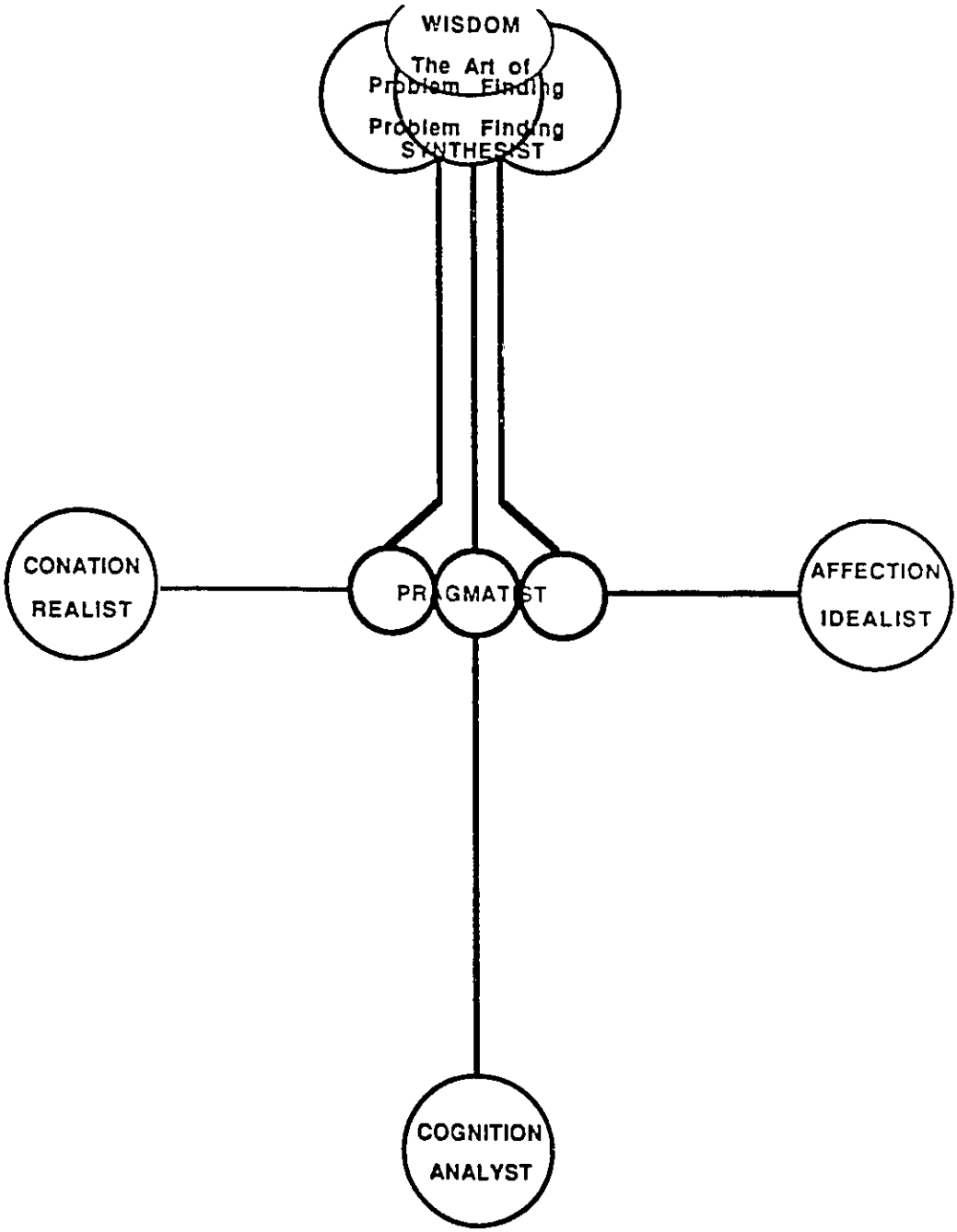
From Wisdom: Its nature, origins and development (p. 321) Edited by R. S. Sternberg, 1990, New York, NY: Cambridge University Press. Copyright 1990 by Cambridge University Press. Reprinted by permission. (See Appendix A.)

However, while they acknowledge the importance of including cognition and cognitive style, together with the conative and affective elements, they fail to include cognitive style in their working model. Furthermore, while they concede that "wisdom seems to emerge as a dialectic that, on one pole, is bounded by the transcendence of limitations and, on the other, by their acceptance" (p.324), no reference to such a dialectic, or to wisdom itself, is presented in their working model.

The present problem solving - problem finding - wisdom framework therefore seeks to address these shortcomings through a knitting of the theories of Arlin (1975, 1975-76, 1989, 1990), Wood (1983, 1990) and Birren and Fisher (1990). This will involve Arlin's CPFT integrated with Harrison and Bramson's (1988) measure of Churchman's (1971) five inquiring systems with the tripartite mind elements. The dialectic Synthesist mode would thus be placed at the top of the vertical vector with problem finding, where the transcendence of limitations through the attainment of wisdom would be expected to occur, while at the bottom of the vector, the Analyst mode, together with cognition (problem solving) functions through the acceptance of limitations.

Figure 2 depicts the positioning of cognition, affection and conation for the presently proposed framework. It differs from that proposed by Birren and Fisher's (1990) working model of wisdom in several ways. In the present framework, cognition (problem solving or formal reasoning) is placed at the lower end of the vertical vector with problem finding at the upper end. For the Birren and Fisher working model, knowledge is placed at the upper end of the verticle vector and uncertainty at the lower end. Also, conation or volition (and the Realist mode) is placed on the left arm of the same plane of the horizontal vector as affection (and the Idealist mode), which is on the right. This is in contradiction to Birren and Fisher's suggestion that volition be on the horizontal, but at right angles to affect. Thus, wisdom: the art of problem finding is purported to evolve from the development, balancing, integration and transcendence of cognition, conation and affection (or positive affect). Such an individual has learned to approach life constructively and with wisdom, through balancing positive emotions with highly developed cognitive and conative elements, rather than allowing emotionalism and/or negativity to take over when situations become exciting, difficult or nonproductive. Because the Pragmatist mode draws on whatever works, and theoretically may be associated with any of the elements at one time or another, a better understanding of its alliances in this study are anticipated following the analysis of the data.

Figure 2 Conceptual Framework Depicting the Integration of Cognition, Affection and Conation and the Five Inquiry Modes (Synthesist, Analyst, Realist, Idealist and Pragmatist) for the Attainment of Wisdom: the Art of Problem Finding



Research Questions

In order to describe the sample of students, its performance across all the variables, and the performance by selected subgroups within the total sample on these variables, the following questions will be addressed:

1. Based on a combination of the particular measures used in this study for representing the elements of wisdom proposed by Birren and Fisher (1990), together with Arlin's (1989, 1990) measures of problem finding (adapted by Kienholz, 1992) and formal reasoning, a measure of creativity, and selected demographic variables; what are the differences in performance on these variables by:

   a) male and female graduate students

   b) students aged ≤ 30 and those aged > 30

   c) master's and doctoral level students

   d) students in administration (business administration, educational administration, and health services administration), natural science (biological, medical and earth sciences, and engineering) and humanities (social sciences, arts, fine arts and education)

   e) students in business administration and the other subjects participating in this study. (This additional analysis was prompted by Sternberg's (1990) research with professors of business concerning their implicit theories of what constitutes wisdom.)

2. Do the scores on the problem finding, cognitive, affective and conative measures (CPFT, ATFR, RES/AIM, and GOI) correlate significantly with the Synthesist, Analyst, Idealist, and Realist modes of inquiry respectively? With the Pragmatist mode operating on whatever works at the time, where might its associations lie?

3. What are the relationships between problem finding and cognitive, affective and conative behavior as measured by the CPFT, the ATFR, the RES/AIM and the GOI respectively; creativity as determined by actual creative achievements, inquiring systems as measured by the InQ, and the demographic variables of age, gender, program, and work experience?

4. Does the present framework for explaining "the art of problem finding" contribute to, or explain this construct better than Arlin's (1990) model? What are the implications of the present framework for "wisdom: the art of problem finding" and for Birren and Fisher's (1990) framework concerning higher order reasoning and adult development ?

CHAPTER III

METHOD AND PROCEDURE

Introduction

This chapter will outline the hypotheses, describe the sample, the instruments used for the assessment, and the means by which the data were collected and analyzed.

Hypotheses

Hypothesis 1: The "art of problem finding" is a multidimensional construct consisting of cognition (CPFT and ATFR), affect (RES/AIM), and conation (GOI), integrated with a cognitive style component (InQ), plus creativity.

Hypothesis 2: Significant differences exist for subjects in extreme groups of problem finding ability as determined by a) the top 25% of scores and the bottom 26% of scores according to Arlin's (1989) weighted formula, and b) the ability to ask a question at the level of transformations and implications versus those not demonstrating this ability - on those measures purported to have relevance to "wisdom: the art of problem finding".

Subjects

Results from eight degree holding volunteers from within the city of Edmonton, who constituted the pilot project, were combined with results from the 92 graduate students at the University of Alberta who made up the main body of data on which the study was based. Participation was on a voluntary basis, involving written consent by participants prior to commencing the activities.

Subjects (Ss) consisted of 54 males and 46 females, eight of whom were the degree holders from the pilot study which preceded the main study. The remaining 92 subjects consisted of graduate students attending the University of Alberta during the 1993 winter and spring sessions. Sixty-one were enrolled in master's programs, while 31 were enrolled in doctoral programs. Thirty-one were studying business administration, and formed a subgroup. The remainder represented a cross section of 37 other disciplines. Subjects ranged in age from 22 to 55 years old, with the mean age being 32 and the mode 28 years. Forty-eight subjects reported holding B.Sc. degrees while another 48 reported holding undergraduate degrees in a variety of other disciplines. Four reported holding no undergraduate degrees. Table 1 provides a summary of the corresponding demographic information for the graduate student population at the University of

Alberta for the 1992-93 term. Table 2 provides cross-tabulated results of age and gender for the 100 subjects involved in the study.

Table 1

Age, Gender and Graduate Program of Graduate Level Subjects Versus the Total Graduate Student Population

	Age		Age Range	Gender		Graduate	Program	
	≤30	>30		M	F	Pilot	Master	Doctor
Subjects	50	50	22-55	54	46	8	61	31
Total grads			21-74	1815	1350		1679	1352

Table 2

Cross-tabulated Results of Age and Gender for 100 Subjects in this Study

	≤30 years	>30 years	Row Total
Male	25	29	54
Female	25*	21	46
Column Total	50	50	100

* Due to missing data for one case of subject's age, the mean was substituted in.

Table 3 provides a cross-tabulated summary of subjects according to categories of Pilot subjects, Master's and Doctoral students, with Age, Gender, and Degree program, for subjects in this study. The following list is intended to aid in interpreting the abbreviations of the Master's degrees: M.Ed. = Education, M.A. = Arts, M.Sc. = Science, M.V.A. = Visual Arts, M.B.A. = Business Administration, M.H.S.A. = Health Services Administration, M.Mus. = Music, M.L.I..S.= Library and Information Services.

Table 3

Cross-tabulated Summary of Subjects According to Pilot, Master's and Doctoral Categories with Age, Gender, and Degree Program

	Pilot	Master's	Doctoral	Total
Age ≤30	1	34	14	49
Age >30	7	27	17	51
Total	8	61	31	100
Male	3	34	17	54
Female	5	28	13	46
Total	8	62	30	100
				Males,Females
Pilot	8			3,5
M.Ed.		5		1,4
M.A.		8		5,3
M.Sc.		13		4,9
M.V.A.		2		1,1
M.B.A.		27		19,8
M.H.S.A.		2		1,1
M.Mus.		1		0,1
M.L.I..S.		2		1,1
M.N.		1		0,1
Ph.D.			28*	17,11
Ed.D.			2	1,1
M.D.			1	0,1
Total	8	61	31	100

* Animal Science = 1, Business = 4, Chemistry = 3, Education = 8, Engineering = 2, Family Studies = 1, Food Science = 1, Forestry = 1, Geology = 2, German Literature = 1, Medical Sciences = 2, Pharmacology = 1, Zoology = 1

Administration Procedure

Permission was obtained as required by the University of Alberta, for research with human subjects. The test battery was administered to those volunteers who, having read and signed the consent form, indicated that they had agreed to participate. (See Appendix B.) A mutually agreeable time and place was set for the procedure. Subjects completed a demographic questionnaire prior to beginning the formal testing. (See Appendix C.) The total time for testing and break time took about two and one half hours. Participation was encouraged by assuring the students that individual interpretations of their results would be available within about two months from the time of administration. Suggestions for maximizing skills and abilities in each of the areas tested was also provided with the interpretations. The final results and recommendations from the study will be available in the University library upon completion of the dissertation. Anonymity of individual results was assured for the student and only group results are reported here.

Instruments

Following the reading and signing of the consent form and the completion of the demographic form, Ss completed the Cognitive Problem Finding Task. This was followed by five paper and pencil measures including the Arlin Test of Formal Reasoning, the Inquiry Mode Questionnaire, the Range of Emotions Scale, the Affect Intensity Measure and the Goal Orientation Index. Because the entire battery was given in one sitting, a short break was allowed about half way through, although students often preferred to work straight through. The battery took about two to two and one-half hours to complete. Participation was elicited by simply entering graduate student's office areas and asking for volunteers. Some of the students were contacted during their classes, when instructors were found who were willing and able to make time for me to address their classes.

Preceding administration of the questionnaires, each student was provided a consent form to explain the purpose and process, which s/he was required to sign before proceeding with the battery. Administration of the battery of tests and measures was carried out in various mutually agreeable locations throughout the campus, including classrooms, the researcher's office and the student offices. Determining the location depended on whether individuals or small groups were involved. Regardless of the location, however, standard testing procedures and criteria were maintained throughout.

Cognitive Problem Finding Task (CPFT)

According to Arlin (1990), wisdom is grounded in those general or generic questions that result from problem finding ability. Based on research done by Arlin (1975, 1989), problem finding ability was measured using methods and materials outlined by Arlin in her CPFT. (See

Appendix D.) The problem situation requires the subject to ask some quality questions about a picture of an array of 12 'problem-rich' objects, within a 10 minute timeframe. In the present study, the subjects were told they had five minutes in which to generate some quality (really good) questions. Upon completion of this session, they were then given an additional five-minute session in which they were to generate further questions that were as good or even better than their first ones, to ensure that they had enough time to provide a representative sample of questions. The students wrote their questions on a sheet of paper provided for this purpose. Following Arlin's procedure (1975-76) the resulting questions were rated using the product categories of Guilford's (1968, 1986) structure of intellect model. A modified version of Guilford's (1968) list of The Intellectual Product Categories is provided below to better delineate how the CPFT scores were derived for the paper and pencil exercise used in the present study.

The Intellectual Product Categories
Adapted from Guilford (1968) by Kienholz (1993)

Category	Definition	Example*
1. Units	Basic units of information.	"How many objects are there here?"
2. Classes	Class is a 'second' kind of Product derived from different sets of particulars. Class exists on its own, yet is transposable.	"Can I arrange these according to size, color or shape?"
3. Relations	Connections between objects or units such as comparisons,opposition, part-whole, agent-action, etc. that are transposable.	"Can I put the quarter through the hole without ripping it?"
4. Systems	Systems involve rules, principles, orders, orientations, and structures. Systems are transposable and can be analyzed into the other five Products.	"Is there a way by which you could fit all the matches into the box?"

5. Transformations	Transformations may involve any kind of change, such as expansion, reversal, interchange, and so on. Transformations occur as activity, but are known as transposable information Products.	"What could you change the clamp into? What could you make?"
6. Implications	Implications are apparent when there is a connection between two units of information. Implications differ from Relations, which involve 'definable' kinds of connections. Implications are associations which are arbitrarily formed by circumstances of contiguity or perhaps frequency of occurance, for which there develops a sense of 'rightness' or 'significance' for the connection.	"In what ways can you arrange the objects on the table to represent how you feel at this time?"

*Examples were taken from or adapted from Arlin (1975-76).

Thus, higher order category questions used for problem finding (transformations and implications) were assumed to more closely approach the notion of a general or generic question than did a lower order category question used in problem solving (units, classes, relations or systems). Quantity and quality of questions were determined. While it was usually fairly clear which category each question fit with, this was not always the case. Therefore, a second rater was involved in determining the ratings. Where the researcher and second rater agreed on the scoring, that rating was assigned; where there was disagreement, the problem was discussed until a category could be determined. In cases where agreement was not possible, a third opinion (thesis supervisor) was consulted and a category was assigned. Interrater reliability based on the independent classification of the questions by the two raters was approximately .70. From this procedure the quality and quantity of questions were determined. The problem finding indicators used in the current analysis for each subject includes not only that for the problem finding quality, but the highest score obtained, and the number of scores rated as at the five or six level. Determination of problem finding quality followed the procedure used by Arlin (1975/76) where quantity was defined as the total number of questions asked by a subject regardless of the category. For each category, the number of questions at that level were determined and entered into the formula. These questions

were tallied for each subject. Quality represented the weighted average of the questions according to the intellectual products category. The relationship was:

$$\text{Quality} = \frac{1(\text{cat1}) + 2(\text{cat2}) + 3(\text{cat3}) + 4(\text{cat4}) + 5(\text{cat5}) + 6(\text{cat6})}{\text{Total number of questions asked by the subject (quantity)}}$$

This definition assumes that a higher order category question more closely approached the criteria used to determine problem finding ability than did a lower order question. However, by averaging out all the scores, it is not possible to tell whether the subject was in fact able to ask a higher order question. Thus, a subject who asked several lower level questions and several higher level ones would not be rated as any better at problem finding than one who asked only one higher order question, or one at perhaps the level of systems. Some ways in which to circumvent this problem are discussed in the sections which address the Results and the Discussion and Implications. Although the current version of the CPFT is intended to provide an improvement over the original version, it, like its predecessor, has yet to undergo an assessment of its reliability and validity. Caution is therefore advised when interpreting results from the three indicators of problem finding.

Arlin Test of Formal Reasoning (ATFR)

The ATFR (Arlin, 1984b) was developed to assess those cognitive abilities associated with the formal operations stage of development outlined by Inhelder and Piaget (1958). As a group test, the instrument allows for a more expedient means for measuring the eight specific abilities that characterize this stage of development, than was traditionally possible using Piaget's highly individualized and time consuming interview technique. These abilities include multiplicative compensation, probability, correlations, combinatorial reasoning, proportional reasoning, forms of conservation beyond direct verification, mechanical equilibrium and the coordination of two or more systems or frames of reference (Arlin, 1984b). It contains 32 items in a multiple-choice format which attempt to assess the process by which the answer is obtained.The total possible score is 32. Norms are provided for High School students by Arlin (1984b), with a score of 18 being the point at which formal reasoning is believed to begin. Thus scores between 18 and 24 are referred to as low formal, while scores ≥25 are considered high formal. The ATFR is the best test of formal operational thought currently available (Fakouri, 1985; Santmire, 1985). This objective assessment of formal operational thought was cross-validated clinically. Using multitrait-multimethod procedures, the objective test was found to be both valid and reliable as a measure of formal operational thought (Arlin, 1982).

Range of Emotions Scale (RES)

According to O'Reilly (1991), affect can not be adequately assessed as a single dimension. Therefore, the frequency with which emotions are experienced will be assessed in terms of positive and negative emotions. The RES was developed by the present author in 1991, in a separate study carried out specifically for measuring the affective element of wisdom. This was necessary since no adequate measure, of the frequency with which such a broad range of emotions are experienced, could be found. (See Appendix E.) Subjects included 146 graduate students in Adult Education and Educational Administration at the University of Alberta. Part A involves a four-point Likert-type scale for determining the frequency with which the individual uses the twenty-four positive and twenty-four negative emotion names listed. The list, being derived from a more extensive taxonomy of 96 emotion terms developed by de Rivera (1984), defines the idea of emotional range in a systematic way, and thereby effectively captures the main varieties of emotions.

Part B consists of an additional list of ten components, rather than elements (as presented in part A) of emotional life, which are also rated on a four point Likert scale. These are more complex emotion terms which characterize what the present author regards as important traits of effective people, and are intended to supplement the 24 Positive Emotions in Part A. Thus, scores were calculated for Positive, Negative and Additional Components subtests by adding the self-ratings of the subjects on each of the three components. Thus, if a subject rated him or her self as experiencing love "frequently" (3), this number would be added with the other self-ratings for the Positive Emotion terms to arrive at a total Positive Emotions score. All Negative Emotion and Additional Component self-ratings were totalled in this manner to give three separate scores.

Reliability based on internal consistency using Cronbach's Alpha was .866 for the Positive Emotions subscale, and .817 for the Negative Emotions subscale (N=146). Temporal stability involving 64 students was determined with a test-retest reliability check. Results suggest that the three subscales of the RES show varying degrees of reliability. Given a two week interval, the Positive Emotions subscale correlation was .72 ($p = .000$), while the negative emotions subscale correlation was .65 ($p = .000$). The additional components subscale correlated at .61 ($p = .000$).

Means and standard deviations for the 146 cases show the mean frequency with which the 24 Positive Emotions listed were reported to have been experienced was 73.40 (S.D. = 7.83). The total possible score was 96 if all 24 emotions were experienced always or almost always, while the lowest possible score was 24 if all 24 emotions were experienced seldom or never. Thus, Positive Emotion scores above 81 were considered high and below 65 would be considered low, compared to other students in this particular sample.

The mean frequency for Negative Emotions of the 146 students involved in completing the RES was 40.91 (S.D. = 6.44). If one were to experience all 24 of the Negative Emotions

always or almost always, their score would be 96, while the minimum possible score would be 24 if one experienced all of the Negative Emotions seldom or never. Therefore, based on the 146 graduate students' scores, Negative Emotion scores above 48 would be considered high compared to other students' scores, while those below 34 would be considered low, compared to other students in this particular sample.

For the more complex emotions or character traits which constitute the Additional Components, the mean score for the 146 students was 31.86 (S.D. = 3.84). This is out of a possible maximum score of 40 and a minimum possible score of 10. Thus, based on the results of these 146 students, a score of 36 or more would be considered high, while a score of 28 or less would be considered low.

Item analysis involved correlating the score on a single item with the appropriate subtest score across all respondents. Results for the Positive Emotions subscale indicated that 23 of the 24 items correlated at > .39 (p = .000) with the subtest scores across all 146 students. Results for the Negative Emotions subscale indicated that 18 of the 24 items correlated with the subscale score at > .40 (p = .000) across the 146 students.

A Pearson correlation analysis between the scores on the RES and the Affect Intensity Measure (AIM), Larson (1985) described below, indicated moderate positive correlations. Since the AIM is a measure of the intensity of emotions experienced, and the RES subscales indicate the frequency with which emotions are experienced, some degree of correlation was expected. The correlation of the AIM with the Positive Emotion subscale of the RES was .22 (p = .004). For the Negative Emotion subscale the correlation was .35 (p=.000).

Affect Intensity Measure (AIM)

Affect intensity is concerned with the characteristic magnitude or intensity with which an individual experiences his or her emotions. The construct definition on which the instrument is based distinguishes between frequency of emotional states and the intensity of experienced emotions, with items being written to assess the intensity dimension, unconfounded with the frequency with which the emotions were experienced. Items include both strong positive emotional reactions and strong negative emotional reactions. Some items also relate to the strength of specific emotions.

The definition of affect intensity also includes the notion that there are a variety of ways in which strong emotional responses might be manifested. Thus, strong emotional responses should be manifest in the subjective experience of strong emotion, in specific bodily responses such as pounding heart and feelings of energy or arousal. Certain aspects of cognitive performance, including concentration and the ability to control one's thoughts and actions, would also be expected through strong emotions. Furthermore, many items were written that had clear situational

referents to gain a clearer picture of true response intensity in actual life situations. This was done to minimize the influence of global self-concept and social desirability in the responses. The effects of 'response set' were limited through writing about half the items in a reversed direction. An affirmative response on these items would indicate a lower emotional response intensity. The recommended scoring strategy for the AIM is therefore to rekey the reversed items and average responses across the 40 items (Larsen and Diener, 1987).

Larsen and Diener (1987) define affect intensity as the "stable individual differences in the strength with which individuals experience their emotions' (p.2). Moreover, they state that affect intensity generalizes across specific emotions in such a way that individuals who experience strong positive emotions will, over time, also experience stronger negative emotions. They distinguish affect intensity from emotionality, suggesting that emotionality refers more to the regular experience of negative emotion and the tendency towards a negative emotional state. Larsen and Diener also distinguish affect intensity from emotional variability which they suggest to be quite similar. As they point out, affect intensity refers to the typical strength of affective states, regardless of the frequency with which those states are experienced. Variability, however, refers to frequent as well as extreme changes in affect. They further suggest that while the two are distinct constructs, they have evidence to show that the two covary across individuals.

Reliability and validity for the AIM was established as acceptable by Larsen (1985) and Larsen and Diener (1987). Reliability and validity was established for University of Alberta students by the present author in conjunction with the RES studies, and correspond well with the results reported by Larsen. Based on a two week interval, the 64 cases involved in the test-retest reliability check yielded a correlation of .79 (p = .000). This is close to the correlations obtained by (Larson, 1985) of .80, .81 .84 for 1, 2, and 3 month intervals, respectively. Larsen (1987) also reported a test-retest reliability for a 2 year interval for 41 students as .75 (p=.01).

The AIM mean score for the 146 University of Alberta students involved was 3.53 (S.D. = .49). This was determined by adding all the self-ratings for the 40 questions and dividing by 40. Thus, with 40 questions and a possible score of 6 (always) and a minimum of 1 (never), a score of 4.02 or more would be considered to be high, while a score of 3.04 or less would be considered low in comparison to others in this sample of graduate students in Educational Administration and Adult Education.

The AIM was developed by Larsen (1985) and refined for research purposes by Larsen and Diener (1987). As they point out, affect intensity is strongly correlated with variability in daily emotional states, with more complex goals, with higher levels of activity, as well as with extraversion, emotionality, and psychosomatic distress symptoms, to name a few. Interestingly, however, individuals high on affect intensity do not score lower on happiness or life satisfaction measures. According to Larsen and Diener (1987), evidence suggests that individuals with a high

affect intensity dimension not only feel and perform better in highly stimulating situations, but even seek out and prefer such emotional stimulation.

As with most such self-report questionnaires, the determination of scores as high or low on these measures of affect may depend on a variety of factors, including, for example, how well a person can remember his or her emotional experiences, how he or she defines the rating categories used in the questionnaire, the personal life circumstances of each individual at the time of assessment and throughout the past year, and/or the degree of stability and validity of the questionnaire itself.

Goal Orientation Index (GOI)

The GOI (Atman, 1986) is a 96-item self-report, Likert type inventory that provides the user with a profile of his or her goal achievement style. Items represent the twelve subcategories of the Conation Cycle, a theoretical model of goal accomplishment, developed by Atman (1990). There are also three main categories within this cycle, each consisting of four subcategories. They include acting, planning and reflecting. For purposes of the statistical analysis of this study, scores from each of these three main categories, together with the total score derived from these three categories is used. Sample items include: 1) I finish jobs on time; 16) I write down the list of things I need to do; 55) When I complete a project, I evaluate how things went. Based on Atman's Norms Profile for American Adults (N = 1116), the four mean scores for Acting total approximately 125, while for Planning the total is approximately 120, and for Reflecting, the total is approximately 106. Standard deviations are not provided as such, although the Profile Chart on which subjects chart their scores does calibrate the scores according to Rarely, Sometimes, Frequently, Usually and Almost Always. The current study also provides a total GOI score.

Reliability coefficient data has been established for both middle school and adult levels. The reliability coefficient across the twelve categories ranged from .789 to .941. The manual provides data on the subscale correlations which were established with other well known instruments, including the Jackson Personality Inventory, the Shostram Personality Orientation Index, the Bass Orientation Index, the Myers-Briggs Type Indicator, and Nidefers' Test of Attentional and Interpersonal Style. Subjects included university students from several faculties. Correlations >.30, p, <.05 (two-tailed tests) for the subscales of these five instruments with the GOI are presented in the Manual for the twelve GOI categories of the Conation Cycle. Concurrent validity was thus displayed for all twelve categories, with significant subscale correlations (p = .05) coming from the subscales of two or more each of these other five instruments.

A variety of studies have been carried out with university students from several faculties including MBA students. Means and standard deviation scores for 47 MBA students in an eastern U.S. university range from 24.8 (SD = 5.55) on category four, to 33.1 (SD = 3.85) in category

eight, over the twelve categories. This range may be compared to the Norms Profile range of approximately 25 to 32 across the 12 categories. Intercorrelations among GOI categories (N=591) show a relative independence of categories, with correlations ranging between .06 to .70. The GOI has been successfully applied in developing self-management skills in children, from the middle school years and up, through adults and professional people (Atman, 1988a; 1988b; Atman and Hanna, 1987; Atman and Santillo, 1988). The GOI was chosen over another measure of Conation, The Action Control Scale (Kuhl, in Kuhl and Beckman, 1985), due to its being a more precise instrument, as well as its applicability to professional populations. The GOI's Conation Cycle for developing conative potential also proved a factor in its choice. The Likert scale of the GOI allows for the subject to express his/her preference for each category item, while The Action Control Scale is more limited, as it requires the subject to choose between items representing either action or state orientations.

Inquiry Mode Questionnaire - Revised (InQ-R)

Based on Churchman's (1971) inquiring systems, the InQ-R is a forced choice, self-report instrument which measures relative preference for five main modes of inquiry: Synthesist, Idealist, Pragmatist, Analyst and Realist. These were defined in the Introduction. The InQ-R requires that each of the five alternatives for the 18 hypothetical situations be rated according to that which is most like the respondent (5) and that which is least like the respondent (1). An example of such a hypothetical situation is:

"When there is conflict between people over ideas, I tend to favor the side that:

1. identifies and tries to bring out the conflict.
2. best expresses the values and ideals involved.
3. best reflects my personal opinions and experience.
4. approaches the situation with the most logic and consistency.
5. expresses the argument most forcefully and concisely."

(Harrison and Bramson, 1988)

The respondent is required to rank each of the choices, but is not told that there are five main thinking styles represented by the choices. Completion of the InQ-R requires responding to 90(18X5) items. Thus, the maximum possible score is 90, and the minimum possible score is 18 (18X1).

The InQ-R therefore provides a means by which to actually measure the inquiring systems that Wood (1983, 1990) and others have drawn on in differentiating formal reasoning and post-

formal reasoning in studies of adult development and wisdom. Reliability and validity studies for the InQ were reported as acceptable for profile interpretation at both the group and individual levels by Bruvold, Parlette, Bramson and Bramson (1983) and Bramson, Parlette, Harrison and Associates (1985). Concurrent validity was also reported by Kienholz and Hritzuk (1986) and Kagan and Tixier y Vigil (1987). Current research is focused on the revised form (InQ-R), which contains various revisions to correct minor language problems and to strengthen the nine items singled out for improvement by item analysis. A test retest reliability check with a one week interval was carried out by Gruber (1992) (N = 34) and provided correlations of .59 for Synthesist, .83 for Idealist, .60 for Pragmatist, .83 for Analyst and .78 for Realist. All were significant at p = .01 on a two-tailed test. It should be noted that the standard deviations for the two testings for Synthesist and Pragmatist modes were 6.28 and 6.13 and 6.47 and 5.93 respectively, while for the Idealist and Analyst they were 7.52 and 8.21 and 8.45 and 8.41 respectively. For the Realist they were 6.76 and 6.70. The lower standard deviations might account for the lower correlations, making them more artifact than reality (see Ferguson, 1981). Kienholz, Hayes, Mishra and Engel (1993) conducted a study to further validate the InQ-R using a sample of 216 nurses. Significant differences among thinking styles on analysis of variance with repeated measures and post hoc Scheffe´ comparisons supported the test's predictive validity. There were negative intercorrelations (> - 0.40) between opposing styles such as Synthesist/Pragmatist, Synthesist/Realist, Pragmatist/Analyst, and Idealist/Realist. Ninety percent (81 of 90 items) were significant in discriminating among the styles of thinking. Preference for the Idealist and Realist styles of thinking by nurses, as postulated by Harrison and Bramson (1982) was confirmed. The application of this research to nursing was reported by Hayes, Kienholz, Engel, and Mishra (1993). Applications to leadership training and development have also been presented by Parlette and Rae (1993). Concurrent validity for the InQ-R was also reported by Hughes and Franceschini (November, 1989). Other research with the InQ-R has been reported by Cervetti, Franceschini and Sojourner (November, 1989) who looked at the thinking styles of teachers of "at risk" children, and Reece and Todd (November, 1989) who investigated math anxiety, math achievement and its relation to preference for the Analyst style of thinking. Two doctoral dissertations have also been completed with the InQ-R. Malone (1992) investigated the thinking styles of police managers, supervisors and CEOs, and found them to have relatively level profiles, although they did not appear to be taking advantage of their potential strengths in each style. However, eleven police departments which were targeted as innovative and progressive, were found to be headed be police chiefs who were remarkably different in the intensity levels of their thinking styles, with evidence of quality and value, stronger concern for people, and advocacy of participatory management, creativity and alternative solutions. Huang (1993, 1994) investigated the differences of thinking styles between Chinese and North American graduate students and found that the Chinese students

rated themselves as more Pragmatic than the American group, while the Chinese men and American women scored as more Idealistic than the Chinese women and American men. Further analysis suggested that students in Social Science/Humanities and Natural Science scored as more Idealistic than those in Engineering. Students of Natural Science and Engineering scored as more Analytical than those from Social Science/Humanities, and Engineering students rated themselves more as Realists than the other groups. Overall, these students preferred the Analyst style most and the Synthesist style least.

Creative Achievements

Because of the problems associated with obtaining an adequate assessment of creativity with the tests currently available (Sternberg, 1990), and also due to time constraints, subjects were simply requested to list their creative achievements as part of the demographic questionnaire. These achievements were categorized according to Quantity and Quality as low, medium or high for scoring purposes. A low score (one) for Quantity was assigned if there were three or fewer creative achievements listed. Four to six qualified as medium quantity (two), and seven or more creative achievements were rated as high (three). Quality of achievements were determined by a more subjective criteria such that truly unique creative achievements receiving provincial or national recognition or patented and copyrighted materials were rated as high (three). A medium rating (two) was assigned to innovative, though more local, less highly acclaimed achievements, or noteworthy endeavors. A low rating (one) was assigned to creative achievements that were somewhat adaptive or aesthetically pleasing, though less than innovative or unique in nature. Interrater reliability based on the independent classification of these creative achievements by two raters was approximately .89 for Quantity and .79 for Quality. An additional related question concerning whether the subjects' creative achievements were accompanied by a Vision or a dream received an interrater reliability score of .84. Where there was no Vision, a rating of one was assigned, while a two was assigned to a response that indicated that a Vision or dream had been experienced.

Data Analysis

The research design for this study is of a quasi-experimental, ex-post facto nature. Such a methodology allows for the investigation of possible cause and effect relationships by observing some existing consequences and searching back through the data for plausible causal factors (Issac & Michael, 1971). The difficulty in operationalizing such an elusive construct as wisdom is that, in the process, the explication of the development, integration and balancing of its elements are compromised. As Birren and Fisher (1990) point out, what differentiates 'wise behavior' from behavior generally, is that, in addition to these behaviors being optimally developed, the 'wise

person' has learned to balance the opposing valences of the three aspects of behavior: cognition, affect and volition. The knowns and unknowns are judiciously weighed. He or she will resist overwhelming emotion, while yet maintaining interest, and carefully choose when and where to take action.

Thus, it is important, when selecting a research methodology to study wisdom and related topics, that it captures the multidimensional aspects of the construct without constricting the investigation. Perhaps, therefore, the most appropriate statistical treatment of initial data collected for describing the multidimensional aspects of wisdom would be of an exploratory nature, involving descriptive and comparative statistics. Inferential statistics involving an exploratory factor analysis might provide additional insights and direction for describing and explaining the underlying factors involved. If, as Birren and Fisher (1990) point out, wisdom research is now involved in the exacting process of problem finding, the best available approach to delineating the interactive nature of this multidimensional construct might be through the application of a confirmatory factor analysis as provided by LISREL VII (Joreskog & Sorbom, 1989). LISREL is rapidly being refined and is sufficiently dynamic to allow for a creative synthesis and analysis of theory and data. According to Hayduk (1987, 1990) it also has potential for accommodating the non-linear structural relations that occur in developmental studies (see Lewis, 1990).

The purpose of the research questions which preceded the Hypotheses were three fold. They were necessary 1) for the insights they could provide for refining the kind of variables to be included when addressing the hypotheses through factor analysis, and in determining what constitutes high and low problem finding ability; 2) for determining the relationships between the preferences and abilities of the various subgroups and the variables purported to contribute to higher order reasoning and wisdom; and 3) to provide the students who participated in the study with a frame of reference by which they could compare their scores. Thus, while the study was mainly theory driven, it was data driven to the extent that certain criteria for testing the Hypotheses were influenced by the statistics observed within the analysis of the subgroups. The correlations among the total number of variables were also taken into consideration. Therefore, in order to better describe the sample and address the four research questions outlined preceding the Method and Procedure section, means and standard deviations were determined for the total sample and for all subgroups. Question one therefore involved conducting t-tests for the Age subgroup and the Gender subgroup across all variables. Significant differences for these subgroups were determined for student performance on these variables. Following this, a t-test was conducted on the subgroup differentiating Master's level students from Doctoral level students across all variables. A three by one-way ANOVA was conducted across all variables to determine what differences might exist among the three groups of students: Administration, Natural Science, and Humanities. Scheffe' tests were then carried out on each of the variables for the three subgroups to determine which of

these groups were significantly different from the others on each of the variables. Determination of differences between these three groups was of interest since Arlin (1989) had found differences between students in the arts and sciences on problem solving and problem finding. Sternberg's (1990) findings concerning Business professor's implicit theories of wisdom, and de Bono's (1992) assertion that Business students need to be taught "serious creativity", prompted a further analysis to determine what differences might exist between Business students and other subjects not in Business.

The second and third questions were addressed through a Pearson Product Moment Correlation Matrix which was generated for 25 variables to determine the intercorrelations of the variables. This included scores from the CPFT, the ATFR, the RES, AIM, GOI and the InQ, along with the creative achievements ratings and the demographic information.

Question four was concerned with providing evidence of how the present framework for wisdom: "the art of problem finding" contributed to or further explained this construct.

The first hypothesis was tested using a factor analytic method to determine if "wisdom: the art of problem finding" was in fact a multidimensional construct consisting of cognitive, affective, and conative elements, together with a thinking style component and creativity. Two related exploratory factor analyses were conducted to better explicate the relationships of the variables. It was necessary to conduct at least two factor analyses because of the ipsative nature of the five subtests of the InQ, which do not allow for a factor analytic solution unless one of the subtests is omitted. Therefore, on the first run, the Pragmatist subtest was omitted, while on the second the Realist subtest was omitted. (This is explained further in the results.)

Hypothesis 2 was concerned with whether significant differences existed for students in extreme groups of Problem Finding ability on those measures purported to have relevance to "wisdom: the art of problem finding". High and low groups were determined by a) top 25 % and bottom 26 % of scores according to (PF), Arlin's (1989) weighted formula, and b) the ability to ask a question(s) at the level of transformations and /or implications (HS) versus those not demonstrating this ability. Multiple t-tests were conducted for the two definitions of problem finding as the criterian variable and the cognition, affection, conation, and the five inquiry modes as predictor variables. Further analysis to help explain the results were also conducted on the demographic variables.

While the study is exploratory in nature, alpha was set at $\leq .025$ in recognition of the probability of Type I error inflation when t-tests/ANOVAs are conducted across multiple variables. The reader is also referred to the Pearson correlation matrix (Table 15), which provides significance levels at the .05, .01 and .001 levels, to better determine the likelihood of any such error inflation.

Due to the large number of variables and acronyms involved, an interpretation key is provided in the following two pages for ready reference in reading the tables and figures in the Results section.

INTERPRETATION KEY

HS	Highest score obtained on the Cognitive Problem Finding Task - is based on Guilford's Product of Intellect criteria as adapted by the present author for the present study which is presented on page 32 - 35. The mean for the 100 subjects in this study was 4.75 (S.D. = .88).
PF	Problem Finding as defined by Arlin's (1975-76) weighted formula using Guilford's Product of Intellect Categories as described on page 32 - 35. The mean for the 100 subjects in this study is 3.45 (S.D. = .61).
PF56	This is the total number of questions asked by a subject that were judged to meet the requirements of the 5 and/or 6 level ie. transformations and implications of Guilford's Products of Intellect Categories on page 32-35. 62 of the 100 subjects in this study demonstrated the ability to ask questions at this level.
FR	Formal reasoning as measued by the ATFR, and described on page 35. The mean for 100 subjects in this study was 24.7 (S.D. = 4.05).
S	Synthesist style of thinking or mode of inquiry - a subtest of the InQ-R defined in the Introduction under Definitions, and further explained on page 40-42. The mean for 100 subjects in this study was 48.38 (S.D. =8.25).
I	Idealist style of thinking or mode of inquiry - a subtest of the InQ-R defined in the Introduction under Definitions, and further explained on page 40-42. The mean for 100 subjects in this study was 57.55 (S.D.=7.81).
P	Pragmatist style of thinking or mode of inquiry - a subtest of the InQ-R defined in the Introduction under Definitions and is further described on page 40-42. The mean for 100 subjects in this study was 52.54 (S.D. = 6.86).

INTERPRETATION KEY CONTD.

A	Analyst style of thinking or mode of inquiry - a subtest of the InQ-R defined in the Introduction under Definitions and further described on page 40-42. The mean for 100 subjects in this study was 57.63 (S.D. = 9.53).
R	Realist style of thinking or mode of inquiry - a subtest of the InQ-R defined in the Introduction under Definitions and further described on page 40-42. The mean for 100 subjects in this study was 53.83 (S.D. = 7.60).
POS	Positive Emotions subtest of the RES - described on page 35-37.
NEG	Negative Emotions subtest of the RES - described on page 35-37.
ADDCM	Additional Components subtest of the RES - described on page 35-37.
POSAD	Combined scores from the POS subtest and the ADDCM subtest - both consist of positive affect.
AIM	Affect Intensity Measure - a Likert type self-report measure that is described on page 37-38 . The mean for 100 subjects in this study was 3.53 (S.D. = .60).
ACT	Acting subtest of the GOI - described on page 39 - 40.
PLAN	Planning subtest of the GOI - described on page 39 - 40.
REF	Reflecting subtest of the GOI - described on page 39 - 40.
TOTGOI	Total GOI score - the sum of all three scores for the GOI subtests described on page 39 - 40.
QL	Quality of the creative achievements listed by the student - described on page 42. Low = 1; Medium = 2; and High = 3. Thus means <2 indicate that the Quality was between low and medium, while those >2 indicate the Quality was above medium.

INTERPRETATION KEY CONT'D.

QN	Quantity of the creative achievements listed by the student - described on page 42. Low = 1; Medium = 2; and High = 3. Thus, means <2 indicate that Quantity was between low and medium, while those >2 indicate that Quantity was above medium.
V	Vision or dream that accompanied the creative achievement(s) No Vision = 1 while having a Vision = 2. Thus, mean scores will range between 1 and 2, depending on the degree to which a Vision was present in a group.
SEX	Males = 1 and Females = 2. Thus, for tables involving mean scores, those <1.5 indicate more males, while those >1.50 indicate more females. See Tables 1, 2 and 3 for actual numbers of each in the various disciplines and groups involved in this study.
AGE	Actual age of the students.
WKEXP	Years of work experience - based on categories listed on the demographic sheet
DOCTOR	Master's level students = 1 and Doctoral level students = 2. This category is contained in the Correlations in Table 15.

CHAPTER IV

RESULTS

Before the results of the analyses for the hypotheses are addressed, the results from the research questions, including the five main approaches to describing the total sample, will be presented. The five subgroups by which the data were analyzed include Gender, Age, Program Level, Academic Discipline, and Business Students versus Students in Other Disciplines.

Male And Female Graduate Students

Descriptive statistics for the total sample, including the eight pilot project subjects and the 92 graduate students, together with those for the male and female students are provided in Table 4. T- tests showing the variables having significant differences for gender are presented in Table 5. Results from the t-tests for males and females presented in Table 5 showed males had higher scores on Formal Reasoning, with a mean score of 25.89 versus the females' mean score of 23.27, $t = 3.37$, $p = .001$. Females, however, rated themselves higher than males on the measure of Additional Components involving some of the more complex emotions. Females' ratings with a mean of 30.91 were higher than males with a mean of 29.33, $t = -2.38$, $p = .019$.

Age Groups

Means and standard deviations for graduate students ≤ 30 years of age and for those > 30 are provided in Table 6. Significant differences were found on two of the variables and are reported in Table 7. Students ≤30 (mean of 60.42) scored higher on Analyst thinking than students >30 (mean of 54.49, $t = 3.27$, $p = .001$). (Results of the differences between the age groups is also included here to show that the two groups really differed, with a mean age of 38.25 for the older students and 25.88 for the younger students, $t = -13.15$, $p = .000$.) As would be expected, the older students had a higher mean (4.61) (between the categories for 6-10 years and 11 to 20 years) on Work Experience, compared to a mean of 2.80 (between the categories for 1 to 2 years and 3 to 5 years) by their younger counterparts, $t = -8.81$, $p = .000$. (See Appendix C for the six categories on which these means are based.)

Table 4

Means and Standard Deviations for the Total Sample and for Males and Females *

Variable	Total Sample		Males		Females	
	Mean	SD	Mean	SD	Mean	SD
HS	4.75	.88	4.85	.85	4.62	.91
PF	3.45	.61	3.57	.60	3.31	.61
PF56	2.29†	1.81	2.20	1.62	2.37	2.00
FR	24.71	4.05	25.89	3.76	23.27	3.97
S	48.38	8.25	48.76	8.30	47.91	8.25
I	57.55	7.81	57.38	9.16	57.76	5.86
P	52.54	6.86	52.18	6.95	52.98	6.79
A	57.63	9.53	59.09	9.83	55.84	8.95
R	53.83	7.60	52.42	7.64	55.56	7.26
POS	68.24	8.72	66.89	8.91	69.89	8.28
NEG	44.04	8.44	43.96	9.29	44.13	7.37
ADDCM	30.24	4.16	29.33	3.54	30.91	3.10
POSAD	98.28	11.02	96.22	11.36	100.8	10.14
AIM	3.55	.52	3.47	.53	3.65	.48
ACT	124.90	15.16	123.73	17.69	126.33	11.37
PLAN	112.36	19.2	110.36	22.08	114.80	14.92
REF	98.86	17.17	100.18	18.96	97.24	14.73
TOTGOI	336.12	42.16	334.27	50.42	338.38	30.62
QL	1.55	.63	1.56	.60	1.53	.66
QN	1.48	.611	1.36	.52	1.62	.68
V	1.20	.402	1.18	.39	1.22	.42
AGE	32	7.74	32.38	7.47	31.53	8.04
WKEXP	3.70	1.36	3.80	1.43	3.58	1.27

*Refer to INTERPRETATION KEY on page 45 - 47 for an explanation of what the acronyms mean, as well as an explanation of the meaning and derivation of the scores.

N = 100 for Total Sample N = 54 for Males N = 46 for Females

†PF56 for Males N = 34, for Females, N = 28 for a total of 62, since only 62 of the 100 subjects asked questions at the 5/6 level of Transformations and Implications.

Table 5

t-tests Showing Variables with Significant Differences for Students According to Gender

Variable	Group	Mean	SD	t Value	P*
PF	M	3.57	.598	2.18	.032†
	F	3.31	.609		
FR	M	25.89	3.76	3.37	.001
	F	23.27	3.97		
R	M	52.42	7.64	-2.10	.038†
	F	55.56	7.26		
ADDCM	M	29.33	3.54	-2.38	.019
	F	30.91	3.10		
POSAD	M	96.22	11.36	-2.13	.036†
	F	100.80	10.14		
QN	M	1.36	.52	-2.09	.040†
	F	1.62	.68		

df=98

*2-tailed tests; significance for $p \leq .025$

†These were included since marginal results are also considered to be worth noting here.

Males N = 54

Females N = 46

Table 6

Means and Standard Deviations for Students Aged ≤30 and >30 Across 24 Variables

	Age ≤30*		Age >30*	
Variable	Mean	SD	Mean	SD
HS	4.80	.81	4.70	.95
PF	3.50	.58	3.40	.65
PF56†	2.06	1.27	2.55	2.23
FR	25.18	4.32	24.29	3.78
S	47.92	8.45	49.00	8.10
I	56.32	8.45	58.78	7.07
P	51.76	6.95	53.51	6.67
A	60.42	10.20	54.49	7.66
R	53.40	7.53	54.27	7.80
POS	53.40	9.23	69.37	8.15
NEG	45.52	9.14	42.71	7.47
ADDCM	29.94	3.12	30.16	3.77
POSAD	96.98	11.35	99.53	10.73
AIM	3.53	.60	3.56	.42
ACT	123.32	16.79	126.31	13.40
PLAN	109.32	18.57	115.00	19.58
REF	98.64	20.74	99.16	12.98
TOTGOI	331.28	47.93	340.47	36.46
QL	1.46	.61	1.63	.64
QN	1.40	.57	1.55	.65
V	1.16	.37	1.25	.43
AGE	25.88	2.21	38.25	6.27
SEX	1.48	.51	1.42	.50
WKEXP	2.80	1.01	4.61	1.04

*For ≤30, N = 50; for >30, N = 50

†PF56, for ≤30 N = 32; for >30 N = 30 for a total of 62.

Table 7

t-tests Showing Variables with Significant Differences for Students in Two Age Groups: ≤30 and >30

Variable	Group	Mean	SD	t Value	P*
A	≤30	60.42	10.20	3.27	.001
	>30	54.49	7.66		
AGE	≤ 30	25.88	2.21	-13.15	.000
	>30	38.25	6.21		
WKEXP	≤30	2.80	1.01	-8.81	.000
	>30	4.61	1.04		

df = 97

*two-tailed t-tests; $p \leq .025$

Master's and Doctoral Level Students

Table 8 provides the means and standard deviations for master's and doctoral level students. Results from t-tests across all these variables are provided in Table 9 for those variables showing significant differences between these two groups. Doctoral level students with a mean of 5.032 scored higher than Master's level students with a mean of 4.574, on Highest Score, t = 2.468, p = .016. They also scored higher on Synthesist, with a mean of 51.355 compared with the Master's students whose mean was 47.197, t = 2.307, p = .023. Both of these variables deal with the more highly conceptual kinds of thinking, and so would be expected to be more characteristic of doctoral students than students at the Master's level. Master's level students scored marginally higher on the AIM, with a mean of 3.649, versus the Doctoral students with their mean of 3.413, t = 2.006, p = .048. Thus, it appears that the ability to do problem finding, together with one's relative preference for the dialectical thinking that characterizes the Synthesist mode of inquiry, and possibly one's degree of Affect Intensity, constitute one potential set of criteria by which to differentiate Doctoral students from students at the Master's level. Furthermore, results from the Pearson correlations in Table 15 support these findings. As was stated earlier, however, when interpreting results from the CPFT, caution is advised, as it has not undergone psychometric validation.

Table 8

Means and Standard Deviations for Masters and Doctoral Level Students

Variable	Masters		Doctoral	
	Mean	SD	Mean	SD
HS	4.57	.81	5.03	.91
PF	3.44	.61	3.47	.64
PF56	1.18*	1.46	1.54**	2.17
FR	24.44	4.13	25.29	3.78
S	47.2	7.26	51.36	9.74
I	56.64	7.95	59.07	8.16
P	52.34	6.76	52.10	6.89
A	59.12	9.23	56.00	9.92
R	54.61	8.11	51.45	6.53
POS	67.44	9.39	69.68	7.62
NEG	44.89	9.07	42.97	7.91
ADDCM	29.62	3.11	30.77	3.96
POSAD	97.07	11.6	100.45	10.32
AIM	3.64	.52	3.41	.50
ACT	123.44	15.79	127.39	14.21
PLAN	110.43	18.42	116.42	21.38
REF	98.41	17.85	100.45	16.55
TOTGOI	332.28	43.53	344.26	42.16
QL	1.48	.57	1.74	.73
QN	1.49	.65	1.42	.56
V	1.19	.40	1.19	.40
AGE	30.77	7.60	32.74	7.31
SEX	1.44	.50	1.42	.50
WKEXP	3.69	1.36	3.48	1.36

N = 61 for Master's

N = 31 for Doctoral

*Based on N = 61 (Maximum = 7, Minimum = 0)

**Based on N = 31 (Maximum = 10, Minimum = 0)

Table 9

t-tests on Variables Selected for Significance for Master's and Doctoral Level Students

Variables	Group	Means	SD	t value	P*
HS	Master's	4.574	.805	2.468	.016
	Doctoral	5.032	.912		
S	Master's	47.197	7.264	2.307	.023
	Doctoral	51.355	9.742		
AIM	Master's	3.649	.519	2.006	.048†
	Doctoral	3.413	.500		

df = 90

*two-tailed t-tests; significance for $p \leq .025$

†This was included since marginal results are also considered to be worth noting here.

Table 10

Means and Standard Deviations for Graduate Students in Administration (Business, Education, and Health Services), Natural Sciences (Medical, Biological, Chemical, and Earth Sciences, and) and Humanities (Social Sciences, Arts, Fine Arts, Education)Engineering

	Admin.	Students	Natural	Sciences	Humanities	Students
Variable	Mean	SD	Mean	SD	Mean	SD
HS	4.69	.87	4.83	.78	4.70	.95
PF	3.43	.59	3.51	.53	3.43	.73
FR	25.36	3.71	26.57	2.86	22.19	4.17
S	47.07	7.57	48.26	7.86	51.26	9.53
I	57.71	8.31	56.26	8.07	58.07	7.83
P	54.17	7.35	50.17	5.31	51.07	6.32
A	57.21	9.96	60.91	8.35	56.96	9.63
R	53.60	8.55	54.57	5.43	52.59	8.17
POS	68.24	9.60	66.96	8.29	69.19	8.27
NEG	41.6	7.71	43.96	8.21	48.59	9.13
ADDCM	29.71	3.54	29.74	3.52	30.70	3.24
AIM	3.59	.56	3.44	.50	3.63	.48
ACT	127.79	13.79	122.30	13.30	122.19	18.56
PLAN	113.31	20.49	111.22	16.01	112.15	21.39
REF	100.15	16.83	97.52	18.89	98.96	17.40
QL	1.60	.50	1.57	.79	1.52	.70
QN	1.60	.63	1.26	.54	1.52	.64
V	1.19	.40	1.17	.39	1.26	.45
AGE	34.02	7.76	28.52	4.62	29.63	8.18
SEX	1.29	.46	1.48	.51	1.63	.49
WKEXP	4.10	1.39	2.87	1.1	3.52	1.22
TOTGOI	341.14	40.00	331.04	42.09	333.30	49.35
POSADD	97.95	12.17	96.70	10.76	99.89	10.31

N = 42 for Administration Students

N = 23 for Natural Science

N = 27 for Humanities

Administration (Business, Education, and Health Services) Natural Sciences (Medical, Biological, Chemical, and Earth Sciences, and Engineering) and Humanities (Social Sciences, Arts, Fine Arts, and Education)

Means and standard deviations for these three groups are provided in Table 10. Results showing significant differences from the oneway ANOVAs, as confirmed by Scheffe´ comparisons, for these groups are provided in Table 11. The Scheffe´ method was used since it leads to the smallest number of significant differences; thus, the possibility of a type 1 error is minimized (Ferguson, 1980). Results from the ANOVAs are contained in Table 11, together with the Scheffe´ comparisons. Thus, on the Formal Reasoning variable, Scheffe´ comparisons indicated that Science students (mean of 26.57) and Administration students (mean of 25.36) were found to differ from students in Humanities (mean of 22.19, p = .025). Differences on Negative Emotions were found between Humanities (mean of 48.59) and Administration Students (mean of 41.60, p = .025). Gender differences were also noted between Humanities (mean of 1.63) and Administration (mean of 1.29, p = .025). Thus, more females were to be found in the Humanities than in the group of Administration students. Differences in age were found between the Administration students, (mean age of 33.98) and the Natural Science students, (mean age of 28.52, p = .025). The work experience of the Administration students (mean of 4.10) was likewise greater than that of Science students, (mean of 2.87, p = .025). Thus, the work experience of Administration students would be approximately six to ten years, while that of Science students would be more than two years, but less than five years.

Table 11

Oneway ANOVAs for Determining Differences Among Three Groups: Administration, Natural Sciences, and Humanities Students as Confirmed by Scheffe´ Comparisons

Variable	MS Error	F Ratio	P*	Scheffe´ Comparisons
FR	13.454	9.991	.000	Science >Human
			.000	Admin >Human
NEG	68.355	5.904	.004	Human >Admin
SEX	.232	4.323	.016	Human >Admin
AGE	52.519	5.033	.009	Admin >Science
WKEXP	1.629	6.973	.002	Admin >Science

df = 2, 89

*Significance for p ≤ .025 for the Scheffe´ comparisons

Table 12

Means and Standard Deviations for 23 Variables for Business Students Versus Non-Business Subjects

	Business Students*		Non-Business Subjects**	
Variables	Mean	SD	Mean	SD
HS	4.52	.81	4.86	.90
PF	3.41	.45	3.47	.68
FR	26.16	3.34	24.06	4.20
S	45.00	5.79	49.90	8.76
I	55.94	8.03	58.28	7.66
P	55.03	7.02	51.42	6.53
A	58.55	9.85	57.22	9.43
R	55.16	8.14	53.23	7.33
POS	66.84	9.77	68.87	8.20
NEG	43.23	7.64	44.41	8.80
ADDCM	29.07	3.27	30.48	3.43
POSAD	95.90	11.99	99.35	10.47
AIM	3.57	.61	3.54	.48
ACT	126.07	14.10	124.38	15.68
PLAN	109.87	17.85	113.48	19.84
REF	99.55	17.68	98.55	17.06
TOTGOI	335.48	40.25	336.41	43.84
QL	1.55	.51	1.55	.68
QN	1.48	.63	1.48	.61
V	1.16	.37	1.22	.42
SEX	1.26	.45	1.54	.50
AGE	31.60	6.72	32.17	8.19
WKEXP	3.71	1.30	3.70	1.40

*N = 31

**N = 69

Students in Business Administration Versus All Other Subjects

Table 12 provides means and standard deviations for students in Business Administration versus all Other Subjects. Table 13 outlines results from t-tests in which Business Administration students (mean of 26.16 on Formal Reasoning) showed a better ability at Formal Reasoning than the Other Subjects as a group (mean of 24.06) p = .009. In terms of thinking style preferences, the Business students rated themselves lower than the other students on Synthesist, but higher on Pragmatist. For Synthesist thinking, Business Administration students had a mean of 45.00, while the Other Subjects had a mean of 49.90, p = .001. Preference for the Pragmatist style was 55.03, while for the Other Subjects it was 51.42, p = .018. This group of Business Administration students also appeared to have more males (mean of 1.26), versus the Other Subjects (mean of 1.54), p = .007. Recall that males were assigned a one value and females a two, for purposes of differentiating them in the input data.

Table 13

t-tests on Variables Selected for Significant Differences Between Business Students (Group 1) and Other Subjects (Group 2)

Variable	Group	Mean	SD	t Value	P†
FR	GP 1	26.16	3.34	2.68	.009
	GP 2	24.06	4.20		
S	GP 1	45.00	5.79	-3.31	.001
	GP 2	49.90	8.76		
P	GP 1	55.03	7.02	2.43	.018
	GP 2	51.42	6.53		
SEX	GP 1	1.26	.45	-2.78	.007
	GP 2	1.54	.50		

df = 98

*N = 31 for Group 1 **N = 69 for Group 2

† 2-tailed t-tests; significance for p ≤.025

Problem Finding, Formal Reasoning, Affect, Conation and the Five Modes of Inquiry

To determine whether problem finding ability, cognitive ability, affective behavior and conative potential correlate significantly with the Synthesist, Analyst, Idealist and Realist styles of thinking respectively (see Figure 2) Pearson correlation coefficients among these variables were determined for the total sample. Table 14 provides the relevant correlations for empirically testing the conceptual framework proposed in Figure 2. No significant correlations were found between the Synthesist style and problem finding using Highest Score, Problem Finding or Problem Finding (5/6). The only significant correlation for any of the problem finding indicators was with the Highest Score indicator and the Realist style, for which there was a rather modest relationship, $r = -.16$, $p \leq .05$. A significant correlation was, however found between the Idealist style and the RES subtest of Positive Emotions (POS), $r = .22$, $p \leq .05$, and also Positive Emotions plus Additional components had an $r = .21$, $p \leq .05$. The Analyst style was correlated with Formal Reasoning, $r = .26$, $p \leq .01$. No significant correlations were noted between any of the GOI variables and the Realist style. In attempting to determine where the Pragmatist associations might lie, the Pragmatist style was found to be negatively correlated with the Reflecting (REF) subtest of the GOI, $r = -.21$, $p \leq .05$, and with Positive Emotions at $r = -.19$, $p \leq .05$.

Table 14

Pearson Correlations for Problem Finding, Formal Reasoning, Affect, Conation and the Five Modes of Inquiry

	HS	PF	PF 56	FR	POS	NEG	AD CM	POS AD	AIM	ACT	PL AN	REF	TOT GOI
S	.12	.04	-.00	-.14	.07	.05	.02	.08	-.12	.04	-.09	.15	.03
I	.11	-.07	.07	**-.24**	**.22**	.04	.06	**.21**	.07	-.11	-.016	-.00	-.05
P	-.10	.04	.14	.03	**-.19**	-.09	-.09	-.14	.03	-.07	-.08	**-.21**	-.12
A	.02	.03	-.13	**.26**	.02	-.01	-.09	-.00	.01	.08	.11	.12	.12
R	**-.16**	-.02	-.03	.03	-.15	-.02	-.15	-.16	.05	-.04	.08	-.11	-.02

All bolded correlations are significant at $p \leq .05$, except I /FR and A/FR which are $\leq .01$ and $\leq .001$ respectively.

As was indicated in Chapter 3, whenever a number of variables are involved, the chance of spurious results are increased. However, it should be mentioned that with a sample size of 100, errors due to chance factors would be minimal. At the same time, if the correlation was significant at ≤ .01 or ≤ .001, then the likelihood of this magnitude of chance correlations would be further reduced. No other significant correlations were found between the five styles of thinking and the cognitive, affective or conative elements.

Other Noteworthy Correlations

Table 15 provides Pearson Correlations for all 25 variables involved in this study. As would be expected, the three methods of measuring problem finding ability were highly significant, although the actual intercorrelation values were more moderate than high. Highest Score and Problem Finding were correlated at $r = .587$, $p \leq .001$. Highest Score and Problem Finding (5/6) were correlated at $r = .631$, $p \leq .001$, while Problem Finding and Problem Finding (5/6) were correlated at $r = .547$, $p \leq .001$. This indicates that these measures provide some fairly unique perspectives on how problem finding might be defined or redefined. Also, the fact that they are not highly correlated would appear to justify the value in using all these measures to analyze and understand the data, since they are sufficiently different to provide three separate kinds of information. (See INTERPRETATION KEY for a fuller explanation of what each of these descriptions of problem finding ability entail.)

The RES and GOI scores were also significantly correlated, and are further explicated in the factor analysis. It should be noted here, however, that these Pearson correlations are all positive and most are significant at $p \leq .01$, with the exception of the correlations occurring among the Negative Emotions for some of the Affect and Conation subscores. The AIM also had significant positive correlations with all RES subscores and with the Planning and Reflecting subscores of the GOI. The magnitude of these correlations was largely within the range of .20 to .55, although there was one correlation of .576, $p \leq .001$ for Positive Emotions plus Additional Components (POSAD) and Planning (PLAN). The moderate correlations therefore indicate that they are measuring relatively independent components.

Formal Reasoning: Comparing Graduate Students and High School Students

In addressing question four, it is necessary to first describe the results from the ATFR and how they compare to results obtained by Arlin in this test and in her more recent research (see Arlin 1984b; 1989). Arlin's basic thesis concerning postformal reasoning assumes a cognitive developmental explanation such that formal reasoning ability must precede postformal reasoning ability. In her study of young artists and young scientists (N= 36), she reported a positive correlation between problem finding question quality and the ATFR, of $r = .55$, $p = .01$. No such

Table 15

Pearson Correlation Coefficients for 25 Variables Purported to have Relevance to Problem Finding Ability (N=100)

Variable	PF	PF56	FR	S	I	P	A	R	POS	NEG	ADDCM	POSAD
HS	.587***	.631***	.130	.116	.113	-.098	.024	-.164*	.061	-.118	-.063	.019
PF		.547***	.071	.039	-.071	.039	.026	-.022	-.134	-.036	-.076	-.134
PF56			.117	-.000	.065	.142	-.130	-.025	.049	-.143	.032	.049
FR				-.138	-.244**	.028	.262***	.034	-.211*	-.045	-.275**	-.268*
S					.177*	-.383***	-.372***	-.463***	.068	.047	.021	.078
I						-.211*	-.435***	-.471***	.223*	.037	.063	.207*
P							-.328***	.144	-.194*	-.087	.087	-.141
A								-.106	.017	-.006	-.093	-.004
R									-.145	-.018	-.146	-.160
POS										-.222*	.500**	.966**
NEG											-.221	-.238*
ADDCM												.756**
POSAD												

* P ≤ .05

** P ≤ .01

*** P ≤ .001

Table 15 (cont'd)

Pearson Correlation Coefficients for 25 Variables Purported to have Relevance to Problem Finding Ability (N=100)

Variables	AIM	ACT	PLAN	REF	TOTGOI	QL	QN	V	SEX	AGE	WKEXP	DOCTOR
HS	-.038	-.098	.022	-.117	-.092	-.023	-.075	.029	-.132	-.099	-.063	.252**
PF	-.021	-.098	.004	-.101	-.074	-.081	-.181*	-.067	-.216*	-.244**	-.123	.028
PF56	.034	-.031	.128	-.169	-.021	.058	.160*	-.059	.006*	.070*	.122	.101
FR	-.183*	-.008	-.081	.066	-.013	.028	-.172*	-.367***	-.324**	-.068	-.095	.100
S	-.124	.037	-.093	.151	.032	-.031	-.075	.035	-.052	.123	.027	.236*
I	.066	-.108	-.016	-.003	-.047	.119	.154	.158	.024	.138	.140	.143
P	.033	.006	-.076	-.214*	-.118	.017	.179*	-.043	.058	.167*	.220*	-.017
A	.011	.080	.105	.118	.124	.023	-.179*	-.025	-.170*	-.330	-.322***	-.155
R	.050	-.036	.078	-.107	-.021	-.125	-.002	-.124	.206*	.000	.046	-.194*
POS	.272**	.342***	.544***	.375***	.519***	.120	.189*	-.185*	.172*	.084	.022	.120
NEG	.241**	-.480***	-.318***	-.073	-.345***	.007	-.092	-.007	.010	-.096	-.096	-.105
ADDCM	.221**	.263**	.385***	.270***	.449***	.123	.189*	-.243***	.244**	.118	.061	.159
POSAD	.284*	.372**	.576***	.391**	.551**	.158	.235*	.247*	.208	.120	.023	.143

* $P \leq .05$

** $P \leq .01$

*** $P \leq .001$

Table 15 (cont'd.)

Pearson Correlation Coefficients for 25 Variables Purported to have Relevance to Problem Finding Ability (N=100)

Variables	ACT	PLAN	REF	TOTGOI	QL	QN	V	SEX	AGE	WKEXP	DOCTOR
AIM	-.102	.247**	.199*	.156	.031	.158	.007	.179*	-.020	.056	-.207*
ACT		.621***	.411***	.803***	.129	.082	.070	.086	.096	.053	.122
PLAN			.516***	.881***	.173*	.124	.090	.115	.110	.060	.146
REF				.783***	.041	-.116	.037	-.086	.011	-.136	.056
TOTGOI					.141	.038	.001	.048	.124	-.009	.132
QL						.597***	.281**	-.024	.094	.208*	.199*
QN							-.099	.212*	.173*	.272**	-.056
V								.050	-.052	.000	-.023
SEX									-.016	-.082	-.022
AGE										.787**	.125
WKEXP											-.072
DOCTOR											

* P ≤ .05

** P ≤ .01

*** P ≤ .001

correlation was found in the present study, however. Although the current adaptation of the CPFT involved some changes in the wording and content of this task, it seems more likely that the kinds of subjects involved in the two studies would account for most of the differences in the results for the two studies. A summary of results for the ATFR for the graduate students and the high school students in Arlin's study follows:

Results From Graduate Level Subjects According to Categories of Formal Reasoning Contained in the ATFR (N = 100)

	Actual Scores	Category	# or %
1.	11-14	High Concrete	1
2	15-17	Transitional	6
3.	18-24	Low Formal	39
4.	25-32	High Formal	54

Thus, 93 per cent of graduate level subjects in this study had the ability to do formal reasoning, as defined by the ATFR. The mean for these students was 24.7, with a standard deviation of 4.05.

Categories of Formal Reasoning for the ATFR for Arlin's Young Artists and Young Scientists (grades 9 - 12) (N = 36)

	Category	%
1.	High Concrete	19%
2.	Transitional	17%
3.	Low Formal	39%
4.	High Formal	25%

Thus, 64 per cent of the high school students in Arlin's study had the ability to do formal reasoning. Norms for the ATFR for 2,755 grade 9-12 students in the U.S.A. provided a mean score of 18.86, with a standard deviation of 4.98 (Arlin, 1984). No norms were provided for graduate students.

Therefore, 93 per cent of the graduate students demonstrated Formal Reasoning ability, while only 64 per cent of Arlin's high school students were performing at the level of formal reasoning. Perhaps the lack of correlation found between Formal and Postformal Reasoning for the graduate level subjects is due to the homogeneity of their Formal Reasoning scores. However,

this does not detract from or in any way disprove Arlin's proposition concerning a cognitive developmental sequence between Formal and Postformal Reasoning. It does, in fact, substantiate her propositions of cognitive development beyond the teenage years, since one would expect graduate level subjects to perform at a higher level of Formal Reasoning than high school students.

Hypothesis 1

Hypothesis 1 proposed that "Wisdom: the art of problem finding" be defined as a multidimensional construct consisting of cognitive, affective and conative elements in combination with a thinking style component, plus creativity. In order to identify the underlying constructs among the variables, an exploratory factor analysis was undertaken. Two factor analyses with 14 variables each were carried out to account for all five thinking styles. On the first set of variables the Pragmatist style was omitted, and on the second, the Realist style was omitted. This was necessary because of the ipsative scaling used in the InQ-R. The last choice of the InQ-R's forced choice, self-rating scales lacks freedom, as it is tied to the previous choices. Most statistical tests are based on the assumption of independence of the elements entering statistical formulas. The resulting linear dependency of the last choice thereby generates factors which cannot be meaningfully interpreted (Kerlinger, 1973). Therefore, by first omitting the Pragmatist and then the Realist style, this problem was circumvented. The Pragmatist and Realist styles were chosen for this purpose since, from a theoretical perspective, they were believed to be least relevant to problem finding. Theoretical support for this position is provided by Wood (1983, 1990) who suggests that Locke's inquiring system (which is measured in this study by the Realist mode of inquiry) and the Leibnizean inquiring system (which is measured in this study by the Analyst mode of inquiry) is best suited for dealing with well-defined problems. However, since Analyst mode and Formal Reasoning were positively correlated at .262, $p = .001$, and since Formal Reasoning is a necessary but not sufficient condition for Problem Finding (see Arlin, 1975-76, 1989), the Realist style was determined to be least relevant to Problem Finding. Ability to deal with ill-structured problems is, he claims, better served by the more abstract dialectical Hegelian, relativistic Kantian, or Pragmatist modes. However, it is the present author's opinion, based on her experience with working with theinquiry modes for the last ten years, that, unless the Pragmatist mode includes a substantial ability for the Synthesist mode in its flexible approach, it will not be able to serve the more ill-structured or wicked-decision kinds of problems. Harrison and Bramson (1982) state that only about 11 per cent of the population in North America prefer the Synthesist mode, and they further suggest that the ability to think in the dialectic is also limited among North Americans. Therefore, the present author chose the Pragmatist mode as the second least essential mode for Problem Finding. Of the 25 variables involved in the study, 14 variables were chosen for factor

analytic purposes. This selection was based on a number of considerations. The choice of variables was somewhat limited due to sample size. With 100 subjects, it would not be practical to include all 25 variables in a factor analysis. To do so would result in too many uninterpretable factors. (Factor variances would be extremely low, perhaps accounting for only one per cent of the variance.) Priority was therefore given to those indicators that were most essential to the conceptual framework. Thus, measures of Cognitive, Affective and Conative elements, together with a measure of Cognitive Style were included. Since Arlin's (1975-76) study included a measure of Creativity, a measure of creativity was also included in the present study. As Sternberg (1990) points out, wisdom overlaps with intelligence, and to a lesser extent, with creativity. The two sets of principal components (PC) analyses including varimax rotations were then conducted for the 14 variables. Following the PC factoring procedure with varimax rotations, six factors were extracted (for both the Realist and Pragmatist sets) having eigenvalues greater than one. The varimax rotation converged in nine iterations for six factors with the Realist set, accounting for 73.3 per cent of the variance. For the Pragmatist set, the varimax rotation for six factors converged in eleven iterations, accounting for 71.3 per cent of the variance.

Results of the two factor analyses are provided in Tables 16 and 17. On visual inspection of the two sets, few differences were noted. Therefore, including first the Realist and then the Pragmatist variable made very little difference in the makeup of the factors for the two combinations of variables .

Factor 1 was identified as conative potential with a positive mental attitude, which together constitute what the present author believes to be inherent motivation. The loadings were basically the same for both the Realist and Pragmatist sets. Loadings ranged from .85 to .66 for Planning, Positive Emotions, Additional Components, Acting and Reflecting, on the Realist set of variables. They ranged from .86 to .62 on these same five variables on the Pragmatist set, with Planning and Positive Emotions loading highest on both sets. Negative Emotions also loaded at -.47 on the Pragmatist set. For both the Realist and Pragmatist set, Factor 1 contributed 22.3 per cent of the variance. Thus it appears that, of the six factors, a combination of Conation and Positive Affect is most essential to "wisdom: the art of problem finding" as defined here, at least for this particular group of graduate students. It is here proposed that this combination constitutes the better part of what is so essential to achievement - that being motivation - and I suspect inherent motivation especially. Factor 2 was identified as logical, analytic, reasoning for both sets with high positive loadings on not only the Analyst thinking style (.80 for the Realist and .86 on the Pragmatist), but also on Formal Reasoning, with loadings of .70 on the Realist set and .61 on the Pragmatist set. It contributed 15.3 per cent of the variance for the Realist set and 14.2 per cent for the Pragmatist set. Idealist was also negatively correlated at - .54.

Factor 3 was identified as substantive, dialectical thinking, with Synthesist thinking style loading highest at .81 for the Realist set and .70 on the Pragmatist set. Idealist also loaded .42 on the Realist set. The Realist thinking style loaded at -.81 on the Realist set and the Pragmatist style loaded at -.86 for the Pragmatist set. It contributed 11.2 per cent of the variance for the Realist set and 11 per cent for Pragmatist set. Thus, the cognitive component of the hypothesis was verified.

Factor 4 was identified as Affect Intensity with Negative Emotions. The Affect Intensity Measure loaded at .75 on the Realist set and .80 on the Pragmatist set. Negative Emotions loaded .73 for the Realist set and .62 for the Pragmatist set. Factor 4 contributed 9.3 and 10.5 per cent of the variance, respectively, for the Realist and Pragmatist sets.

Factor 5 was identified as Problem Finding Ability and showed the students' highest score on the problem finding task loading at .88 for the Realist set and .89 for the Pragmatist set of variables. It contributed 7.7 per cent of the variance for the Realist set and 7.9 per cent for the Pragmatist set of variables.

Factor 6 was identified as the Quality of Creative Achievements and loaded .90 for the Realist set and .95 for the Pragmatist set of variables. It contributed 7.4 and 7.2 per cent of the variance respectively for the Realist and Pragmatist sets of variables . Thus, with creativity, along with cognitive, affective and conative elements , as well as the cognitive style component being accounted for in the six factors, it appears that Hypothesis 1 can be accepted. The clarity of these factors and their high loadings indicate that the independence of the measures used in this study is quite well supported. The six factors that are delineated here as constituting "wisdom: the art of problem finding" correspond well with the constructs associated with higher-order reasoning and wisdom.

Hypothesis 2

Extreme Group Comparisons of High and Low Problem Finding Ability

Hypothesis 2 concerns those variables showing significant differences between extreme groups of students demonstrating problem finding ability and those not demonstrating this ability. Two sets of t-tests were conducted across the 25 measurement variables listed in Table 15 in order to explore the effects of these predictor variables on Problem Finding. The first set of t-tests involved Problem Finding as defined according to Arlin's formula as the criterion variable, with the top 25% having Problem Finding scores ≥ 3.90 and the bottom 26% having Problem Finding scores ≤ 3.00. Not counting the significant difference found with PF itself, results indicated that significant differences were found for Highest Score with a mean of 5.46 (S.D. =.706) for those demonstrating problem finding ability and for those not demonstrating this ability, a mean of 4.04 (S.D. = .958), $t = -6.10$ ($df = 98$) $p = .000$. Thus, students having Problem Finding scores at

Table 16

Principal Components Analysis for 14 Variables Purported to Contribute to Wisdom: the Art of Problem Finding (R included)

Varimax Rotation for a Six Factor Solution

Measure	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	h^2
PLAN	**.854**	.067	-.133	-.097	-.018	.045	.764
POS	**.772**	-.162	.069	.106	.223	.082	.695
ADDCM	**.696**	-.274	.035	.051	-.047	.207	.608
REF	**.667**	.272	.321	.099	-.265	-.173	.732
ACT	**.663**	.119	.030	**-.527**	-.180	.023	.765
A	.119	**.803**	-.147	.134	.069	.108	.715
FR	-.201	**.710**	.044	-.181	.093	.007	.587
I	.030	**-.536**	**.416**	.120	.314	.307	.668
R	-.063	-.056	**-.813**	-.058	-.236	-.271	.800
S	.004	-.250	**.805**	-.117	-.076	-.214	.776
AIM	.371	-.086	-.165	**.754**	.071	-.047	.748
NEG	-.369	.036	.157	**.733**	-.254	.033	.765
HS	-.038	.104	.116	-.062	**.878**	-.093	.808
QL	.126	.045	.031	-.031	-.090	**.895**	.830
Eigen-values	3.129	2.148	1.572	1.297	1.084	1.029	
Percent of Variance	22.3	15.3	11.2	9.3	7.7	7.4	

h^2 = communality

(Pragmatist style of thinking is omitted)

Bolded type indicate loadings ≥.40

Table 17

Principal Components Analysis of 14 Variables Purported to Contribute to Wisdom: the Art of Problem Finding (P included)

Varimax Rotation for a Six Factor Solution

Measure	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	h^2
PLAN	**.857**	.110	-.022	.013	-.001	.072	.753
POS	**.754**	-.153	.132	.215	.225	.049	.708
ACT	**.721**	.099	-.014	-.462	-.157	.024	.768
ADDCM	**.700**	-.278	-.079	.153	-.067	.114	.615
REF	**.619**	.169	.384	.056	-.254	-.020	.626
A	.108	**.858**	.106	.158	.058	-.007	.788
I	.020	**-.619**	.245	.133	.316	.280	.639
FR	-.201	**.611**	.024	-.290	.123	.174	.544
P	-.079	-.170	**-.864**	-.103	-.158	-.009	.817
S	-.017	**-.450**	**.700**	-.240	-.047	-.075	.758
AIM	.278	-.037	-.110	**.795**	.013	-.044	.725
NEG	**-.468**	-.002	.234	**.619**	-.275	.125	.749
HS	-.049	.038	.080	-.063	**.892**	-.032	.811
QL	.143	.002	-.042	-.010	-.034	**.950**	.926
Eigen-value	3.13	1.98	1.53	1.47	1.11	1.01	
Percent of Variance	22.3	14.2	11.0	10.5	7.9	7.2	

h^2 = communality estimate

R (Realist style of thinking is omitted)

Bolded type indicate loadings ≥.40.

≥ 3.90 had a mean of 5.46 on Highest Score and students having Problem Finding scores at ≤ 3.00 had a mean of 4.04 on Highest Score. Also significant were results for PF5/6, with a mean of 2.81 (S.D. = 2.37) p = .000 by those demonstrating this ability. For those not demonstrating this ability, the mean was .39 (S.D. = .75), p ≤ . 000. No significant differences were found for any of the variables given the requirement for significance at ≤ .025.

The second set of t-tests were conducted for the Highest Score as the criterion variable, with the low scores being ≤ 4 and high scores being ≥ 5. These parameters were based on the fact that scores at ≥ 5 are believed to be indicative of problem finding, while those ≤ 4 are believed to indicate problem solving or Formal or Concrete levels of Reasoning ability (Arlin, 1989). Not counting the Highest score differences for HS itself, significant differences between Highest Score and Problem Finding ability according to Arlin's formula were found for the subjects, and for the Problem Finding 5/6 variable. However, since these results don't apear to provide any new information, these results will not be explicated. No other significant differences were found for the 25 variables.

Results from the Pearson correlations in Table 15 for the three indicators of Problem Finding ability also showed only a few low, although significant, correlations with any of the other variables. Some suggestions concerning the reasons for such results are offered in the discussion.

CHAPTER V
DISCUSSION AND IMPLICATIONS

This chapter will discuss the results outlined in the present study in terms of the subgroups within the sample that was obtained, as well as the relationships among the variables, both measurement and demographic. The factor analytic solution will receive special emphasis. Finally, implications and recommendations for research and education will be delineated.

Gender

Males and females differed significantly on two variables. Males scored higher than females on Formal Reasoning, while female ratings were higher on Additional Components (the 10 more complex emotions such as determination, curiosity and sense of humor). This suggests that this group of males are better at formal reasoning than their female counterparts, while these females appear to be more likely than their male counterparts to experience the more complex kinds of emotions. However, it seems important to make clear that, with a mean score of 23.27 (low formal) for females and 25.89 (high formal) for males, and with 18 being the score required to qualify as performing at the level of Formal Reasoning, it is obvious that, overall, the subjects in this study, whether male or female, were quite capable of performing at the level of Formal Reasoning.

Age Groups

By dividing the students into two groups of those ≤ 30 and those > 30, significant differences were found for those ≤ 30 on the Analyst mode. Those > 30 naturally rated themselves higher on years of Work Experience. While it is reasonable to expect older people to have more Work Experience, why those ≤ 30 would rate themselves as preferring an Analyst style of thinking more than their older counterparts is open to speculation. It may be that the younger subjects are entering university requiring higher levels of analytic ability than was ever required of their older counterparts. On the other hand, it may be that the older subjects adopt a preference for a less analytic, but more pragmatic, and/or relativistic, dialectic approach as they gain experience in dealing with the problems of everyday life (see Sternberg, 1990). Furthermore, the effect of broadening their approach may therefore be such that it would not show up as significantly different from their younger counterparts on any one style, either.

Problem Finding, Highest Score and Quantity of Higher Order Questions Asked

The need to provide three different scores for problem finding became apparent when the Problem Finding weighted formula used by Arlin was not measuring the ability to ask a higher

order question, or problem finding ability per se, i.e. the ability to generate quality questions in an ill-defined situation. Her weighted formula was more concerned with obtaining an average score of all the questions asked. As was alluded to on page 35, for the subject who asked many lower order questions and only one or two higher order ones, the weightings of the lower order would cancel out the effect of the higher order ones on the final score.Thus, a person who asked only one question at the five or six level would score considerably higher than a person who asked several higher order questions along with a lot of lower order questions. This seemed counterproductive. Therefore, in order to determine if the students had actually asked any higher order questions, and if so, how many, the HS (Highest Score) and PF56 (number of questions asked that were rated at the five and/or six level) variables were created. Because quality of questions have been defined by Arlin (1975-76) as Guilford's structure of intellect products at the fifth and sixth levels, (transformations and implications), the HS and PF56 indicators were included along with Arlin's weighted formula. According to Arlin (1989), the high Formal Reasoning category of the ATFR is probably equivalent to Guilford's fourth category at the level of systems. The significance of the PF56 indicator becomes evident when you realize that only 62 per cent of the graduate students were able to ask a question at this level. Thus, while 93 per cent of these graduate students were considered to be able to do Formal Reasoning, only 62 per cent were able to ask the kinds of questions necessary to elevate their thinking to the level of postformal reasoning. Table 15 shows all three indicators (HS, PF, and PF56) to be well correlated and highly significant with HS most highly correlated with PF56 at .631, $p = .001$.

One of the most obvious payoffs for the inclusion of these additional indicators is provided in the results of the t-tests involving the Master's and Doctoral level students, where Doctoral students performed significantly better than Master's level students in their ability to ask higher order questions, as indicated through the HS variable. The PF and PF56 variables, however, did not discriminate between the groups. The Pearson correlations (Table 15) also showed the HS variable to be significant for the Doctoral variable, correlating at .252, $p \leq .001$, while the PF variable correlated at only .028, and was not significant. While the PF56 variable was not significant either, it did correlate a little better than the PF variable at $r = .101$, indicating that it is a slightly more reliable indicator of the ability to ask a quality question than the PF variable is. Clearly, however, the HS variable is the most reliable indicator.

Master's and Doctoral Level Students

A comparison of Master's and Doctoral level students produced results that were supportive of problem finding as higher order, postformal reasoning and cognitive development. Doctoral students had significantly higher scores on Highest Score and Synthesist thinking, both of which have been associated with higher order reasoning. Highest Score indicates the extent to

which a student is able to ask a higher order question (i.e. a transformational or implications level question). Higher scores on the Synthesist style indicates one's relative preference for dialectical thinking. As Arlin (1989) points out, dialectical thinking is so essential to the problem finding process, because it involves a developmental transformation that occurs through a process of constitutive and interactive relationships. Being substantive and value-oriented, it questions basic assumptions, sees likenesses in things that are unlike, gets at essences, and thrives on change and conflict. Highest Score and Synthesist thinking involve the kind of higher order, abstract forms of thought that are associated with postformal development (Arlin, 1989; Basseches, 1980; Wood, 1983). It is, however, of interest to contemplate why no significant differences were found for Synthesist thinking and the Highest Score (HS) variable for Problem Finding for extreme group comparisons in Hypothesis 2. Nor did the two variables correlate significantly with HS in Table 15, although Highest Score did correlate positively and significantly with the Doctoral variable, and negatively with the Realist style. In attempting to explain why the PF and PF56 results were not significant for the Doctoral variable, it appears that Arlin's weighted formula for determining PF neutralized the Higher Order questions asked by the Doctoral students with the number of lower order questions they also asked, thus reducing their problem finding performance to that of the Master's level students. Also, the number of higher order questions asked by the Doctoral level students was not significantly different from the number asked by the Master's level students. This simply states that for the 61 Master's and 31 Doctoral level students, the "mean" number of higher order questions asked was between one and two (Master's = 1.18, Doctoral = 1.54).

Because Formal Reasoning is considered to be a necessary but not sufficient condition for problem finding, it is not surprising that the mean score for the Doctoral Students on this variable was 25.29, placing them in the High Formal category (see Table 8, page 53). It is also interesting to note from a visual inspection of Table 8 that the mean scores were higher on the Synthesist and Idealist styles of thinking for Doctoral students, while the scores for Master's students were higher on Analyst and Realist styles of thinking. This tendency is in keeping with the propositions of Wood (1983) and the present framework that the more substantive styles are associated with higher order reasoning, while the more functional styles are associated with the more formal kinds of reasoning. The abilities and preferences of Doctoral students outlined this far for problem finding, formal reasoning, and thinking styles leads one to question whether the conative and affective elements have high scores for Doctoral students as well. A comparison of Doctoral students mean scores on Positive Emotions with those of both the Masters students (see page 53) and the 1991 "Norms" (see page 36-37) show Doctoral students to be at or above the mean for the norming group of graduate students. Their mean scores on Negative Emotions, when compared with both the Master's students (see page 53) and the 1991 "Norms" (see page 36-37) also indicated that they were within the normal range. For the Additional Components (more complex emotions or

character traits), Doctoral students were again within the normal range for graduate students. In terms of their Conative Potential, Doctoral students had scores within the normal range on Planning, Acting and Reflecting. Thus, it appears that the ability to ask a higher order question for problem finding is associated with a high level of knowledge (Doctoral level), a preference for Synthesist thinking style, and possibly lower scores on Affect Intensity. Furthermore, Doctoral students as a group scored in the High Formal category on Formal Reasoning, and also had scores within the normal range on measures of affect and conation.

From the marginally higher scores of the Master's level students on Affect Intensity, (AIM) it may be inferred that they require more involvement in the process of balancing and mastering their affect than do the Doctoral students. One possible explanation for the Doctoral students' preference for Synthesist thinking, may come from Wood's (1983) proposition of a developmental sequence of added competencies for the five inquiring systems. Thus, competency in Analyst and Realist (Leibnizean/Lockean) problem solving is purported to deal with well-structured problems, while ill-structured problems, involving the inherent relativity of multiple intellectual perspectives, are dealt with using Kantian (Idealist), Hegelian (Synthesist), and Singerian (Pragmatist) functioning. Therefore, if one can assume that students at the Doctoral level deal more with ill-structured problems than students at the Master's level, they would be expected to prefer a more Hegelian approach (Synthesist) for dealing with the problems they face.

Administration (Business, Education, and Health Services), Natural Sciences (Medical, Biological, Chemical, and Earth Sciences, and Engineering) and Humanities (Social Sciences, Arts, Fine Arts and Education)

Significant differences among the three discipline-based groups were found for Formal Reasoning between Natural Sciences (mean of 26.57) and Administration (mean of 25.36) with both scoring at the high formal level, while students in the Humanities (mean of 22.19) scored at the low formal level of reasoning. It is also interesting to note that, with 25 being the score required to qualify as high formal, this may indicate that these Humanities students have less need for this kind of formal reasoning, which is so basic to scientific thinking. Or, perhaps this difference results from a self-selection process in which students in these two groups choose their disciplines based on their own perceived abilities and what kind of academic criteria constitute these respective disciplines; thereby establishing the "norm" for these disciplines. Humanities rated themselves higher on Negative Emotions than did the Administration students. Why students in these Humanities should rate themselves as experiencing Negative Emotions more frequently than those in Administration might be attributable to the kind of emphasis that is placed on keeping a positive mental attitude in the two groups. Administrators are expected to "set the tone" and

present a confident, optimistic and positive attitude, and so are less likely to allow themselves to be downcast. Gender differences were also noted between Humanities (mean of 1.63) and Administration (mean of 1.29), indicating that Humanities had more females than Administration. In summary, then, the Humanities group had lower Formal Reasoning scores than either the Administration or Sciences groups. They also had higher Negative Emotion ratings and more females, than did the group of Administration students.

Differences in age were especially apparent between Administration (mean of 34.02) and Science (mean of 28.52). This difference was reflected for these two groups in their Work Experience, suggesting that this group of Science students have chosen not to interrupt their education with employment in the way that students in Administration have. This tendency has implications for students in Administration, as they appear to be predominantly male, older, with more experience and perhaps, therefore, more secure than the Science students. Age and experience are important variables in the development of wisdom, as they have been included in those terms used to refer to what constitutes wisdom by Clayton and Birren (1980) and others.

Students in Business Versus Those in All Other Disciplines

This additional analysis of Business students follows from research carried out by Sternberg (1990), with university professors from a variety of disciplines, into the implicit theories held by these professors with respect to wisdom, creativity and intelligence. What was most striking in the correlations between wisdom, creativity and intelligence for the professsors' listings of behaviors associated with each, was the single negative correlation - that between wisdom and creativity - for the business professors. As he points out, managers tend to view creative people with skepticism, and certainly do not regard them to be the kind of people who should be running the organization. de Bono (1992, 1993) also laments the emphasis on analysis at the expense of creativity in the way business students are taught. He proposes that in addition to analysis, they should also be taught "serious creativity" - which he differentiates from traditional notions of creativity - if they are to be successful in the 1990s and beyond. With business students constituting 31 per cent of the sample in this study, there is opportunity here for some further investigation of whether Business students show any unique characteristics in terms of these wisdom related variables. Therefore, it is interesting to note that Business students had higher scores than students in the other disciplines on Formal Reasoning (mean of 26.16 versus 24.06) and on the Pragmatist style of thinking (mean of 55.03 versus 51.42). This higher ability in Formal Reasoning may be gender related, since this group of Business students also had significantly more males (mean of 1.26) than females (mean of 1.54). Table 3 shows 19 males and 8 females in the Master's of Business Administration program. Add to this 3 males and 1 female in the Doctoral program in Business, and it becomes clear that the 22 males far

outnumbered the 9 females in this sample. Table 5 shows males performing better than females on FR. Thus, the male predominance in the Business students may have influenced the result found here as well. That they also preferred a Pragmatist mode of inquiry is in keeping with some earlier findings by Bramson, Parlette, Harrison and Associates (1985), who found CEO's of small and medium companies to also prefer a Pragmatist mode of inquiry. Thus, it appears that this group of graduate level Business students think like CEOs of small and medium companies, which is what one might reasonably expect.

The lower scores obtained by Business students on Synthesist thinking compared to the non-Business subjects may be explained by the fact that 27 of the 31 students comprising this group were at the Master's level. Examination of scores comparing Master's and Doctoral level students in Table 9 reveals that Doctoral level students received higher scores, on both Highest Score on Problem Finding and Synthesist style of thinking, than did the Master's level students. This may be explained by the fact that there were 62 Master's level students altogether, and apparently the 28 Master's level Business student's scores were sufficiently weighted by the other 34 Master's degree students in the Other group to cancel out the effect of the 27 Doctoral students also in the other group, who would otherwise also have higher scores on the HS variable.

This group of Business students therefore appears to be quite adept at the kinds of skills needed for analyzing information, solving problems, and making decisions. However, as de Bono (1992) points out, success in business in the 1990s and beyond will depend on a shift to conceptual thinking, not instead of information analysis and decision making, but in addition to them. He further contends that while analysis can yield some of the decision making alternatives, the rest must be produced through the creative design of innovative concepts. Concepts, he predicts, may even replace technology in their importance to societal advancement. It is therefore becoming increasingly apparent that 'business as usual' won't work anymore.

The relative preference for the Pragmatist mode (mean of 55.03) can provide some of the flexibility needed in this direction. However, according to Harrison and Bramson (1982) a score of at least 60 is required before a preference can be at all ascertained, and the Pragmatist mode, in drawing on whichever mode serves the needs of the moment, should include thinking in the Synthesist mode. With their mean of 45.00 versus 49.90 for the rest of the subjects, the Business students appear to be reticent to use the Synthesist mode, and are therefore less likely to ask a higher order question when dealing with ill-structured problems. This reticence to use the Synthesist mode by these Business students merits further discussion, for it is so basic to bringing about real change through new paradigms. It is thus Harrison's and Bramson's (1982) adaptation of Churchman's (1971) particular version of the dialectical approach of questioning the obvious, getting at underlying assumptions, confronting problems directly, third-party observation, simultaneously entertaining opposing ideas, speculation and fantasy, proposing far-out solutions

and negative analysis, that unique and innovative concepts can be generated. Perhaps then, with an added ability in Synthesist thinking and Problem Finding, some real alternatives can be generated for dealing with the complex and ill-structured problems that organizations are being confronted with. The lack of awareness of the kinds of agents needed for any real change and innovation, and the implications of this for the future, are indicated in these results for graduate level Business students.

Therefore, while it is true that only about 11 per cent of the population prefers to think in the Synthesist mode (Harrison & Bramson ,1982), and while this approach does seem to fly in the face of convention - even opposing the logic of the 'scientific method'- its value in resolving ill-structured and convoluted problems should be acknowledged. Granted, Synthesist thinking did differentiate the Master's students from the Doctoral students, but the need for this approach by those in, and especially those entering business, remains. Therefore, it seems clear, that there is a place in business for the dialetical approach, for as Harrison and Bramson (1982) point out, the thinker who can think as both an Analyst and a Synthesist can have immense intellectual and conceptual power. Concepts are, as de Bono (1992) makes clear, the way of the future.

Correlational Analysis

In addressing the degree of fit between the conceptual framework outlined in Figure 2 and the variables involved, it appears that the only positive correlations found between the five styles of thinking and the three basic elements of wisdom were those between Formal Reasoning (Cognition) and the Analyst style, and Positive Emotions (Affection) and the Idealist style. While this leaves one to wonder where the Synthesist, Pragmatist and Realist styles might fit into the proposed framework, it is encouraging to have successfully predicted these correlations for the Analyst and Idealist styles. It is especially supportive for the Idealist style and its correlation with the Positive Emotions and Positive Emotions plus Additional Components variables, rather than the Negative Emotions. The point here being that frequency of Positive Emotions is more characteristic of an Idealist approach than is intensity of emotions or frequency of Negative Emotions. It is this positive affect, as the factor analysis indicates, that is more essential to "wisdom : the art of problem finding". While no positive correlations were found for the Realist style, the negative correlation of Realist with the Highest Score measure of problem finding (r = -.164) supports the discriminating ability of the InQ concerning theories put forth by Harrison and Bramson (1982) and Wood (1983), that the Lockean, empiricist Realist style of thinking is a more fact-oriented and concrete approach than is the more abstract, higher order reasoning measured by Highest Score.

The negative correlations of the Pragmatist style with Reflecting and Positive emotions is interesting in terms of its lack of commanality with these two measures, especially the latter.

One further negative correlation was noted for Formal Reasoning with the Idealist style, $r = -.244$, $p = \leq .001$. Such a negative correlation is in the expected direction and supports the discriminating ability of the two measures. The Idealist style is characterized by a more value-oriented, relativistic approach, as opposed to the fact-oriented, logical, scientific approach of the ATFR.

Some significant correlations were also found between the styles of thinking and the demographic variables. These findings support the results of the t-tests reported earlier and will therefore not be reported again here. Some other variables having correlations that were not reported in the t-tests or ANOVAs included those with Quality of Creative Achievments, Quantity of Creative Achievements, whether or not a Vision accompanied the Creative Achievements, and Work Experience. Where these correlations were $\geq .2$, $p \leq .05$, they will be discussed here. Positive Emotions plus additional components were correlated with Quantity of Creative Achievements at $r = .189$, $p \leq .05$. As would be expected, Quality of Creative Achievements were correlated with Quantity of Creative Achievements at $r = .597$, $p \leq .001$. However, while no significant correlation was found for Quantity of Creative Achievements and Vision, the Vision variable was positively correlated with Quality of Creative Achievements at $r = .281$, $p \leq .001$, suggesting that the question of whether one's creative achievements are accompanied by a vision is associated more with the Quality of Creative Achievements than the Quantity. Work Experience was negatively correlated with the Analyst style of thinking at $r = -.322$, $p = .001$, but positively correlated with the Pragmatist style at $r = .220$, $p \leq .05$. This may be interpreted to mean that work experience tends to discourage or reform the Analyst preference in favor of the Pragmatist approach, or, that the younger, less experienced students actually are better at formal reasoning than the older students, or both. Work Experience was also positively correlated with both Quality of Creative Achievements at $r = .208$, $p \leq .05$ and Quantity of Creative Achievements at $r = .272$, $p \leq .01$. While it is possible that the more experienced are more creative, this increase in creativity with Work Experience may be a function of the amount of time available for creative pursuits, with the less experienced students being younger, and therefore having less opportunity for creative achievement.

Correlations Among the AIM, RES, and GOI

With two exceptions, the 36 correlations among the AIM, RES (POS, NEG, ADDCM, POSAD) and GOI (ACT, PLAN, REF, TOTGOI)) scores contributed to the concurrent validity of these three instruments. All were significant at $\leq .05$, with the two exceptions occurring between the AIM and the Acting subtest of the GOI, and the Total of the three GOI scores. Ten scores were significant at $\leq .001$. Especially noteworthy in terms of their positive correlations are those correlations between Positive Emotions plus Additional Components (POSAD) and Planning, with $r = .576$, $p \leq .001$; between Positive Emotions and Planning, with $r = .544$, $p \leq .001$;

between Positive Emotions plus Additional Components (POSAD), and the Total score for the GOI with r = .551, p ≤ .001; and between Positive Emotions and Total score for the GOI with a r = .519, p ≤ .001. Clearly, conation and affection are intricately related, although these two are not correlated sufficiently highly to be considered synonymous. The discriminating ability of the instruments was made apparent through the negative correlations occurring between Negative Emotions (RES) and Acting (GOI), with r = -.480, p ≤ .001; Planning (GOI), with r = -.318, p ≤ .001; and the Total score for the GOI with r = -.345, p ≤ .001. This stands in stark contrast to the strong positive correlations occurring with conation (GOI) and the Positive Emotions. One might infer from this that harboring Negative Emotions could inhibit the propensity for Acting or Planning in the attainment of one's goals. Even overall Goal Orientation is diminished with Negative Emotions. Furthermore, because planning is associated with higher order mental processes (Springer and Deutsch, 1993), the ability to engage in the kind of higher order reasoning that is so necessary in resolving ill-structured or wicked-decision kinds of problems, could also be impaired. While what is being suggested here serves more to refine and/or substantiate current theories than to provide anything new, important implications do exist for these findings at the individual, organizational and societal levels. Negative emotions often arise at those critical times when complex and ill-structured problems, at any of these levels, confront us. It is the wise person who knows how to detach him/herself sufficiently from such situations, so as to regain the positive mental attitude needed to generate unique and insightful solutions.

Correlations of the AIM with the RES and GOI scores were somewhat lower than those involving just the RES and GOI, the highest correlation being with Positive Emotions plus Additional Components (r = .284, p ≤ .05) and the lowest being with REF (r = .199, p ≤ .05). Thus it appears that affect intensity is, as one would expect, more associated with the frequency with which emotions are experienced than it is with conation (GOI).

Formal and Postformal Reasoning: Comparing Graduate Students and High School Students

Results from question four also provided evidence for substantiating both of Arlin's instruments. The fact that 93 per cent of the graduate students were able to perform at the level of Formal Reasoning versus 63 per cent of the high school students in Arlin's study, suggests that a developmental process may be involved. In measuring postformal reasoning, Arlin (1989) paired the problem finding task with seven other postformal cognitive measures involving tasks and interviews with the students. The quality of questions asked by the students in the problem finding task was correlated with most of the postformal measures at between .33 and .41, p ≤ .05. The omission of these additional postformal measures from the present study in favor of conative and affective measures is due to the knitting of Arlin's (1990) theory of "wisdom: the art of problem

finding" with Birren and Fisher's (1990) summary of what constitutes wisdom: - cognitive, affective and conative elements plus a cognitive style component. In summarizing her study, Arlin called for a broad conceptualization of adult thought, that can integrate the apparently conflicting or competing ideas being put forth by different theorists. The present study attempts to contribute to that end.

Hypothesis 1

Two figures are provided in order to represent the two versions of the factor analysis presented in Tables 16 and 17 using first the Realist style of thinking and omitting the Pragmatist and then using the reverse. Figures 3 and 4 portray the multidimensional construct of "wisdom: the art of problem finding" in its modified form, following the incorporation of current factor analytic findings, into the conceptual framework proposed in Figure 2. Once again, wisdom is at the apex of the framework, and "the art of problem finding" acting as the mediator, is situated between wisdom and the indicators of postformal reasoning.

Factor 1 consists of a pattern of Positive Emotions and Conative elements, including Acting, Planning and Reflecting. With the highest loadings ($\geq .75$) being on Planning and Positive Emotions, it appears that, for this sample of graduate students, "the art of problem finding" develops more out of affection and conation (inherent motivation), than out of any of the other indicators, accounting for 22.3 per cent of the variance.

Cognition is predominant in Factor 2 for Figures 3 and 4, with the Analyst mode of inquiry and Formal Reasoning loading highest on Factor 2, accounting for 15.3 and 14.2 per cent of the variance, respectively. Thus, the logical, analytic approach to problem solving that Arlin states is the necessary but not sufficient condition for problem finding is reaffirmed as an essential component of the "art of problem finding." With 93 per cent of the students demonstrating Formal Reasoning ability and 62 per cent demonstrating Problem Finding ability (PF56), (see page 49) reasoning is transduced into behavior through the three conation subscales: Planning, Acting and Reflecting. In summarizing the influence of Factors 1 and 2 on the "wisdom: art of problem finding," it appears that, at least for this group of graduate students, this form of higher order reasoning evolves, from the development and refinement of conation and affection (inherent motivation), together with the interaction of cognition. Factors 1 and 2 thus appear to define the basic constituents for "wisdom: the art of problem finding" as Conation/Affection and Cognition, and the first indication of a cognitive style component as proposed by Birren and Fisher (1990). This would support the proposed framework suggested in Figures 1 and 2, of the interaction of Conation and Affection (as motivation) with Cognition (problem solving), which develops into higher order reasoning and ultimately wisdom.

The Synthesist style is common to Factor 3 for both figures characterizing it as a substantive, dialectic approach. Factor 3 for Figures 3 and 4 would therefore fit with Arlin's (1989) definition of postformal reasoning, requiring a dialectical (Synthesist) approach. Figure 3, with an additional, moderate loading on the Idealist style (as indicated in Table 16) relates to Kramer's (1990) propositions on wisdom involving dialectical (represented here by the Synthesist thinking style) and relativistic thinking (sharing similarities with the Idealist thinking style).

Factor 4 in Figures 3 and 4 share high loadings on Affect Intensity and Negative Emotions, suggesting that higher order reasoning may be provoked out of emotionally problematic and conflict laden situations. Thus, one is provoked to find new ways of dealing with painful problems. As Kramer (1990) explains, such situations foster the development of relativistic and dialectic thinking. However, she cautions, that a high degree of affective and affective-cognitive integration is required for such development to take place; otherwise, in introducing these new ways of thinking into one's life and one's relationships with others, there is the potential for simply imposing one's own needs (ego) onto others. Kramer (1990) also discussed research with affect intensity where dialectical thinking was found to be positively and linearily related to age. However, only for those who maintained a high degree of affect intensity did this relationship hold. She concluded that an ability to respond affectively to the experiences of adult life (rather than becoming detached) may be necessary for continuing the development of dialectical thinking.

Factor 5 contains high loadings for the Highest Score on Problem Finding (HS) on both figures. This factor provides the only indicator of problem finding for this construct of "wisdom: the art of problem finding." However, that it should account for only 7.9 per cent of the variance is somewhat surprising in light of Arlin's (1990) propositions concerning what might constitute "wisdom: the art of problem finding". The more cognitive orientation of her definition contrasts with the present factor analytic solution wherein the Positive Emotions and Additional Components, together with the Conative elements of Acting, Planning and Reflecting in Factor 1 accounted for 22.3 per cent of the variance.

Factor 6 contains very high loadings on the Quality of Creative Achievements on both figures. Arlin's (1975-76) work found that the quality of questions (PF) asked on the problem finding task correlated significantly with such creative qualities as elaboration ($r = .21$, $p < .05$) and adaptive flexibility ($r = .26$ $p < .05$). While no actual measure of creativity was used in the present study, the listing of creative achievements by the students for this factor provides some index for describing the kinds of creative elements that Arlin was initially working with in delineating what constitutes Problem Finding. It is interesting to observe that three of the factors in this six factor solution of "wisdom: the art of problem finding" are represented in the Pearson correlations (page 62-63) with the Doctoral variable. The Doctoral students scores were positively

correlated with Highest Score on Problem Finding, the Synthesist style of thinking, and Quality of Creative Achievements.

In summarizing the factor analysis of the variables contributing to "wisdom: the art of problem finding," it appears that all of these variables and factors, which account for >.71 per cent of the variance, support the current literature in adult development. Factor 1 includes the Affective and Conative elements, Factor 2 the Cognitive and Factor 3 accounts for Cognitive Style (especially dialectical thinking) all of which account for about 48 per cent of the variance. That problem finding (HS) accounts for only about 8 per cent of the variance in Factor 5 suggests that the better part of "wisdom: the art of problem finding" lies not in problem finding per se, but in willing and striving and a positive mental attitude (inherent motivation), together with an ability and preference for logical, analytic thinking and substantive, value-oriented ways of knowing. This is not to say that it is a complete model. Nor does it deny that other elements might contribute to the construct. However, it seems fair to state that these findings are encouraging in delineating a framework for describing and explaining the development of "wisdom: the art of problem finding" and in further justifying it as a viable construct.

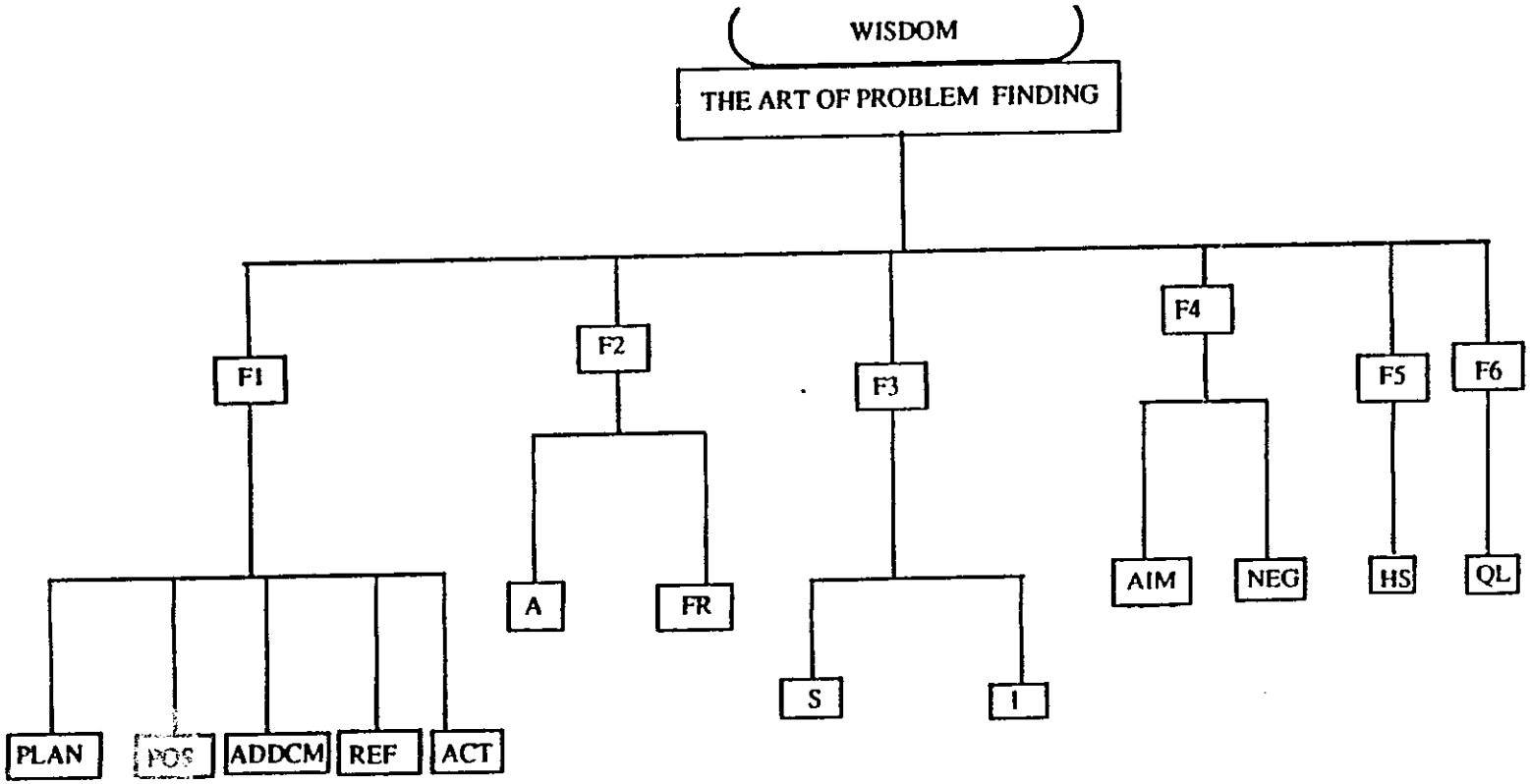
Hypothesis 2

Hypothesis 2 sought to determine whether the graduate subject's who demonstrated high problem finding ability also had higher mean scores on measures of cognition, affect, conation and the five inquiry modes, than did those rated low on problem finding ability. Results of t-tests indicated that, aside from the expected differences between high and low performers on the other Problem Finding variables, no significant differences were found with any other variables.

These results may be better understood if the homogeneity of the sample is taken into account. Arlin states that perhaps the best predictor of Problem Finding (using her weighted formula) is performance at the level of Formal Reasoning. However, her subjects have been at the undergraduate or high school level. With 93 per cent of these graduate students performing at this level, and 62 per cent demonstrating the ability to ask a higher order question, the likelihhood of problems with homogeneity arises.

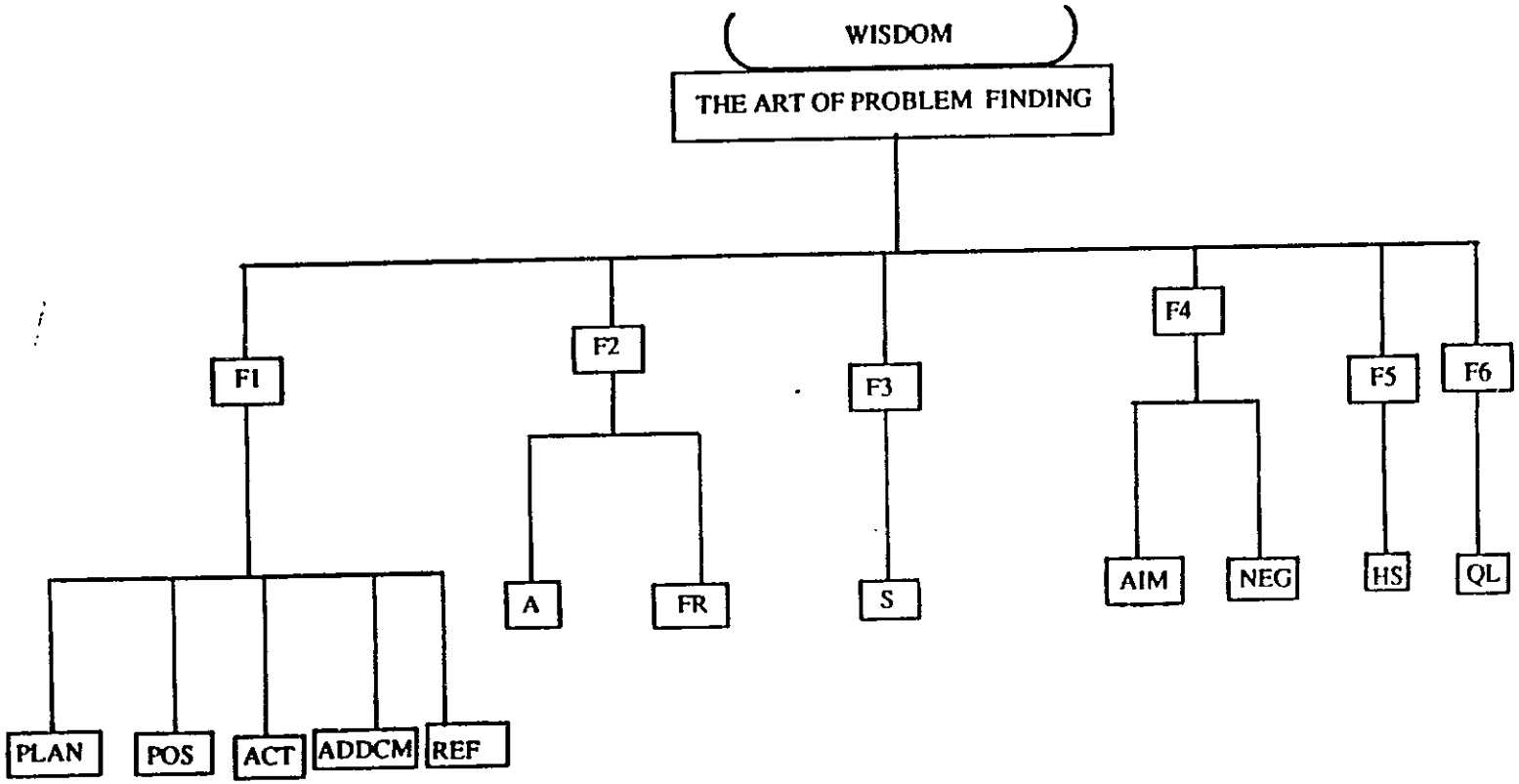
Another problem may lie in the Problem Finding task itself, since it involves two five minute timed sessions that deal with objects. It could be argued that the probability of obtaining a representative sample of someone's ability to ask a higher order question when confronted by an ill-structured problem might better be determined in a real life situation - or one that is at least less clinical. The rating procedure may also need refinement. Because many of the "wicked problems" we face involve people and society, it may be that a task relevant to these kinds of concerns would produce better results. Initial studies by Schwartz (1977) and Smilansky (1985)

Figure 3. A Six Factor* Solution for the Multidimensional Construct "The Art of Problem Finding" for the R Set of Variables (Table 13)



*F1 = Inherent Motivation, F2 = Logical, Analytic Reasoning, F3 = A Substantive, Dialectic Mode of Inquiry F4 = Affect Intensity
F5 = Problem Finding, F6 = Quality of Creative Achievements

Figure 4 . A Six Factor* Solution for the Multidimensional Construct "The Art of Problem Finding" for the P Set of Variables (Table 14)



*F1 = Inherent Motivation, F2 = Logical, Analytic Reasoning, F3 = A Substantive, Dialectical Mode of Inquiry, F4 = Affect Intensity, F5 = Problem Finding, F6 = Quality of Creative Achievements

addressing this concern to some degree were conducted following Arlin's (1975) initial study and have been discussed on page 13.

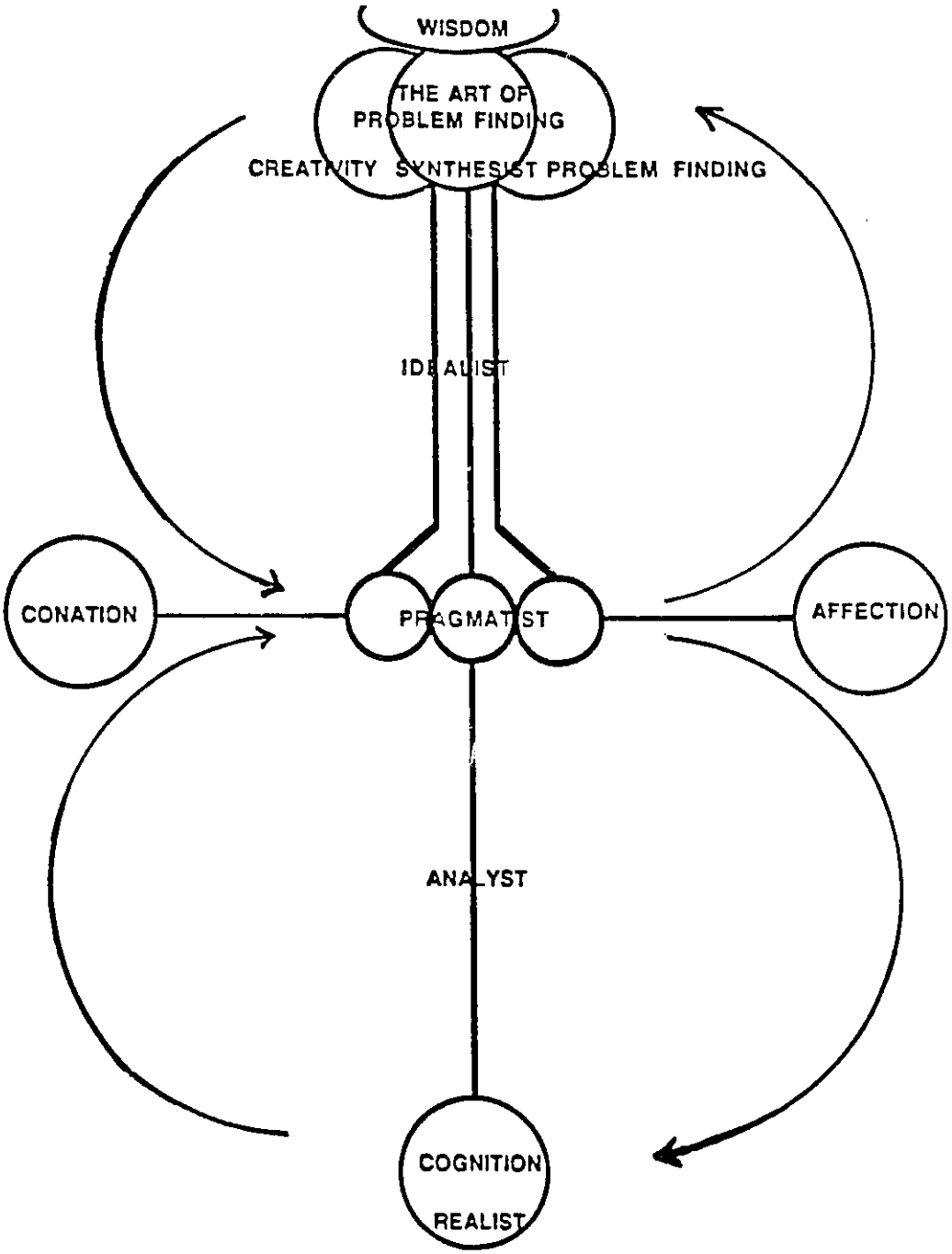
Problem Finding as determined by Guilford's structure of intellect products can give some indication of the ability to do higher order reasoning. However, it is currently being proposed that there are higher stages of human development that extend beyond where Problem Finding, as it is currently assessed can reach (see Richards and Commons, 1990). Some consideration for providing a more refined assessment of the kind of quality questions being asked - involving perhaps a greater scope or higher ceiling - may therefore be indicated.

However, it may be that these results can be useful in providing evidence for Arlin's (1990) concern that problem finding must be shown to be differentiated from creativity and divergent thinking. If we can assume that such creativity and divergent thinking is of the traditional kind, then de Bono's (1993) observations on the inherent weaknesses of creativity and divergent thinking as they are traditionally defined (i.e. brainstorming) may provide some support for Arlin's attempt to differentiate wisdom from creativity and divergent thinking. He regards such definitions of creativity and divergent thinking as being old fashioned and inefficient. Instead, he proposes the concept of "brain-sailing" to suggest a deliberate controlled process, in which we change tack as we wish, rather than being tossed about in the "storm." Problem finding would seem to be more closely associated with the more substantive kind of creativity referred to as "brain-sailing." The correlational results in Table 15 suggest that Problem Finding (whether HS, PF, or PF56) and Creativity (whether Quantity or Quality) are at best, only slightly associated. Tables 16 and 17 show the Highest Score on Problem Finding to be a clearly separate factor from Quality of Creative Achievements. It may also be that the lack of correlation between Problem Finding (HS, PF, or PF56) and Quality or Quantity of creative achievement may result from these particular operational definitions of Problem Finding and Creative Achievements.

Revising the Conceptual Framework for "Wisdom: the Art of Problem Finding"

Following the analysis of the data, the Conceptual Framework proposed in Figure 2 was revised to encorporate the present findings with the theoretical basis on which the framework was designed. In Figure 5 the cognitive style components were placed along the vertical axis to indicate the hierarchy of these modes of inquiry in terms of their appropriateness for dealing with well-structured and ill-structured problems (see Brabeck and Wood, 1990; Churchman, 1971; Harrison and Bramson, 1982; and Wood, 1983). The Cognitive, Conative and Affective elements, however, maintain their same positions. This change, which corresponds more closely with the inquiry mode literature just cited, is still in keeping with the correlations found between Formal Reasoning (Cognition) and the Analyst mode of inquiry, and the correlation of Positive Emotions with the Idealist mode, since relative to the other elements, there is still some degree of proximity

Figure 5 Conceptual Framework for Incorporating the Cognitive, Affective and Conative Elements, Together with the Cognitive Style Components of Wisdom with Arlin's Problem Solving - Problem Finding - Wisdom Developmental Process



themselves, and then with Cognition and the Inquiry Modes, in the development of these elements for the attainment of "Wisdom: the Art of Problem Finding". Having obtained these initial results concerning what constitutes "Wisdom: the Art of Problem Finding," the question arises as to how this process might develop. The present author envisages this process developing through a figure eight flow (see Figure 5, page 86) which begins in the upper left hand quadrant and proceeds from Conation - as the spirit moves us - toward Affection to involve the emotions. Following the integration of Conative and Affective elements, the process moves on downward to a further integration of Cognitive elements and then loops back toward the Conative and Affective (motivation) elements, before arriving at a higher level of development in which Problem Finding, Synthesist thinking and Creative applications can occur. As a total, dynamic, integrative, ever-acting organismic process, these elements are continuously being developed and balanced, leading to the attainment of wisdom: the art of problem finding and transcending it to ultimately become wisdom.

Limitations of the Study

This study is limited in a number of ways. First, in terms of research design, limitations of ex-post facto studies result from the lack of control over independent variables. Thus, as Isaac and Michael (1971) point out, all the other plausible hypotheses which might account for the results obtained must be considered. The present study provides some immunity against this uncertainty by applying a top-down approach and drawing upon a summation of the best information available in psychology (for its predictors and criterion) in ensuring that relevant causative factors are actually included among the many factors under study. A further limitation might result from the fact that no single factor is the cause of an outcome, but rather some combination and interaction of factors working together under certain conditions will yield a given outcome. As was stated in the method section, empirical methods compromise the ability to show how the elements are developed, balanced and integrated.

Also, while the focus of the study was on determining what the constituents of wisdom: the art of problem finding might be, the fact that the sample was drawn from volunteers, dictates that the results can only be applied to other graduate students to the extent that they fit the demographic and other characteristics - some of which are unknown - of the particular group of graduate students involved. The inherent homogeneity of a sample of graduate students also may bias the results. Although care was taken to use the best instruments available for the present purposes, they all are relatively new, and so could be strengthened in terms of their reliability and/or validity. It must be recognized that, while additional confirmation of postformal reasoning

could be had using additional measures such as those of dialectical and relational thinking (i.e. see Basseches, 1980; Labouvie-Vief, 1980; Riegel, 1973) and systematic, metasystematic, paradigmatic and cross-paradigmatic reasoning (Richards and Commons, 1990), the time required of students for completing the present minimal battery itself, prohibited such elaboration. Measures of Eastern cognitive styles might also provide additional valuable information to that of the Western philosophical/historical basis of the InQ-R. Physiological measures of not only cognition, but of affection and conation as well, are currently being reported in the literature, providing the possibility of more direct measures and/or neurological correlates for these processes. Such measures might contribute to a better understanding of the elements of wisdom and their relationships and processes in delineating "wisdom: the art of problem finding." Because ill-structured problems often arise out of problems involving people and society, a measure of problem finding ability based on this reality should also be included. Reports from fellow students or professors concerning these student's abilities, behaviors, attitudes and values, might also contribute to a more total picture, although they might also jeopardize voluntary participation by the students.

Delimiting the Sample

Subjects at the graduate level were chosen to constitute the sample since they are more likely to demonstrate ability in formal reasoning than a less mature group. This ability is considered to be a necessary although not sufficient condition for problem finding.

Implications and Recommendations

Research

As we enter the 1990s, facing economic and political uncertainty, within a context of incredible changes for our global society - with its multitude of technologies - the need for new and better ways of addressing ill-structured problems becomes increasingly apparent. The recent application of methods of self-understanding and self-regulation in the academic and business world has sparked a series of studies and publications describing how learners cognitively, emotionally, motivationally, and behaviorally promote their own academic achievement, or performance, within the organization (Bandura, 1986; Hershberger, 1989; Sternberg, 1988; Zimmerman & Schunk, 1989). Research into how students master the cognitive, affective and conative domains, when integrated with the process of their mastery of the situationally responsive application of the five main modes of inquiry, should offer direction for fostering self development and understanding, and a greater degree of wisdom, in carrying out the problem finding process. This can be fostered through improved methods and instruments for measuring the various components that comprise such postformal operational thinking as problem finding. Perhaps some means for measuring

Eastern modes of inquiry could be developed that could further illuminate this research. Clayton and Birren (1980) describe the merits of the Eastern tradition for enhancing our understanding of the development of wisdom, by experiencing life directly through intuition and compassion rather than through the intellect. The path to wisdom or enlightenment would therefore require meditation and a teacher (one who has attained enlightenment).

In reflecting on Arlin's definition of problem finding and its measurement using transformations and implications as the criterion for arriving at the essence of the problem, I would refer the reader to the work of Churchman (1971, 1979), and more specifically Harrison and Bramson (1982). As they point out, the Synthesist mode of inquiry can provide some helpful insights for going beyond problem solving. The Synthesist mode is comprised of seven basic strategies, with its grand strategy being the dialectic: thesis (that which is known), antithesis (that which is new but not yet accepted) and synthesis (the new, original, creative result of the integration of thesis and antithesis). These seven strategies include: 1) open argument and direct confrontation, where conflict is something that is inevitable and should be dealt with directly; 2) questioning the obvious (basic assumptions); 3) third party observation, where in any given situation, the key questions to ask are "What is really going on here?" and "What role am I playing in it?"; 4) suspending opposing ideas in your mind (while you wait for a resolution to emerge from the conflict); 5) speculation and fantasy where the key questions are "What if...?" and "Why not...?"; 6) proposing "far-out" solutions, where play and irrelevance become important elements of an original solution; and 7) negative analysis, which, as another key strategy asks, "What could go wrong here when we carry out our plans?" Thus, the key questions and strategies involved in Synthesist thinking could be included in both the assessment and the teaching of the ability to do higher order thinking, for they also get at the essence of problems. It is interesting to note that the transformations and implications from Guilford's structure of intellect model, involving change and speculation respectively, seem to fit well with these seven strategies. 'What if' and 'why not' questions are likely questions to ask when dealing with transformations. ('What if we held the candle upright in the clamp and decorated it with the cord and tacks, to make a centerpiece?') What is needed then, is a test of actual ability for these seven strategies, for while the InQ measures relative preference for the five modes of inquiry, and this too is important, it does not measure actual ability. Brabeck and Wood (1990) and Wood (1990) have already begun this process of measuring actual ability in Churchman's Inquiring Systems. As was mentioned earlier, Arlin (1989) recognized this need for incorporating other measures of postformal reasoning into a battery of tests and measures for describing and explaining the development of postformal reasoning. Thus, measures of metasystematic, reflective, and dialectic reasoning, together with that of the relativistic logic mentioned earlier, are all potential candidates for a more complete assessment battery.

While the present study seeks to integrate and elaborate Arlin's problem finding model with the main elements of wisdom outlined by Birren and Fisher (1990), and relative preference for the inquiring modes of Harrison and Bramson (1982), it does not assume that such an elaboration will produce anything approximating a complete model of wisdom. The purpose of the present framework is rather, to integrate into Arlin's model, what Birren and Fisher state are the main elements of wisdom, some of which they recommended, but omitted from their own working model of wisdom. As Sternberg (1990) points out in his introductory chapter of the book on wisdom which he edited, and in which Birren and Fisher's summary chapter appears; this book is intended to point the way for future theory and research. Birren and Fisher also concede "that in addition to the study of the individual, there is room for the development of a collective social psychological approach or perhaps a political science approach to complement the present thoughts by psychologists (p. 330)". Development of the current framework through the integration of a social psychological approach is seen as one of the next logical steps to be taken by the present author, and would most probably draw on Erikson's (1978) work concerning the development of wisdom. The virtues corresponding to the four stages of his eight stage developmental cycle seem immediately congruent with the elements of wisdom outlined here. His stage two virtue (will) seems to fit with conation, stage four (competence) fits, or can probably be extended to fit with cognition, stage six (love) fits with affection, and stage eight would be wisdom through "the art of problem finding". How the other fourvirtues corresponding to the stages would be integrated into the framework is less obvious, and beyond the scope of the present study. Perhaps this could be integrated with the problem finding task mentioned above concerning people and society. Since higher order reasoning often deals with problems involving people and society, assessment of an individual's ability to deal with unstructured problems should probably focus more on people than on objects. The spiritual component which moves us to higher goals and aspirations also merits further study and could be included within the conation component, as was alluded to by Kornhuber et al. (1989) and Atman and Atman (1983). Accounting for the role of language in the development of higher order reasoning is another vital component to be included. It may be that higher forms of reasoning are not possible in the absence of language. Also, some cultures may contain languages which acknowledge wisdom related concepts better than others, thereby resulting in more emphasis being placed on the development of wisdom. Conversely, as Clayton and Birren (1980) point out, wisdom may only be attained through the kind of direct experience that typifies the Eastern tradition - where words are by-passed. Further research with other graduate students and other populations, including professionals in various occupations, high school students, undergraduate students, and on a cross-section of the population, is also indicated. Longitudinal studies beginning in high school, or earlier perhaps, and extending into adulthood could also

provide valuable information and insights for explaining the nature, origins and development of higher order reasoning, and ultimately wisdom.

Education and Practice

While this study is mainly concerned with identifying and measuring those aspects of mind that contribute to the development of "wisdom: the art of problem finding," the next step might be to develop an educational package for developing, balancing and striving upward, in order to integrate and transcend these qualities, so as to bring about the transformation necessary for attaining such aspects of postformal thinking as reflective judgement, dialectic thinking, relativistic logic, metasystematic thinking and problem finding. Areas of weakness could thereby be augmented and developed, and strengths could be made more explicit in order to capitalize on them. Educational materials and procedures have already been developed to accompany the ATFR, the GOI, and the InQ. Programs for developing a positive mental attitude and for enhancing intra- and interpersonal skills are readily available in most libraries as well as the bookstores. Educating for higher order reasoning and instruction in asking "essential questions" is less obvious, and deserves special attention, although some initial exercises for developing the dimensions and characteristics required for mastering the higher order mental processes, such as problem finding, could probably be assembled largely from what is already known. de Bono (1993) has also produced a step-by-step approach to "serious creativity" on demand, which appears to have much in common with the kinds of higher order reasoning being proposed by Arlin and other more cognitively oriented developmental researchers. He too laments the Western emphasis on analysis and the neglect of what he calls "design." While analysis is also necessary - being concerned with what is - design is concerned with what could be. His definition of design therefore includes all those situations where we put things together to achieve some effect. Thus, he states that since design is the basis for ideas and action, we ought to consider design and analysis as equally important. Most good scientists have always known that science involves more than just analysis. It is through the creation and design of hypotheses and speculation - this poetry of speculaton in combination with the rigorous collection of information - that makes the good scientist. The problem therefore seems to be more one of informing educators of the preeminence of these essential elements of "education for wisdom", and how they can be implemented, than it is in any lack of materials to begin to carry it out.

If we can assume that Arlin, Birren and Fisher, and others mentioned here are on the right track, the elements of the trilogy of mind, the five inquiry modes, and the other constituents of wisdom described on pages 32 - 42, can now be integrated into a comprehensive curriculum. A more holistic approach could thereby be developed. This in turn should enhance the educational process for turning out exemplary scholars and leaders, and wise administrators.

References

Abelson, R. P. (1963). Computer simulation of "hot cognitions", In S. Tomkins and S. Messick (Eds.), Computer simulation of personality (pp. 279-298). New York: Wiley.

Alexander, C. N. & Langer, E. J. (1990). Higher stages of human development . New York, NY: Oxford University Press, Inc.

Allport, G. (1961). Pattern and growth in personality. New York, NY: Holt, Rinehart & Winston.

Amabile, T. M. (1983). The social psychology of creativity. New York, NY: Springer-Verlag.

Arlin, P. K. (1975). Cognitive development in adulthood: A fifth stage? Developmental Psychology, Vol. 11. No. 5. 602-606.

Arlin, P. K. (1975-76). A cognitive process model of problem finding. Educational Horizons, Winter, 99-106.

Arlin, P. K. (1982). A multitrait-multimethod validity study of a test of formal reasoning. Educational and Psychological Measurement, 42, 1077-1088.

Arlin, P. K. (1984a). Adolescent and adult thought: A structural interpretation. In M. L. Commons, F. A. Richards, & C. Armon (Eds.), Beyond formal operations: Late adolescent and adult cognitive development (pp. 258-271). New York: Praeger.

Arlin, P. K. (1984b). Arlin Test of Formal Reasoning. East Aurora, NY: Slosson Educational Publications, Inc.

Arlin, P. K. (1989). Problem solving and problem finding in young scientists. In M. L. Commons, J. D. Sinnott, F. A. Richards, & C. Armon (Eds.), Adult development, Vol.1 Comparisons and applications of developmental models (pp. 197-216). New York, NY: Praeger.

Arlin, P. K. (1990). Wisdom: The art of problem finding. In R. J. Sternberg (Ed.), Wisdom: Its nature, origins and development (pp. 230-243). New York, NY: Cambridge University Press.

Arnold, M. B. (1960). Emotion and personality. New York: Columbia University Press.

Assagioli, R. (1973). The act of will. New York, NY: The Viking Press.

Atman, K. S. (1986). Goal Orientation Index. P.O. Box 12868, Pittsburgh, PA, 15241: Curriculum Innovators and Implementers.

Atman, K. S. (1990). The conation cycle. P. O. Box 12868, Pittsburgh, PA, 15241: Curriculum Innovators and Implementers.

Atman, K. S. (1988a, January 26). Academic advising: Mortar for building the community of scholars. Paper presented at the University of Pittsburgh Conference on Undergraduate Education, Pittsburgh, Pennsylvania.

Atman, K. S. (1988b, April 7). Conation, self-regulation and attention control, Paper presented at the American Educational Research Association Annual Meeting, New Orleans, LA.

Atman, K. S. & Atman, C. J. (1983). Getting (and keeping) your act together: Implications of the conative domain for industrial settings. 1983 Spring Annual Conference Proceedings, Institute of Industrial Engineers, Inc., 25 Technology Park/Atlanta, Norcross, GA 30092.

Atman, K. S. & Hanna, J. W. (1987). Conation, goal accomplishment style, and academic achievement at the middle school level. In Research Annual 1987 Selected Studies. Columbus, OH: National Middle School Association, pp. 19-35.

Atman, K. S. & Santillo, R. (1988, April 8). Conative processes and goal accomplishment style of junior high school students. Paper presented at the American Educational Research Association Annual Conference. New Orleans, LA.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Barker, J. A. (1985). Discovering the future. The business of paradigms. St. Paul, MN: I.L.S. Press.

Barker, J. A. (1992). Future edge: Discovering the new paradigms of success. New York, NY: William Morrow and Company, Inc.

Bartlett, F. C. (1932). Remembering. Cambridge: Cambridge University Press.

Basseches, M. (1980). Dialectical schemata: A framework for the empirical study of the development of dialectical thinking, Human Development, 23, 400-421.

Beth, E. W. & Piaget, J. (1966).Mathematical epistemology and psychology. (W. Jays, Trans.) New York, NY: Gordon & Breach.

Birren, J. E. & Fisher, L. M. (1990). The elements of wisdom: Overview and integration. In R. J. Sternberg (Ed.), Wisdom: Its nature, origins and development (pp. 317-332). New York, NY: Cambridge University Press.

Bower, G. H. (1981). Mood and memory. American Psychologist, 36, 120-148.

Bower, G. H. & Cohen, P. R. (1982). Emotional influences in memory and thinking: Data and theory. In M.S. Clark and S. T. Fiske (Eds.), Affect and cognition (pp. 291-332). Hillsdale, NJ: Erlbaum.

Brabeck, M. M. & Wood, P. K. (1990). Cross-sectional and longitudinal evidence for differences between well structured and ill-structured problem solving abilities. In M. L. Commons et al. (Eds.). Adult development, Vol. 2. Models and methods in the study of adolescent and adult thought. (pp. 133-146). New York: Praeger.

Brainerd, C. D. (1978). Learning research in Piagetian theory. In L. S. Siegel & C. J. Brainerd, (Eds.), Alternatives to Piaget: Critical essays on the theory (pp. 69-110). New York, NY: Academic Press.

Bramson, Parlette, Harrison and Associates (1985). InQ styles of thinking administration and interpretation manual. (1985). Oakland, CA: InQ Educational Materials Inc.

Broughton, J. M. (1984). Not beyond formal operations but beyond Piaget: In M. L. Commons, F. A. Richards, & C. Armon (Eds.), Beyond formal operations: Late adolescent and adult cognitive development. (pp. 395-412). New York, NY: Praeger.

Bruvold, W. H., Parlette, G. N., Bramson, R. M., Bramson, S. J. (1983). An investigation of item characteristics, reliability, and validity of the Inquiry Mode Questionnaire. Educational and Psychological Measurement, 43, 483-493.

Bynum, T. W., Thomas, J. A., & Weitz, L. J. (1972).Truth function in formal operational thinking: Inhelder and Piaget's evidence. Developmental Psychology, 40 (7), 129-132.

Cavanaugh, J. C. & Stafford, H. (1989). Being aware of issues and biases: Directions for research on postformal thought. In M. L. Commons, J. D. Sinnot, F. A Richards, & C. Armon (Eds.), Comparisons and applications of developmental models. Vol. 1. (pp. 279-292). New York, NY: Praeger.

Cervetti, M. J., Franceschini, L. A., & Sojourner, D. S. (1989, November 10). Cognitive styles among teachers of "at risk" children. Paper presented at the Annual Meeting of the Mid-South Educational Research Association, Little Rock, AR.

Churchman, C. W. (1971). The design of inquiring systems. New York: Basic Books.

Churchman, C. W. (1979). The systems approach. New York, NY: Laurel.

Clark, M. S. & Isen, A. M. (1982).Toward understanding the relationship between feeling states and social behavior. In A. H. Hastorf and A. M. Isen (Eds.), Cognitive social psychology. New York, NY: Elsevier North Holland.

Clayton, V. P., & Birren, J. E. (1980). The development of wisdom across the life-span: a reexamination of an ancient topic. In P. B. Baltes & O. G. Brim, Jr. (Eds.), Life-span development and behavior (Vol. 3, pp. 103-135). New York: Academic Press.

Commons, M. L., Richards, F. A., & Kuhn, D. (1982). Systematic and metasystematic reasoning: A case for levels of reasoning beyond Piaget's stage of formal operations. Child Development, 53, 1058-1069.

Commons, M. L., Richards, F. A. & Armon, C. (Eds.) (1984). Beyond formal operations: Late adolescent and adult cognitive development. New York, NY: Praeger.

Commons, M. L., Sinnott, J. D., Richards, F. A. & Armon, C. (Eds.) (1989). Adult development. 1. Comparisons and applications of developmental models. New York, NY: Praeger.

Commons, M. L., Armon, C., Kohlberg, L., Richards, F. A., Grotzer, T. A. & Sinnot, J. (Eds.) (1990). Adult development. 2. Models and methods in the study of adolescent and adult thought. New York, NY: Praeger.

Cornford, F. M. (1945). (Translator). The Republic of Plato. New York, NY: Oxford University Press.

Csikszentmihalyi, M. & Rathunde, K. (1990). The psychology of wisdom: An evolutionary interpretation. In R. J. Sternberg, (Ed.), Wisdom: Its nature, origins and development. (pp. 25-51). New York, NY: Cambridge University Press.

Dalla Costa, J. (1991). Meditations on business. Englewood Cliffs, NJ: Prentice-Hall, Inc.

de Bono, E. (1992). SUR/PETITION: Creating value monopolies when everyone else is merely competing. Toronto, ON: Harper Collins Publishers, Ltd.

de Bono, E. (1993). Serious creativity. Toronto, ON: Harper Collins Publishers Ltd.

de Rivera, J. (1984). Development and the full range of emotional experiences. In C. Z. Malatesta & Izard, C. E., (Eds.), Emotions in adult development (pp. 45-63). Beverly Hills, CA: Sage Publications.

Diener, E., Larsen, R. J., Levine, S., & Emmons, R. (1985). Intensity and frequency: Dimensions underlying positive and negative affect. Journal of Personality and Social Psychology, Vol. 48, No. 5, 1253-1265.

Doctoroff, M. (1977). Synergistic management. New York, NY: Cambridge University Press.

Drucker, P. F. (1992). Managing for the future: The 1990's and beyond. New York, NY: Truman Talley Books/Dutton.

Erikson, E. H. (1950). Childhood and society. New York, NY: Norton.

Erikson, E. H. (1959). Identity and the life cycle. Psychological Issues Monograph. 1.

Erikson, E. H. (1978). Adulthood. New York, NY: Norton.

Erikson, E. H. (1982). The life cycle completed: A review. New York, NY: Norton.

Fakouri, M. E. (1985). Arlin Test of Formal Reasoning. In D. J. Keyser & R. C. Sweetland (Eds.), Test Critiques (pp. 40-41). Kansas City, Missouri: Test Corporation of America.

Ferguson, G.A. (1981). Statistical analysis in education and psychology. (5th ed.). Toronto, ON: McGraw-Hill, Inc.

Fiske, S. T. (1981). Social cognition and affect. In J. Harvey (Ed.), Cognition, social behavior, and the environment. (pp. 227-264). Hillsdale, NJ: Erlbaum.

Fiske, S. T. (1982). Schema-triggered affect: Applications to social perception. In M. S. Clark & S. T. Fiske (Eds.), Affect and cognition. (p.55-78). Hillsdale, NJ: Erlbaum.

Fiske, S. T. & Taylor, S. E. (1984). Social cognition. Reading, Mass.: Addison-Wesley.

Flavell, J. H. (1982). On cognitive development. Child Development, 53, 1-10.

Flavell, J. H. (1985). Cognitive development. (2nd ed.) Englewood Cliffs, NJ: Prentice Hall.

Getzels, J. W. (1964). Creative thinking, problem-solving and instruction. In E. Hilgard (Ed.), Theories of learning and instruction (pp. 240-267). Chicago: The University of Chicago Press.

Getzels, J. W. & Csikszentmihalyi, M. (1970). Concern for discovery: An attitudinal component of creative production. Journal of Personality, 38, 91-105.

Gruber, C. (1992). InQ test-retest results (Unpublished document). Los Angeles, CA: Western Psychological Services.

Guilford, J. P. (1968). New psychological conceptions in memory. In J. P. Guilford, Intelligence, creativity and their educational implications (pp. 43-49). San Diego, Ca: R. R. Knapp.

Guilford, J. P. (1986). Creative Talents: Their nature, uses and development. Buffalo, NY: Bearly Ltd.

Harrison, A. R. & Bramson, R. M. (1982). Styles of thinking: Strategies for asking questions, solving problems and making decisions. New York, NY: Doubleday (In paperback entitled The art of thinking. New York, NY: Berkley Books, 1983.

Harrison, A. R. & Bramson, R. M. (1988). The Inquiry Mode Questionnaire. P.O. Box 10213. Berkeley, CA 94709: Bramson, Parlette, Harrison and Associates.

Hayduk, L. A. (1987). Structural equation modeling with LISREL. Baltimore: John Hopkins.

Hayduk, L. A. (1987). Should model modifications be oriented toward improving data fit or encouraging creative and analytic thinking? Multivariate Behavioral Research, 25 (2), 193-196. L.E.A.

Hayes, P., Kienholz, A., Engel, J., & Mishra, R. (1993). Diverse thinking styles in nursing. In N. Diekelmann & M. Rather (Eds.), Transforming RN education: Dialogue and debate (pp. 137-149). New York: National League for Nursing.

Hershberger, W. A. (Ed.), (1989). Volitional action: Conation and control. New York, NY: North Holland.

Hilgard, E. R. (1980). The trilogy of mind: Cognition, affection and conation. Journal of the History of the Behavioral Sciences. 16, 107-117.

Huang, J. (1993). The relationship of cognitive styles, cognitive profiles and thinking profiles among selected Chinese and American students in higher education. Doctoral Dissertation, University of Wyoming. (University Microfilms No. 940 5075).

Huang, J. (1994). Thinking styles of Chinese and American adult students in higher education: A comparative study. Psychological Reports. 74, 475-480.

Hughes, T. H. & Franceschini, L. A. (1989, November 10). A comparison of the Myers-Briggs Type Indicator with the Harrison and Bramson Inquiry Mode Questionnaire. Paper presented at the Annual Meeting of the Mid-South Educational Research Association, Little Rock, AR.

Inhelder, B. & Piaget, J. (1958). The growth of logical thinking from childhood to adolescence. New York, NY: Basic Books.

Isaac, S. & Michael, W. B. (1971). Handbook in research and evaluation. San Diego, CA: EdITS publishers.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. Journal of Personality and Social Psychology. Vol. 52 (6), 1122-1131.

Isen, A. M. & Means, B. (1983). The influence of positive affect on decision making strategy. Social Cognition. 2, 18-31.

Isen, A. M., Means, B., Patrick, R. & Nowicki, G. P. (1982). Some factors influencing decision making strategy and risk taking. In M. S. Clark and S. T. Fiske (Eds.), Affect and cognition. (pp. 243-262). Hillsdale, NJ: Erlbaum.

Isen, A. M., & Patrick R. (1983). The effect of positive feelings on risk taking: When the chips are down. Organizational Behavior and Human Performance. 31, 194-202.

Isen, A. M. & Shalker, T. E. (1982). Do you "Accentuate the positive, eliminate the negative" when you are in a good mood? Social Psychological Quarterly. 45, 58-63.

Isen, A. M., Shalker, T. E., Clark, M. & Karp, L. (1978). Affect, accessibility of material in memory and behavior: A cognitive loop? Journal of Personality and Social Psychology. 36. 1-12.

James, W. (1890). The principles of psychology. Vol. 2, New York, NY: Henry Holt.

Joreskog, K. G. & Sorbom, D. (1989). LISREL 7: A guide to the program and applications (2nd edition). Chicago, IL: SPSS Inc.

Kagan, D. M. & Tixier y Vigil, Y. (1987). Students' cognitive styles and their ratings of their teacher's effectiveness. Educational Considerations. Winter, XIV (1), 2-6.

Keats, J. A., Collis, K. F. & Halford, G. S. (Eds.) (1978). Cognitive development: Research based on a neo-Piagetian approach. New York, NY: Wiley.

Kepner, C. H. & Tregoe, B. (1976). The rational manager. Princeton, NJ: Kepner Tregoe Associates.

Kerlinger, F. N. (1973). Foundations for behavioral research. (2nd ed.) New York, NY: Holt, Rinehart & Winston.

Kienholz, A. (1991). The Range of Emotions Scale. Unpublished document. University of Alberta.

Kienholz, A. & Hritzuk, J. (1986). Comparing students in architecture and medicine: Findings from two new measures of cognitive style. Psychological Reports. 58, 823-830.

Kienholz, A., Hayes, P. Mishra, R. K., & Engel, J. (1993). Further validation of the revised Inquiry Mode Questionnaire. Psychological Reports. 72, 779-784.

King, P. M. (1986) Formal reasoning in adults: A review and critique. In R. K. Mines and K. S. Kitchener (Eds.). Adult cognitive development. New York: Praeger.

King, P. M., Kitchener, K. S., Davidson, M. L., Parker, C. W. & Wood, P. K. (1983).The justification of beliefs in young adults: A longitudinal study. Human Development. 26, 106-116.

Kitchener, K. S. & King, P. M. (1981). Reflective judgment: Concepts of justification and their relationship to age and education. Journal of Applied Developmental Psychology. 2, 89-116.

Koestler, A. (1964). The act of creation. London: Hutchinson.

Kornhuber, H. H., Deeke, L., Lang, W., Lang, M. & Kornhuber, A. (1989).Will, volitional action, attention and cerebral potentials in man: Bereitschaftspotential, performance-related potentials, directed attention potential, E. E. G. spectrum changes. In W. A. Hershberger (Ed.), Volitional action: Conation and control (pp. 107-168).New York, NY: North Holland.

Kramer, D. A. (1983). Post-formal operations? A need for further conceptualization. Human Development. 26, 91-105.

Kramer, D. A. (1990). Conceptualizing wisdom: the primacy of affect-cognition relations. In R. J. Sternberg (Ed.), Wisdom: Its nature origins and development. (pp. 279-313). New York, NY: Cambridge University Press.

Kuhl, J. (1985). Volitional mediators of cognition. Behavior consistency self-regulatory processes and action versus state orientation. In J. Kuhl & J. Beckmann (Eds.), Action Control: From cognition to behavior (pp. 101-126). West Berlin: Springer-Verlag.

Kuhl, J. & Beckmann, J. (Eds.) (1985). Action control: From cognition to behavior. Preface. West Berlin: Springer-Verlag.

Labouvie-Vief, G. (1980). Beyond formal operatons: Uses and limits of pure logic in life-span development. Human Development. 23, 141-161.

Lang, P. L. (1984). Cognition in emotion: Concept and action. In C. E. Izard, J. Kagan, & R. B. Zajonc (Eds.), Emotions, cognition and behavior. (192-226). New York, NY: Cambridge University Press.

Larsen, R. J. (1985). Theory and measurement of affect intensity as an individual difference characteristic. Dissertation Abstracts International. 45, 297. (University Microfilms No. 84-2212.

Larsen, R. J. & Diener, E. (1987). Affect intensity as an individual difference characteristic: A review. Journal of Research in Personality. 21, 1-39.

Leventhal, H. (1980). Toward a comprehensive theory of emotion. In L. Berkowitz (Ed.), Advances in experimental social psychology. Vol. 13, (pp. 139-207). Orlando, FL: Academic Press.

Levinson, D. J. (1990). A theory of life structure development in adulthood. In C. N. Alexander & E. J. Langer, (Eds.), Higher stages of human development. New York, NY: Oxford University Press.

Lewis, M. (1990) Development, time and catastrophe: An alternate view of discontinuity. In P. Baltes, D. Featherman & R. Lerner (Ed.), Lifespan Development and Behavior. (pp. 325-348). Hillsdale, N. J.: LEA, Publishers.

Locke, E. A. & Latham, G. P. (1984). Goal setting : A motivational technique that works. Engelwood Cliffs, NJ: Prentice-Hall, Inc.

Mackworth, N. H. (1965). Originality. The American Psychologist, 20, 51-60.

Malone, M. (1992). The effect of law enforcement managers' and supervisors' inquiry modes and organizational planning. Doctoral Dissertation, Golden Gate University. (University Microfilms No. 930 7059).

Mandler, G. (1975). Mind and emotion. New York: Wiley.

Merton, R. K. (1945). Sociology of knowledge. In G. Gurvitch & W. E. Moore (Eds.), Twentieth Century Sociology, (pp. 366-405). New York, NY: Philosophical Library.

Miller, G. H. & Johnson-Laird, P. N. (1976). Language and perception. Cambridge, MASS: The Belknap Press of Harvard University Press.

Mitroff, I. I. (1988). Break-away thinking. How to challenge your business assumptions and why you should. Toronto, ON: John Wiley & Sons.

Mitroff, I. I. & Pondy, L. (1974). On the organization of inquiry. Public Administration Review, 34, 471-479.

Murray, H. (1938). Explorations in personality. New York, NY: Oxford University Press.

Neisser, U. (1976). Cognition and reality. San Francisco: Freeman.

O'Reilly, C. A. (1991). Organizational behavior: Where we've been, where we're going. In M. Rozensweig & L. W. Porter, (Eds.), Annual review of psychology, 42; 427-58.

Parlette, N. & Rae, R. (1993). Thinking about thinking. Leadership (Washington) Washington, DC: American Society of Association Executives, 71-74.

Piaget, J. (1952a). The origin of intelligence in children. New York: International Universities Press.

Piaget, J. (1970). Structuralism. New York, NY: Basic.

Piaget, J. (1981). Intelligence and affectivity: Their relationship during child development. Palo Alto, CA: Annual Reviews, Inc.

Reece, C. C. & Todd, R. F. (1989, November). Math anxiety, math achievement and the analyst style of thinking. Paper presented at the Annual Meeting of the Mid-South Educational Research Association. Little Rock, AR.

Richards, F. C. & Commons, M. L. (1990). Postformal cognitive-developmental theory and research: A review of its current status. In C. N. Alexander & E. J. Langer (Eds.), Higher stages of human development (pp. 139-161).

Riegel, K. F. (1973). Dialectic operations: The final period of cognitive development. Human Development, 16, 346-370.

Royce, J. R. & Diamond, S. R. (1980). A multifactor system dynamics theory of emotion: Cognitive-affective interaction. Motivation and Emotion, 4, 263- 299.

Santmire, T. E. (1985). Arlin Test of Formal Reasoning In J. V. Mitchel (Ed.). The Ninth Mental Measurement Yearbook. Vol 1, (80). Lincoln, Nebraska: The University of Nebraska.

Schacter, S. & Singer, J. E. (1962). Cognitive, social and physiological determinants of emotional state. Psychological Review, 65, 121-128.

Schneider, D. J., Hastforth, A. H., & Ellsworth, P. C. (1979). Person perception. Reading, MASS: Addison-Wesley.

Schwartz, D. (1977). The study of interpersonal problem posing. Unpublished Ph.D. Thesis, University of Chicago.

Siegler, R. S. (1991). Children's thinking. Englewood Cliffs, NJ: Prentice Hall.

Sinnot, J. D. (1981). The theory of relativity: A metatheory for development. Human Development, 24, 293-311.

Smilansky, J. (1985). Problem finding and creative problem solving. Journal of Educational Psychology, 76, 377-384.

Springer, S. & Deutsch, G. (1993). Left brain, right brain. (4th Ed.) New York, NY: W.H. Freeman and Company.

Sternberg, R. J. (1984). Mechanisms of cognitive development. New York, NY: Freeman.

Sternberg, R. J. (1988). The triarchic mind: A new theory of human intelligence. New York, NY: Cambridge University Press.

Sternberg, R. J. (Ed.) (1990). Wisdom: Its nature , origins and development. New York, NY: Cambridge University Press.

Torrance, E. P. (1988). The nature of creativity as manifest in its testing. In R. J. Sternberg (Ed.). The nature of creativity (pp. 43-75). New York, NY: Cambridge University Press.

Travis, L. D. & Cote, A. D. J. (1989). Piaget, Plato and pedagogy. In C. Violato & A. Marini, (Eds.), Child Development: Readings for Teachers. (pp. 97-112). Calgary, AB: Detselig Enterprises, Ltd.

Vaughan, T. (1982). Creativity: An interactive process. Gifted Education - International, 1, (1), 6-9.

Vaughan, T. (1985). The balance of opposites in the creative process. Gifted Education - International, 3, (1), 38-42.

Wang, K. (1984). Research on the feeling mind of actors during creative performances. Information on Psychological Sciences, 6, 30-33, 29.

Weiner, B. (1986). An attributional theory of motivation and emotion. New York, NY: Springer-Verlag.

Wertheimer, M. (1945). Productive Thinking. New York, NY: Harper & Bros.

Wood, P. K. (1983). Inquiring systems and problem structure: Implications for cognitive development. Human Development, 26: 249-265.

Wood, P. K. (1990). Construct validity and theories of adult development: Testing for necessary but not sufficient relationships. In M. L. Commons et al. (Eds.). Adult development: Vol. 2. (pp. 113-130).

Wundt, W. (1907). Outlines in psychology (7th ed.; C. H. Judd, Trans.). Leipzig, Engelmann. (Original work published in 1896).

Zajonc, (1980). Feeling and thinking: Preferences need no inferences. American Psychologist, 35, (2), 151-175.

Zimmerman, B. J., & Schunk, D. H. (1989) (Eds.). Self-regulated learning and academic achievement: Theory, research and practice. New York, NY: Springer-Verlag.

APPENDIX A

LETTER OF PERMISSION TO COPY FIGURE 14.1 FROM BIRREN AND FISHER'S CHAPTER

CAMBRIDGE
UNIVERSITY PRESS

North American Branch
40 West 20th Street
New York, N.Y. 10011-4211
U.S.A.

Telephone 212 924 3900
[redacted]

November 24, 1993

Alice Kienholz
Dept. of Educational Psychology
6-102 Education North
University of Alberta
Edmonton, Alberta T6G 2G5
Canada

Dear Ms. Kienholz:

Thank you for your request for permission to include

Fig. 14.1, p. 321,
from WISDOM: ITS NATURE, ORIGINS AND DEVELOPMENT,
edited by Robert J. Sternberg,

in your forthcoming dissertation, ONLY.

Permission is granted for this use only, subject to full acknowledgement of our material and clear indication of the copyright notice as it appears in our publication, followed by the phrase "Reprinted with the permission of Cambridge University Press."

Please note that this permission does not allow reprinting any material copyrighted by or credited to another source; to use such material, permission must be obtained directly from the owner of that material. Cambridge disclaims all liability in connection with the use of such material without proper consent. We cannot provide additional information or addresses other than that which appears in our publication.

Sincerely,

M. P. Anderson
Manager
Rights and Permissions

APPENDIX B
CONSENT FORM

CONSENT FORM

Research Number_____

Title of Study: The Problem Solving Approaches of University of Alberta Graduate Students

Researcher: Alice Kienholz, Doctoral Candidate, Department of Educational Psychology, University of Alberta

You are invited to participate in a study designed to determine what the relationships are between thinking styles, cognition, creative thinking, affect and goal orientation style. Subjects will consist of graduate students at the University of Alberta. Participants will be asked to complete a brief demographic survey, a thinking style questionnaire, two short measures of affective behavior, a test of formal reasoning, an exercise in asking questions, and a questionnaire of your goal orientation style. The whole process will probably take about two and one half hours, including a break mid-way through. Individual results and interpretations will be provided in confidence within about a month of completion of the session, and can be obtained from the researcher (on campus). Group results will be made available to the students, once the study is completed. If interest is sufficient, a group workshop may be held at a time and place that is convenient for those interested, to provide information for developing a variety of approaches to structured and unstructured kinds of problems. All participating students will be assigned a research number, and your results and any information that could identify you will remain confidential.

Also, your decision to participate does not bind you to participate, and you are free to withdraw your consent and to discontinue participation at any time without penalty. Similarly, the reseacher reserves the right to terminate the subject's involvement at any time. Please feel free to ask any questions that you have about the study. I agree to participate in the study described above.

_____ _____

Date Signature

_____

Please print name

APPENDIX C
DEMOGRAPHIC INFORMATION

Research Number_____

DEMOGRAPHIC DATA

Please check the item that most appropriately describes you:

_____ _____
Male Female

Formal Education: ____ ____ _____ _____ _____ _____
B.A. B.Ed. B.Comm. B.Ed. LL.B Other?

Please state your age_____

State Undergraduate Major:_____

Current Degree Program and Major:_____

Cumulative years of work experience: (Approximate)

_____ 1 year or less
_____ between 1 and 2 years
_____ 3 to 5 years
_____ 6 to 10 years
_____ 11 to 20 years
_____ 21 years & more

Present position (or most recent major position)

Please state title and describe briefly_____

_____

For the following questions, think back over your lifespan and try to remember all of your creative achievements.

On the back of this sheet, please list and briefly describe any of these achievements that you consider to be noteworthy.

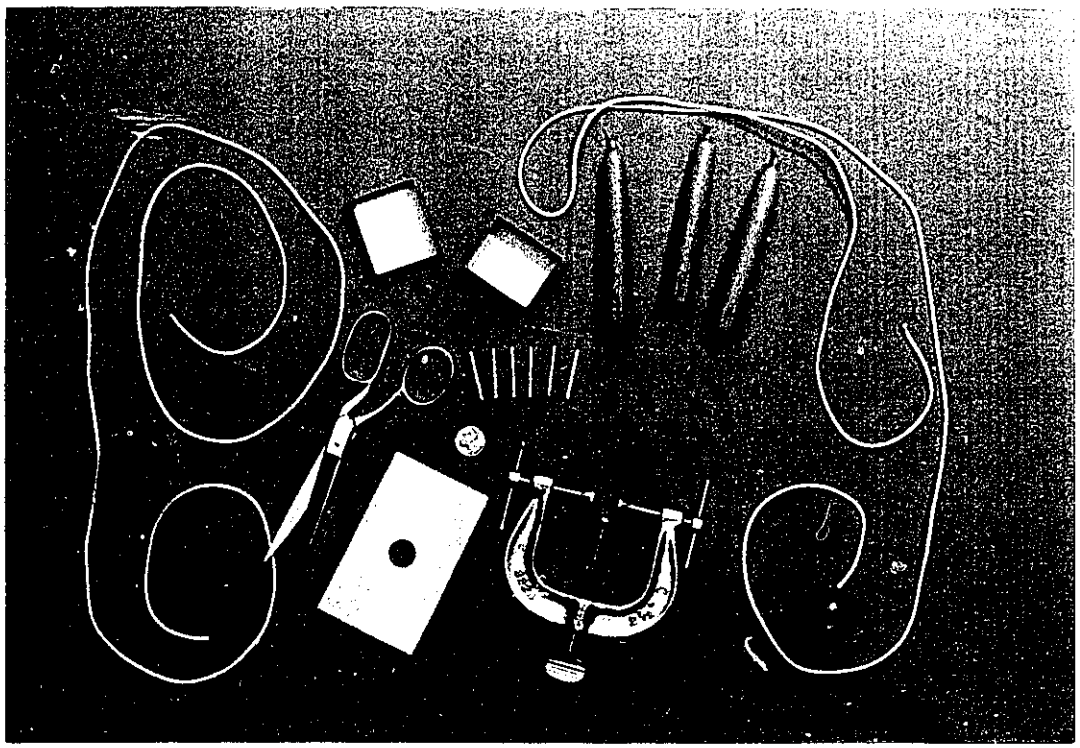
If your creative achievements include any of the following, please be sure to list and describe them also: patents and inventions, musical compositions that were publicly performed, novels, awards for art works in a juried exhibition, founding of a business, founding a journal or professional organization, developing an innovative technique in science, business, teaching, or any other discipline.

Was there a dream or a vision that accompanied your creative achievement? What was behind it? What sparked it? Discuss briefly, please.

APPENDIX D
COGNITIVE PROBLEM FINDING TASK

COGNITIVE PROBLEM FINDING TASK
(adapted from Arlin, 1975-76, by Kienholz, 1992)

After you have read the following instructions and understand what to do, you will be given **five minutes** to make up some **quality questions** that **refer to one or more of the objects that you see illustrated and listed below.** Your questions can take any form that you wish them to take. They might be brainteasers, puzzles to solve, novel questions, or whatever. Your questions can therefore be any type that you wish them to be. You are to write your questions on the sheet of paper provided, and **you will be told when to begin.**



Some Objects

1 C-clamp	1	25 cent piece
1 small box top	1	small box bottom
3 small colored candles	6	wooden matches
10 thumb tacks	2	2-meter long cords

1 pair of scissors
1 black wooden block (2 cm. x 2 cm. x 2 cm.)
1 plain wooden block (1 cm. x 1 cm. x 1 cm.)
1 small index card (3" x 5") with a dime-sized hole in the centre

APPENDIX E

THE RANGE OF EMOTIONS SCALE

The Range of Emotions Scale

Adapted from de Rivera (1984)

EDMONTON, AB CANADA

Part A

Instructions: Below is a list of terms that describe emotions. Take a moment to recollect how each particular emotion feels. As soon as you remember, circle the appropriate number reflecting **how often** you have experienced that emotion in the last year. Circle 1 if you seldom or never experience the emotion. Circle 2 if you occasionally experience the emotion. Circle 3 if you frequently experience the emotion. Circle 4 if you always or almost always experience the emotion.

1 = seldom or never	2 = occasionally	3 = frequently	4 = always or almost always
1 2 3 4	admiration	1 2 3 4	confidence
1 2 3 4	longing	1 2 3 4	pride
1 2 3 4	love	1 2 3 4	self-worth
1 2 3 4	respect	1 2 3 4	security
1 2 3 4	anger	1 2 3 4	sadness
1 2 3 4	fear	1 2 3 4	anxiety
1 2 3 4	contempt	1 2 3 4	shame
1 2 3 4	horror	1 2 3 4	guilt
1 2 3 4	wonder	1 2 3 4	joy
1 2 3 4	appreciation	1 2 3 4	hope
1 2 3 4	trust	1 2 3 4	eagerness

1 = seldom or never 2 = occasionally 3 = frequently 4 = always or almost always

1 2 3 4	uncaring	1 2 3 4	hurt
1 2 3 4	jealous	1 2 3 4	lonely
1 2 3 4	suspicious	1 2 3 4	frustrated
1 2 3 4	hate	1 2 3 4	bored
1 2 3 4	friendly	1 2 3 4	energetic
1 2 3 4	grateful	1 2 3 4	alert
1 2 3 4	dignified	1 2 3 4	enthusiastic
1 2 3 4	fulfilled	1 2 3 4	devoted
1 2 3 4	despair	1 2 3 4	shy
1 2 3 4	alarmed	1 2 3 4	discouraged
1 2 3 4	threatened	1 2 3 4	helpless
1 2 3 4	embarrassed	1 2 3 4	worried

Part B

Instructions: Below you will find some additional components of emotional life. Circle the number that best describes your experience with each term, just as you did above.

1 2 3 4	strength	1 2 3 4	fortitude
1 2 3 4	determination	1 2 3 4	blazing drive
1 2 3 4	loyalty	1 2 3 4	forgiveness
1 2 3 4	sensitivity	1 2 3 4	curiosity
1 2 3 4	sense of humor	1 2 3 4	empathy