How Cognitive Complexity Affects Accounting Career Paths

by

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Dissertation submitted to the Faculty of the

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Business with Major

in

Accounting

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June 1989

Blacksburg, Virginia

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(ABSTRACT)

The demands of the accounting workplace have become increasingly complex. Abstract-thinking individuals are better able to process a wider variety of inputs and presumably better able to function in the complex environments. A stated goal of accounting education has been to attract and retain students who are suited to the accounting profession. These students are believed to be the more abstract-thinking individuals. The purpose of this study is twofold: (1) to investigate whether or not individuals in the various accounting career paths differ with regard to level of cognitive complexity and (2) to investigate whether or not more cognitively complex individuals (abstract-thinking) are rewarded by the profession.

In 1988, the cognitive complexity of 494 accounting graduates from the classes of 1980, 1981, and 1982 were measured using the Paragraph Completion Test. This sample was selected from four different universities: James Madison University, the University of Massachusetts, the University of Tennessee, and

Virginia Polytechnic Institute and State University. The data were analyzed using analyis of variance and analysis of covariance.

Results indicate that cognitive complexity does not differ among accounting graduates pursuing various career paths within accounting. More importantly, individuals who have elected to leave accounting do not exhibit a different level of cognitive complexity. Results do suggest that the profession does, in fact, reward abstract-thinking individuals since more abstract individuals were found to earn higher incomes.

Acknowledgements

I am grateful to my chairman, Dr. Brown, for his support and unfailing good humor. I would also like to thank Drs. Cross, Downey, Killough, and Leininger for their significant contributions to this project.

This dissertation is dedicated to my wife, , and son, , with whom all things are possible.

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CHAPTER 1

INTRODUCTION

The purpose of this dissertation is to investigate whether or not there are significant differences in the cognitive complexity of accounting graduates in different occupational categories and across income levels within occupational categories. Psychologists have determined that individuals who are more cognitively complex are better equipped to process a wider variety of inputs in complex environments. As the demands of the workplace become more complex, it is important for accounting educators to have an understanding of the factors that contribute to a student's compatability with the work environment. Because of the diversity of terminology used in the cognitive psychology literature, the location of the concept of cognitive complexity within the domain of cognitive research is explained in the first section of this introductory chapter.

The Concept of "Cognitive Complexity" in the Domain of Cognitive Psychology

Chen and Olson (1989) present a conceptual "map" of research approaches to cognitive psychology in human information processing. This map is an adaptation of a framework originally developed by Driver and Mock (1975) and is presented as Figure 1 on Page 3.

The study of cognitive psychology is divided into two approaches, normative and descriptive. The normative approach evaluates the quality of information processing against some absolute standard. The descriptive approach looks at how people make decisions and process information. Whereas the normative approach is concerned with whether a decision is good or bad, the descriptive approach is concerned with how much information is used in reaching a decision. In this study information is gathered to describe the level of cognitive complexity exhibited by accounting graduates. This study is therefore categorized as descriptive.

The descriptive category is subdivided into three approaches: general, unique, and differential. Under the general approach, it is assumed that people are essentially the same and any differences are viewed as random. Under the unique approach, it is assumed that each person processes information in a unique and individualistic manner. A limitation with the unique approach is that the

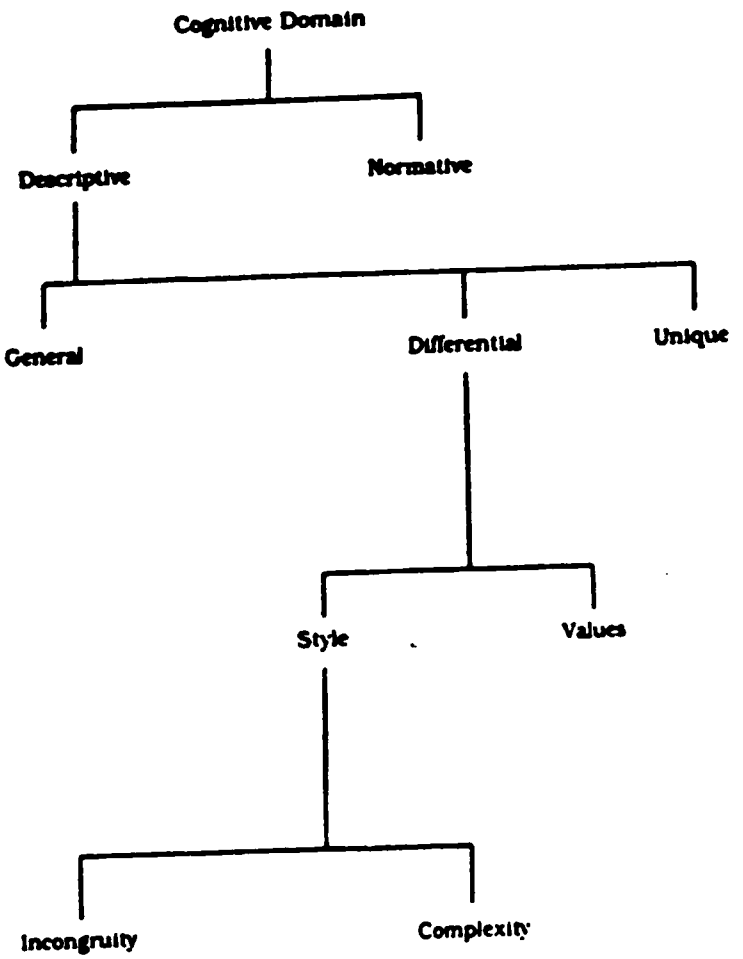

Figure 1. A Conceptual Map of Some Approaches to Cognitive Psychology in Human Information Processing Systems [Chen and Olson (1989, p. 162)]

INTRODUCTION

uniqueness of each individual precludes development of any generalizable methodology. Under the differential approach, it is assumed that people process information in a unique manner; however, people can be grouped on the basis of similar thought processes. Due to the limitations inherent with the general and unique approaches, the differential approach has the optimal potential of producing useful insights regarding information processing.[1] Because data is analyzed for differences in cognitive complexity between various accounting groups, this study is categorized under the differential approach.

The differential approach has been examined from two aspects, values and style. The first aspect categorizes people by how much they value different modes of information processing. Self-description questionnaires or tests are used in this approach. The second aspect is concerned with characterizing the cognitive style of information processing, i.e. the way people actually use information. Cognitive style describes a pattern of individual preference for some learning abilities over others.[2] Cognitive style is the theoretical construct that has been developed to explain the process of mediation between stimuli and responses. It refers to the characteristic ways in which individuals conceptually organize their environment. As such, cognitive constructs shape the connection between stimulus and response. If it were not for these cognitive constructs, individuals would respond

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[1] Chen, Kung H. and Stevan K. Olson, "Measuring Cognitive Complexity in the Accounting Domain," *Behavioral Research in Accounting*, Vol. 1, 1989

[2] Kolb, D. A., I. M. Rubin and J. M. McIntyre, *Organizational Psychology: An Experiential Approach*, Prentice-Hall, Englewood Cliffs, New Jersey, 1984

to stimulation in a robotlike fashion.[3] Individuals learn strategies, programs, or other transformational operations to translate objective stimuli into meaningful dimensions.

Unlike personality, which consists of attitudes or beliefs, cognitive style refers to the methods by which individuals receive, store, process, and transmit information. These methods may be learned over time and may vary across different settings.[4] For example, individuals who are exposed to environments (settings) with which they are unfamiliar will, in many cases approach problems using a different cognitive style than they might normally use in a familiar setting. While personality and cognitive style may be related, in that attitudes and beliefs provide a basis for organizing or processing information, individuals with similar personalities may use different cognitive processes in arriving at decisions. There is clearly a distinction between what an individual thinks (personality) and the way an individual thinks (cognitive style).[5]

An individual's "learning style" is the translation of personality and cognitive style characteristics into study behavior. Learning style can also be viewed as a predisposition to display a particular pattern of information processing activities

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[3] Harvey, O.J., "Conceptual Systems and Attitude Change," In Sherif, C. W. & Sherif, M. (Eds.), *Attitude, Ego-Involvement, and Change*, New York, Wiley, 1967, p. 201-226

[4] Entwistle, N., *Styles of Learning and Teaching*, John Wiley & Co., New York, 1980

[5] Pratt, Jamie, "The Effects of Personality on a Subject's Information Processing: A Comment," *The Accounting Review*, Vol. LV, No. 3, July 1980, p. 502

when preparing for a test of memory.[6] Thus, Schmeck (1983)[7] argues that individual's learning styles are simply the cognitive styles that they evidence when confronted with a learning task.

In studies conducted in 1984 and 1986, learning styles of senior accounting majors were measured using Kolb's Learning Style Inventory.[8] A conclusion reached in both of these studies is that learning style may be a useful concept in making the accounting education process more effective and efficient. For example, students in the second study preferred teachers whose learning style approximated their own. One conclusion reached by this study was that faculty should attempt to include a variety of learning opportunities in each class in order to reach students with different learning styles.

Brown and Burke (1987)[9] examined the learning styles of both business students and accounting practitioners in Canada. In this study students were found to exhibit differences in learning styles across groups of business majors (Accounting, Finance, and Marketing). In addition, accounting students and graduates appear to have an increasing preference for the convergent learning style as time passes. Brown and Burke concluded that individuals with convergent learning

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6 Messick, S., "Personality Consistencies in Cognition and Creativity," In S. Messick (Ed.), *Individuality in Learning*, Jossey-Bass Publishers, San Francisco, 1976

7 Schmeck, R. R., *Individual Differences in Cognition*, Vol. 1, Academic Press, Inc., New York, 1983

8 Baldwin, B. A. and M. J. Reckers, "Exploring the Role of Learning Style Research in Accounting Education," *Journal of Accounting Education*, 1984, and Baker, Richard E., John R. Simon and Frank P. Bazeli, "An Assessment of the Learning Style Preferences of Accounting Majors," *Issues in Accounting Education*, 1986

9 Brown, Donald H. and Richard C. Burke, "Accounting Education: A Learning-Styles Study of Professional-Technical and Future Adaptation Issues," *Journal of Accounting Education*, Vol. 5, 1987

styles prefer working with things rather than with people and tend to have narrow technical interests.

In a similar study Collins and Milliron (1987)[10] examined the dominant learning style of accounting practitioners in general and investigated whether there are learning style differences between individuals grouped by accounting occupations. Collins and Milliron observed no differences in learning style preferences between groups. The convergent learning style was the dominant style of learning exhibited by these accounting graduates. These results (identifying the convergent learning style as the dominant style of accountants) are consistent with the results of the Brown and Burke study.

Under the conceptual framework (Figure 1, Page 3) cognitive style is divided into incongruity and complexity categories. Incongruity describes a variety of research approaches which focus upon ambiguity, novelty, risk, and uncertainty. Complexity (the focus of this study) is the specific level or measure of cognitive development exhibited by an individual. "Cognitive level" is a psychological term used to describe how much and what kinds of information an individual is able to use in reaching a decision. Conceptual level, also known as the level of cognitive complexity, refers to two basic features of the cognitive system: the number of dimensions taken into account in formulating a judgment and the nature of the rules used to combine these dimensions in arriving at a final decision. For ex-

[10] Collins, Julie H. and Valerie C. Milliron, "A Measure of Professional Accountants' Learning, Style," *Issues in Accounting Education*, Fall 1987, Vol. 2

ample, an individual with a high or 'abstract' conceptual level will, in deciding whether to market a new product, consider a large number of variables such as costs, competitive reactions, market potential, and economic conditions. In 'combining' these dimensions to make his decision, he will be capable of perceiving alternate perspectives of the situation. He may have an array of rules which are tailored to the specific circumstances at hand and which can change according to basic trends in the environment. In contrast, those who possess low or 'concrete' conceptual levels will focus on only a few variables in a decision situation and will tend to combine these to form a judgment using fixed and singular rules.[11]

Importance of Cognitive Complexity to the Accounting Profession

The importance of cognitive complexity to the accounting profession is recognized in a 1979 research study sponsored by the American Accounting Association. One conclusion reached in this report follows:

> Given that there are accounting problems in the profession that require the use of abstract reasoning abilities, then students without these abilities must either be assisted in acquiring these abilities or counseled to change their interest from accounting to another field.[12]

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[11] Harvey, O., D. Hunt and H. Schroder, *Conceptual Systems and Personality Organization*, John Wiley & Co., New York, 1961, and Schroder, H. and P. Suedfeld, *Personality Theory and Information Processing*, Ronald Co., New York, 1971

[12] Shute, George E., "Accounting Students and Abstract Reasoning: An Exploratory Study," American Accounting Association, 1979

In 1984, the executive committee of the American Accounting Association (AAA) appointed a study committee to investigate and report on the structure, content, and scope of accounting education through the year 2000. In August 1986, the AAA's executive committee endorsed the study committee's report. The committee reported that accounting services are becoming broader in scope and yet, at the same time, much more precise and specialized. The size and complexity of modern economic activities require both, and this demand, in turn, requires extraordinary professional competence from accountants. The new accounting services required by various types of decision makers are more creative and innovative than those associated with the traditional financial reporting process.[13]

Although the American Accounting Association has recognized the importance of cognitive complexity in research, few researchers have applied the concept in the accounting area. According to Chen and Olson (1989)[14]

> Other disciplines have applied cognitive complexity in research. However, accounting studies have not explicitly incorporated the concept of cognitive complexity. This is indicative of the fact that application of behavioral science concepts to the accounting domain is still an expanding area.

Amernic and Enns (1979)[15] suggest that, when the goals of accounting education are being formulated, consideration should be given to the fact that professional accountants face a complex, shifting, and often conflicting environment. Success in the accounting environment requires both intelligence and cognitive complex-

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[13] Bedford, Norton M. and William G. Shenkir, "Reorienting Accounting Education," *Journal of Accountancy*, August 1987, pp. 84-91

[14] *Op. Cit.*, Chen and Olson

[15] Amernic, Joel H. and Robin J. Enns, "Levels of Cognitive Complexity and the Design of Accounting Curriculum," *The Accounting Review*, Vol. LIV, No. 1, January 1979, p. 138

ity.[16] This matching requirement strongly suggests a developmental goal for accounting education, namely, to create learning environments so that the student's progression to the desirable (i.e., high) cognitive level is enhanced. Student failure to develop along the dimension of cognitive complexity should result from personal rather than from environmental limitations.

Students' first exposure to the financial accounting environment occurs during introductory and intermediate accounting courses. This exposure occurs at a time when research suggests that students are formalizing their choice of accounting as a career.[17] Amernic and Beechy[18] theorized that, since the introductory and intermediate accounting courses may profoundly influence students' perceptions and their career choices, the courses should be designed to attract and retain individuals capable of dealing with a complex environment (abstract individuals).

Among the implications that Amernic and Beechy draw from their research is that, where possible, students who should be encouraged into the accounting profession are those who are operating at a relatively high level of cognitive complexity. This type of student might currently be discouraged from an accounting career due to negative experience drawn from highly structured intro-

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[16] Inhelder and Piaget (1958) identified four levels of cognitive development/complexity in childhood and adolescence of which the last two are concrete-operational and formal-operational. The concrete-operational and formal-operational stages are also referred to as concrete and abstract levels.

[17] De Coster, D. T. and J. G. Rhode, "Analysis of Certified Public Accounting Subgroups and Accounting Personality Traits Using The California Psychological Inventory," *Journal of Vocational Behavior*, 1972, pp. 155-162

[18] Amernic, Joel H. and Thomas H. Beechy, "Accounting Students' Performance and Cognitive Complexity: Some Empirical Evidence," *The Accounting Review*, April 1984

ductory courses. The suggestions made by Amernic and Beechy are by their own admission not supported by their research findings, but offered in an anecdotal fashion.[19]

Motivation for Studying Levels of Cognitive Complexity Exhibited by Accountants

People choose occupations for many reasons including challenge, money, location, family encouragement, influence of charismatic teachers, desire to serve others, opportunity for leisure time, and enjoyment of co-workers. An assumption used in career counseling is that one of the most important motivations for career choice is a desire for work that is intrinsically interesting and satisfying and that will permit use of specific individual talents. No occupation provides a perfect match between individual talents and work tasks, but good occupational choices can prevent major mismatches.[20]

When there is a mismatch between individual talents and occupational requirements, individuals report feeling tired and inadequate. The mismatch causes fatigue because it is more tiring for an individual to use less preferred processes.

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[19] *Op. Cit.*, Amernic, *et al.*

[20] Myers, Isabel Briggs and Mary H. McCaulley, *A Guide to the Development and Use of the Myers-Briggs Type Indicator*, Consulting Psychologists Press, Palo Alto, California, 1985, p. 77

A mismatch also causes discouragement. Despite the greater expenditure of effort, the work product is less likely to show the quality of products that would be developed if the individual's talents were utilized.[21]

In this dissertation study, information is gathered to describe the levels of cognitive complexity exhibited by accountants. By gaining an understanding of the types of individuals employed in this field, individuals contemplating entering the accounting profession may better assess their compatability with the requirements of the work environment.

It is important to note that information gained from this study should not be used to discourage an individual from pursuing an occupation on the basis that "they are not the correct type." If, after researching the requirements of an occupation, an individual still wishes to enter that occupation despite an apparent mismatch, the resultant situation is very different from the situation where one expects to fit in and does not understand why one feels like an outsider. The result of the atypical choice can be positive. A rare type in a field can bring new viewpoints to the occupation that can lead to progress in the field.[22]

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[21] *Ibid.*, p. 78

[22] *Ibid.*

Summary

This dissertation consists of six chapters. The concept of cognitive complexity and its importance to the accounting profession is introduced in Chapter 1. The literature in vocational counseling, cognitive development, and accounting research are reviewed in Chapters 2, 3, and 4, respectively. The methodology employed in assessing cognitive levels of various occupations, including sample selection and instrument development, is described in Chapter 5. The testable hypotheses and method of statistical analysis are also described in Chapter 5. Results of data analysis, implications of the findings, research contributions, limitations of the research study, and areas for further research are presented in Chapter 6.

CHAPTER 2

VOCATIONAL COUNSELING

One goal of this dissertation study is to describe the levels of cognitive complexity exhibited by accountants. By gaining an understanding of the types of individuals employed in this field, individuals contemplating entering the accounting profession may better assess their compatability with the requirements of the work environment. Matching individuals with compatible occupations is a major purpose of vocational counseling.

If a goal of accounting education is to attract individuals who are suited to the profession, it is important to have an understanding of the factors that contribute to an individual's career selection. The benefits of matching individual talents with the specific demands of a career are widely recognized. Carl Snyder[23] suggests that selection of the right person for the right work is important to society

[23] Snyder, Carl, *Capitalism the Creator*, The Macmillan Company, 1940, p. 280

as a whole. When the proper match fails to materialize, society's productive capacity is not fully utilized. The material benefits that result from an effective guidance system would be immense. Individuals would not start down a career path for which they have no talent or adaptability, but instead would be learning to do something distinctly suited to their capacities.[24]

There are many factors involved in the selection of a career. The following researchers have attempted to catalogue the social and personality characteristics exhibited by members of established professions in order to assist the vocational guidance process. Gray, Segal and Szabo investigated social characteristics. Holland examined the role of personality. Reckers and Bates applied an eighteen-item composite of personality, social, and intellectual characteristics to investigate a negative accounting stereotype.

The Gray Study

Gray (1963) compared teachers, certified public accountants, and mechanical engineers using the Edwards Personality Preference Schedule (EPPS) and the Miller Occupational Values Indicator (OVI).[25] The purpose of the study was to test the hypothesis that there is no difference in needs and values between the

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[24] *Ibid.*

[25] Gray, J. T., "Needs and Values in Three Occupations," *Personnel and Guidance Journal*, 1963, pp. 238-244

three occupational groups under consideration. Subjects selected consisted of 50 secondary school teachers (excluding mathematics and science majors), 50 accountants (all CPA's), and 50 mechanical engineers. All subjects were male. Special care was exercised in selecting the subjects comprising each occupational group to insure that each worker had adjusted in his occupation and in all probability would continue in that occupation. In the case of teachers, only those were selected who had a bachelors degree, had spent two years in teaching, and were working toward a higher degree in the teaching field; in the accounting group, only CPA's with two years' work experience were selected; in the mechanical engineering group, those selected had degrees in mechanical engineering, were currently working in the mechanical engineering field, and all except one subject, personally known to the investigator to be adjusting in the profession, had had at least two years of experience in mechanical engineering. Gray found that teachers considered social rewards important while accountants placed a higher value on career satisfaction and prestige. When Gray compared accountants and engineers, he found the one significant difference was the higher value accountants place on prestige.

The Segal and Szabo Study

Segal and Szabo (1964) compared accountants with creative writers.[26] The sentence completion test was used to measure the subjects' acceptance or rejection of authority figures, as well as positive or negative reactions to people in general. The subjects in this study were fifteen accounting students and fifteen creative writing students at the University of Michigan. Segal and Szabo concluded that accountants accept social norms and control their emotions better and were more skilled in handling complex emotional situations.

The Holland, Cole, and Whitney Study

Holland, Cole, and Whitney (1971) presented an empirical classification of occupations using the six scales of Holland's Vocational Preference Inventory (VPI) and expressed vocational choice of male college freshmen.[27] Data were collected from 6,289 freshmen at 31 colleges in the spring of 1964. In addition, the same data were collected from 12,345 junior college freshmen at 66 institutions in 1968.

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[26] Segal, J. J., and R. Szabo, "Identification in Two Vocations: Accountants and Creative Writers," *Personnel and Guidance Journal*, 1964, pp. 252-255

[27] Holland, J. and N. Cole and D. Whitney, "A Spatial Configuration of Occupations," *Journal of Vocational Behavior*, 1971, pp. 1-9

The researchers used a composite of the following traits to show how various career types are positioned in relation to each other (Figure 2).

- Realistic (R) (Motoric) (Characterized by aggressive behavior and interest in activities requiring motor coordination, physical strength and masculinity)
- Investigative (I) (Intellectual) (Characterized by thinking rather than acting, organizing, understanding, persuasion and associability)
- Social (S) (Supportive) (Seek close interpersonal relations, socially skilled, avoid engagement in intellectual problem-solving situations and situation requiring extensive physical skill)
- Conventional (C) (Conforming) (Identification with power and status, great concern for rules and regulations, conforming)
- Enterprising (E) (Persuasive) (Characterized by verbal skills used to manipulate and dominate people, concerned about power and status, as do Conventional, however aspire to the power and status while Conventional honor others for it.)
- Artistic (A) (Esthetic) (Characterized by strong self-expression, dislike structure, intraceptive, asocial, exhibit great emotion and little self-control)

Holland characterized accountants as having a great concern for rules and regulations, self-control, subordination of personal needs, and strong identification with power and status. The accountant prefers a concrete environment where structure is readily available.

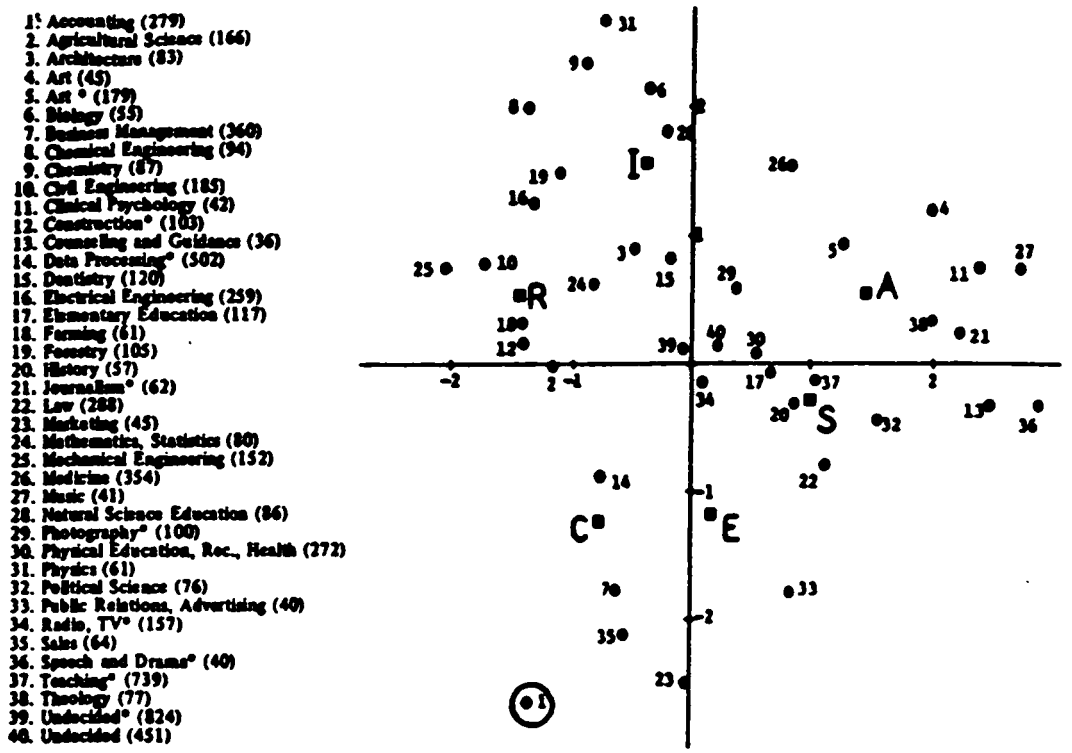

Figure 2. Holland's Figure Showing Relative Position of Career Preferences (Holland, *et al.*, 1971)

The extent to which occupations have similar interests can be measured by the distance between occupation groups in Figure 2. As the groups become closer together, the interests become more similar. Accountants (code 1) who are at the very bottom of the Conventional quadrant, are most distant from what might be categorized as the natural science group: Physics (code 31), Chemistry (code 9), and Biology (code 6).

Further studies have attempted to develop theoretical frameworks for the characterization of an accounting stereotype. Using Holland's theory of six personality types,[28] i.e.,

- Realistic
- Investigative
- Artistic
- Social
- Enterprising
- Conventional

Amernic, Aranya and Pollack[29] surveyed chartered accountants to ascertain if one of the six groups categorized the chartered accountants. Results of this survey showed that Conventional was the most frequently dominant personality trait exhibited by accountants (27.5%).

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[28] Holland, J. L., *Making Vocational Choices: A Theory of Careers*, Prentice-Hall, 1973

[29] Amernic, Joel H., Nissim Aranya, and Jerome Pollack, "How Typical is the Typical CA?" *CA Magazine*, October 1979, pp. 35-42

The conventional type prefers activities that entail the explicitly-ordered, systematic manipulation of data, such as keeping records, filing materials, reproducing materials, organizing written and numerical data according to a prescribed plan, operating business machines and data processing machines to attain organizational or economic goals, and has an aversion to ambiguous, free exploratory or unsystematic activities (concrete behavior). These behavioral tendencies result in an acquisition of clerical, computational and business system competencies and a deficit in artistic competencies.

The Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator (MBTI) is a counseling tool developed to assess individual styles of information gathering and decision making.[30] The MBTI contains four separate indices. Each index reflects one of four basic preferences which direct the use of perception and judgment. The preferences affect not only *what* people attend to in any given situation, but also *how* they draw conclusions about what they perceive.

- Extroversion-Introversion (EI). The EI index is designed to reflect whether a person is an extrovert or any introvert. Extroverts are oriented primarily toward the outer world; thus, they need to focus their perception and judg-

[30] Myers, Isabel Briggs and Mary H. McCaulley, *A Guide to the Development and Use of the Myers-Briggs Type Indicator*, Consulting Psychologists Press, Palo Alto, California, 1985

ment on people and objects. Introverts are oriented primarily toward the inner world; thus, they tend to focus their perception and judgment upon concepts and ideas.

- Sensing-Intuition (SN). The SN index is designed to reflect a person's preference between two opposite ways of perceiving; one may rely primarily upon the process of sensing (S), which reports observable facts or happenings through one or more of the five senses; or one may rely more upon the less obvious process of intuition (N), which reports meanings, relationships, and/or possibilities that have been worked out beyond the reach of the conscious mind.

- Thinking-Feeling (TF). The TF index is designed to reflect a person's preference between two contrasting ways of judgment. A person may rely primarily on thinking (T) to decide impersonally on the basis of logical consequences, or a person may rely primarily on feeling (F) to decide primarily on the basis of personal or social values.

- Judgment-Perception (JP). The JP index is designed to describe the process a person uses primarily in dealing with the outer world, that is, with the extroverted part of life. A person who prefers judgment (J) has reported a preference for using a judgment process (either thinking or feeling) for dealing with the outer world. A person who prefers perception (P) has reported a

preference for using a perceptive process (either S or N) for dealing with the outer world.

Using the Myers-Briggs Type Indicator, D. W. MacKinnon (1961)[31] of the Institute of Personality Assessment and Research found that especially creative groups, whether architects, writers, research scientists, or mathematicians, are almost entirely composed of intuitive types as opposed to sensing types. The second most important preference for this group relates to the thinking-feeling choice. People who prefer thinking are more skillful in handling inanimate objects, principles, or theories. (See Table 1.)

The previously described MacKinnon study (1961) is nearly thirty years old. MacKinnon used data collected by Laney in 1949. While Laney examined individual characteristics, MacKinnon's study analyzed these preferences in combination. Laney focused on the individual components, for example, extroversion vs. introversion. MacKinnon combines the individual components into personality types. The results of a 1985 study reported by the Center for Applications of Psychological Type, Inc., Data Bank (CAPT)[32] indicate that the MBTI still does not classify a majority of accountants as having a creative preference in processing information. However, in the intervening period between 1962 and 1985 there has been a shift in the creative direction. In 1985, 39 percent of accountants were classified as Sensing-Thinking and 23 percent as Sensing-Feeling

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[31] MacKinnon, D. W., *The Personality Correlates of Creativity: A Study of American Architects*, Institute of Personality and Assessment Research, Berkeley, California, 1961

[32] *Op. Cit.*, Myers and McCaulley

Table 1. Distribution of Types within Occupational and Academic Groups

	Percentages			
	ST	SF	NF	NT*
OCCUPATIONS				
Accountants	64	23	4	9
Bank employees	47	24	11	18
Sales, customer relations	11	81	8	0
Creative writers	12	0	65	23
Research scientists	0	0	23	77
FIELDS OF GRADUATE STUDIES				
Theology (liberal)	3	15	57	25
Law	31	10	17	42
FIELDS OF COLLEGE STUDIES				
Finance and commerce	51	21	10	18
Nursing	15	44	34	7
Counseling	6	9	76	9
Science	12	5	26	57
Health-related	13	36	44	7
Education	13	42	39	6
Journalism	15	23	42	20
P.E. and health	32	34	24	10

Sources: MacKinnon (1962) and Laney (1949)

*ST Sensing-Thinking
SF Sensing-Feeling
NF Intuitive-Feeling
NT Intuitive-Thinking

compared with 64 and 23 percent, respectively, in 1962. In the categories associated with creativity, the 1985 study classified 18 percent as Intuitive-Feeling and 20 percent as Intuitive-Thinking compared with 4 percent and 9 percent, respectively, in 1962. While the updated statistics do not indicate that the majority of accountants exhibit a creative preference in processing information, there has been a notable change in the distribution of types in this occupational group.

While the cognitive development of an individual is an ongoing process, it is of some interest to note that the effect of the workplace on the individual is considerable. Inkeles (1960)[33] articulated what has come to be known as the "convergence thesis."

The convergence thesis proposes that organizations differ in differing societies and that these organizations have standard, powerful environments where they produce common values, perceptions, and ways of thinking. Put more generally, institutions with similar structures tend to induce common psychic structures or regularities in the personalities of their participants. This is especially true if, as in the case of schools and the workplace, the individual spends time in the institutions and they control powerful rewards and punishments.[34]

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[33] *Social Psychology, Sociological Perspectives,* Rosenberg, Morris and Ralph H. Turner, Editors, Basic Books, Inc., New York, 1981, "Social Structure and Personality," Chapter 17, James S. House, p. 537

[34] Suzman, R. M., "The Modernization of Personality," In *We, The People: American Character and Social Change,* Ed. G. J. DiRenzo, Greenwood Press, Westport, CT, 1977

The specific structural imperatives of work have profound and pervasive influences on values and behavior. The impact of occupation and education of parents or siblings have very weak effects on values once an individual's occupation and education are controlled, whereas the effects of current occupation are hardly diminished by controls for parental socioeconomic status.[35]

Longitudinal analysis performed by Kohn and Schooler[36] indicates that over time personality has important consequences for the individual's place in the job structure. Job conditions are not readily modified to suit the needs or capacities of the individual worker. Over a long period of time, however, individuals either modify their jobs or move to other jobs more consonant with their personalities. Thus, the long-term effects of personality on job conditions are considerable. The process of job affecting man and man affecting job is truly reciprocal through adult life.[37]

The De Coster and Rhode Study

This 1972 occupational study was unique in that it examined occupational sub-

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[35] Kohn, M.L. and Schooler, C.,"Occupational Experience and Psychological Functioning: An Assessment of Reciprocal Effect," *American Psychological Review*, 1973, 38:97-118

[36] *Ibid.* Kohn and Schooler, 1973

[37] Kohn, M. L. and C. Schooler, "Job Conditions and Personality: A Longitudinal Assessment of Their Reciprocal Effects," *American Journal of Sociology*, May 1982, Vol. 87, No. 6, p. 1281

groups within the accounting profession.[38] The accounting sub-groups consisted of 24 Beta Alpha Psi members; 52 (13 in each category) "Big Eight" CPA firm juniors, seniors, managers, and partners; and 56 practitioners. The subjects were administered the California Psychological Inventory to test for sub-group differences in personality traits. The results of this study reveal two different styles of interpersonal relationships. The partners were found to be more conservative and conforming than the other groups. The authors of this study suggest that over time members of the profession undergo a maturational process leading to a more conforming posture. Another explanation for these results might be that the partners (the "survivors") were initially more conservative.

Combining the results of the previous four studies, the accounting personality values prestige, power, and status; enjoys working in a structured environment; accepts social norms; and controls emotions. The following section describes the relationship between personality and career selection.

The Relationship Between Personality and Career Choice

Vocational guidance theory suggests that, "Career choices represent an extension of personality and an attempt to implement broad personal behavioral styles in

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[38] *Op. Cit.*, De Coster, D. T., *et al.*

the context of one's life style."[39] When an individual has no understanding of the exact requirements of a particular occupation, the stereotype that the individual holds regarding a particular occupation may strongly influence the initial vocational choice.[40] While financial rewards, peer and/or parental pressures play a role in job selection, congruence between the individual's career needs and his perception of the characteristics of a particular vocation can be a determining factor in the selection process. The extent that this congruence exerts itself in the selection process can be amplified when the vocational image is appreciably negative, or unusually positive. College schools of journalism had an increase in the number of students in the early 1970's. An explanation that has been suggested is that the influence of journalists during the Watergate era made the profession much more appealing and glamorous.[41]

The need for congruence of self-image and vocational environment forces the individual to gravitate in the direction of an occupation that has the proper environmental match.[42] During the undergraduate years one would expect that, as students learn more about themselves and their initial career selection, the discovery of incongruence would result in a change in career selection.[43] This dis-

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[39] Osipow, S., *Theories of Career Development*, Second Edition, Prentice Hall, Inc., 1973, p. 41

[40] Reckers, Phillip and H. L. Bates, "The Accountant's Stereotype -- Impact on Career Selection," *Massachusetts CPA Review*, November/December 1978

[41] *Ibid.*

[42] *Op. Cit.*, Osipow

[43] *Op. Cit*, Reckers, *et al.*

covery of incongruence would occur when an occupational stereotype that had been instrumental in an original career choice is found to be erroneous.

Mitigating factors prevent a proper matching of career entrants with professional needs. If the financial rewards of an occupation are perceived to be great, there is likely to be more of a willingness on the part of an individual to settle for less congruence. To the extent that an erroneous negative stereotype exists regarding a particular vocation, individuals who might be suited for that vocation will be unwilling to direct their interests in that area.[44]

The Reckers and Bates Study

To determine whether a negative accounting stereotype affected students' selection of a career field, Reckers and Bates administered the California Psychological Inventory (CPI) to students at the University of Maryland and the University of South Carolina. The CPI was administered to 107 accounting seniors, 135 business seniors, and 1,137 members of the general college population. This instrument is a highly validated instrument that measures the subject on eighteen dimensions falling in four categories[45] The four major categories attempt to measure:

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[44] *Ibid.*

[45] Megargee, E., *The California Psychological Inventory Handbook,* Jossey-Bass, Inc., 1972

1. Poise, ascendency, self-assurance and interpersonal adequacy.
2. Socialization, maturity, responsibility and interpersonal structuring of values.
3. Achievement potential and intellectual efficiency.
4. Intellectual and interest modes.

Accounting students scored significantly lower than overall college norms in the area of responsibility and tolerance. The CPI describes "responsibility" as a combination of being "responsible, thorough, progressive, capable, independent, alert to ethical and moral issues." "Tolerance" is characterized as "tolerant, clear-thinking, broad and varied interests, and permissive with respect to social beliefs and attitudes." The low tolerance score is consistent with the stereotype of an accountant as an individual driven by strict rules and procedures. However, when looking at the overall results from the CPI, the study found that accounting students are not significantly different from the average college student and therefore could not conclude that a negative stereotype was or was not at work.

A recurring theme in the accounting literature has been the need to attract individuals who are cognitively complex. If we are to attract this type of individual, it is important to know when career choices are being made. The following study investigates this issue.

The Paolillo and Estes Study

The researchers in this 1982 study attempted to systematically relate career-choice factors of accountants with those of other professionals.[46] The sample in this study is drawn from the following professional organizations: The American Institute of Certified Public Accountants, The American Bar Association, The American Society of Mechanical Engineers, and The American Medical Association. Results indicate that mechanical engineers and physicians establish their career choice by the time they graduate from high school. Interestingly, one fourth of the physicians had made their career choices before reaching high school. Accountants choose their occupation during their first two years of college. Attorneys make their career choice during the last two years of college.

Paolillo and Estes used the following items to determine the factors that influence choice of profession: earning potential, association with others in the field, parental influence, cost of education, social status attainment, job satisfaction, years of formal education required, aptitude for subject matter, teacher influence, peer influence, previous work experience, and availability of employment. The accounting group's choice of profession was most influenced bv availability of employment. Other factors scoring high with the accounting group were earnings potential, years of education required, aptitude for the subject, and teacher in-

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[46] Paolillo, G. P. and R. W. Estes, "An Empirical Analysis of Career Choice Factors Among Accountants, Attorneys, Engineers, and Physicians," *The Accounting Review*, October 1982

fluence. Factors that did not seem to be of particular importance were parental influence, cost of education, job satisfaction, and peer influence.

Attorneys rank social status attainment higher than the other three professional groups. Of the four groups, attorneys are the least concerned with employment availability. Mechanical engineers, like accountants, are concerned with employment availability. Social status attainment appeared to be less important to mechanical engineers than to the other three professions. Physicians regard parental influence, job satisfaction, and peer influence as more important in influencing career choice than do the other three professions. Earnings potential, previous work experience, and aptitude for the subject were considered less important.

Summary

Factors that affect career choice, as well as the point in time that such a choice is made, are reviewed in this chapter. Accounting educators should understand these factors in their role of attracting students who are likely to be successful in the field of accounting. Influential factors in the choice of accounting as a career are earnings potential, years of education, teacher influence, and availability of employment.[47] The choice of accounting as a career is made sometime within the

[47] *Op. Cit.*, Paolillo and Estes

first two years of college. Recent Myers-Briggs Type Indicator (MBTI) studies provide evidence that an increasing number of accountants exhibit a creative preference when processing information. At this time there are still large differences between accountants and those groups historically associated with creative preferences, for example, research scientists. According to Reckers and Bates,[48] a negative accounting stereotype is not driving students away from selecting accounting as a major and, consequently, as a career.

[48] *Op. Cit.*

CHAPTER 3

COGNITIVE DEVELOPMENT

Because this dissertation study extends cognitive research into the accounting domain, it is necessary to review existing psychology literature concerning cognitive development. Most research in the area of cognitive development is based upon Piagetian theory. Piaget's theoretical framework is therefore presented in this chapter. This presentation of Piagetian theory is followed by a review of the literature extending Piaget's theories into the area of individual learning strategies and cognitive training.

Piagetian Theory of Cognitive Development

The psychological growth of the human mind has been described as a develop-

mental process.[49] As with physical maturation, the greatest growth takes place during the first fifteen years of an individual's life. Piaget identified four developmental levels of thinking: sensory-motor, pre-operational, concrete-operational, and formal-operational levels.

Sensory-Motor Level.

This first level of cognitive development begins at birth. This level receives its name (Sensory-Motor) from the way in which the infant relates to its environment. This level is pre-verbal and is comprised primarily of the infant's use of motor skills to interact with the environment. This level continues until the infant is about two years old. The end of this level coincides with the infant's development of early language skills.[50]

Pre-operational Level.

At about two years old the child develops the ability to form constructs or mental representations of objects. This level of development is labelled pre-operational because the child does not yet have the ability to perform operations. Operations are internalized mental actions that are reversible. Reversible means the per-

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[49] Inhelder, B. and J. Piaget, *The Growth of Logical Thinking from Childhood to Adolescence*, Basic Books, 1958

[50] Ginsburg, A. and S. Opper, *Piaget's Theory of Intellectual Development*, Prentice Hall, 1969

formance of a mental operation which leads to a certain conclusion, and then do the reverse of this operation which enables him to return to the original starting point.[51] Counting and measuring are examples of operations.

Concrete-Operational Level

This level begins at about the age of seven. Elementary mathematical and science skills are mastered during this level. The skills mastered during this level consist of nothing more than a direct organization of immediately given data.[52] The child cannot handle the information in a hypothetical fashion. There are three specific mental abilities developed during this concrete-operational level: class inclusion, serial reordering, and conservation. Briefly, the mental abilities involved at the concrete-operational level can be described as follows:

1. **Class Inclussion.** Elementary classifications can be made and generalizations derived.
2. **Serial Reordering.** A group of objects may be resequenced according to a predetermined ordering scheme.
3. **Conservation.** In a specific sense, the ability to recognize that certain physical properties such as weight, volume, and length are held constant (or con-

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[51] *Ibid.*

[52] *Op. Cit.*, Inhelder and Piaget

served) even though the appearance of the object in question is changed in some manner.

Formal-Operational Level.

Formal-operational thinking involves the ability to reason abstractly. This ability involves not only performing operations on objects, but also exploring possibilities in totally hypothetical situations. This involves the development and testing of consequences from purely hypothetical assumptions or deductive reasoning. There are several abilities involved at this level. Although not an exhaustive list, a sample of formal reasoning patterns is as follows:

1. **Combinational Reasoning.** All possible combinations of outcomes are derived and evaluated in a systematic manner.
2. **Propositional Reasoning.** Hypotheses are evaluated in a systematic manner by manipulating the variables involved. The key methodological component is the ability to hold all other variables constant while manipulating a single variable and then evaluating the results.
3. **Probabilistic Reasoning.** The nature of the world is seen as probabilistic. Any conclusion regarding the exploration of a hypothesis must be considered in that light. The concept of chance is understood to affect outcomes of various activities. This understanding allows the individual to accept the results of

these activities, even though the results may not be exactly the same each time they are investigated.

4. **Proportional Reasoning.** The ability to determine proportional relationships allows the individual to relate objects and data and even concepts not only in terms of physical dimensions where appropriate, but also in terms of the relationship between relationships. For example, the ability to really understand and use percentage as a concept requires this skill. This contrasts with the ability to memorize and apply a specified formula for calculating a certain percentage.
5. **Correlational Reasoning.** The relationships or associations between sets of data are recognized to be significant in some cases, even to the extreme case of causal relationships.

In summary, formal-operational thought involves thinking about thinking and the ability to consider possibilities rather than being limited by observable realities.[53] It was Piaget's original belief that all individuals passed through each of the first three stages--sensory-motor, pre-operational, and concrete-operational--in sequence; and somewhere between 11 and 15 years of age reached the level called formal-operational. Subsequent research has indicated that the time frame when transition to formal-operational takes place is extremely variable and that some individuals never reach the highest level.[54]

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[53] *Op. Cit.*, Shute, G.

[54] Neimark, E., "Intellectual Development During Adolescence," in Frances D. Horowitz, Ed., *Review of Child Development Research*, Vol. 4, The University of Chicago Press, Chicago, 1975, pp. 541-594

Piagetian Research

There is general agreement among Piagetian researchers that a significant number of all college freshmen are still functioning largely at the concrete-operational level.[55] Deanna Kuhn and her associates (1977) report that 50 percent of individuals tested between the ages of 11 and 15 showed predominantly formal reasoning; this figure rose to 60 percent for 16 to 20 year olds and to 70 percent for 21 to 30 year olds. Furthermore, although about 20 percent of the 16 to 20 year olds showed both concrete and formal-operational reasoning, very few young adults between the ages of 21 and 30 attempted to solve the problems by means of a combination of both types of reasoning. Kuhn states that, if an individual makes the transition to formal thought, it will be achieved by the late twenties.[56]

In separate reviews of the research on critical thinking, Lawson (1985)[57] and Kuhn (1986)[58] report that a substantial percentage of adolescents and adults show surprising deficiencies in their abilities to use rational thinking skills. This deficiency has resulted in a number of reports criticizing the U.S. educational system. According to Kuhn, students are often competent in basic computational skills

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[55] Dunlop, D. and F. Fazio, "Piagetian Theory and Abstract Preferences of College Science Students," *Journal of College Science Teaching*, May 1976, pp. 297-300

[56] Stevens-Long, J. and N. J. Cobb (Eds.), *Adolescence and Early Adulthood*, Mayfield Publishing Company, Palo Alto, California, 1983

[57] Lawson, Antone, "A Review of Research on Formal Reasoning and Science Teaching," *Journal of Research in Science Teaching*, Vol. 22, No. 7, 1985

[58] Kuhn, Deanna, "Education for Thinking," *Teachers College Record*, Vol. 87, No. 4, Summer 1986

but are unable to apply those skills in situations that require quantitative reasoning and problem solving.[59]

Findings of additional studies[60] indicate that as many as 50 percent of all adults may be functioning at the concrete-operational level in all or a major proportion of their activities. Shute (1979)[61] examined cognitive levels of accounting majors and found evidence that a majority of these students were not operating at the formal-operational level. A 1986 study also found that large percentages of college age subjects had not reached the formal-operational level of cognitive development.[62] Development of formal-operational thought remains a topic of cognitive research.

Fluid and Crystallized Intelligence

The results of the Kuhn study on formal reasoning skills are consistent with the results of research on the development of intelligence. Intelligence is often described in terms of a number of specific intellectual abilities: verbal, numerical, reasoning, spatial relations, and memory. The theory of fluid and crystallized

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[59] *Ibid.*

[60] For example, Kangus and Bradway, 1971; Tomlinson-Keasey, 1972.

[61] *Op. Cit.*, pp. 24-34

[62] Poduska, Ervin and Darrell G. Phillips, "The Performance of College Students on Piaget-Type Tasks Dealing with Distance, Time, and Speed," *Journal of Research in Science Teaching*, Vol. 23, No. 9, 1986

intelligence attempts to divide intelligence into two levels.[63] Fluid intelligence involves the capacity to use unique kinds of thinking in order to solve unfamiliar problems, rather than merely drawing on previously acquired information. This form of intelligence resembles skills developed during Piaget's formal-operational stage of development.

In an examination of this relationship between formal reasoning and fluid intelligence, Clayton and Overton (1976)[64] found that both formal reasoning and fluid intelligence decrease with age. Crystallized intelligence involves the knowledge that has been acquired through education. It is typically measured by using tests of vocabulary, information, and mechanical knowledge, all of which draw on one's acquired store of information. Piaget's concrete-operational stage resembles crystallized ingelligence. Crystallized intelligence reflects our accumulated store of knowledge, which is likely to remain relatively stable or even increase as we grow older. Conversely, fluid intelligence is a more innate capacity. It does involve incidental learning, but also requires the use of efficient brain and nervous systems. Since our physiological capacities are known to degenerate with increasing age, a corresponding decline in fluid intelligence is to be expected. (See Figure 3.)[65]

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[63] Horn, J. L. and R. B. Catell, "Age Differences in Primary Mental Ability Factors," *Journal of Gerontology*, 1966, pp. 210-229

[64] Clayton, V. and W. F. Overton, "Concrete and Formal Operational Thought Processes in Young Adulthood and Old Age," *International Journal of Aging and Human Development*, No. 7, 1976

[65] Horn, J. L., and G. Donaldson, "Cognitive Development II: Adulthood Development of Human Abilities," In Brim, O. G., Jr., and J. Kagan, Eds., *Constancy and Change in Human Development*, Harvard University Press, Cambridge, Massachusetts, 1980

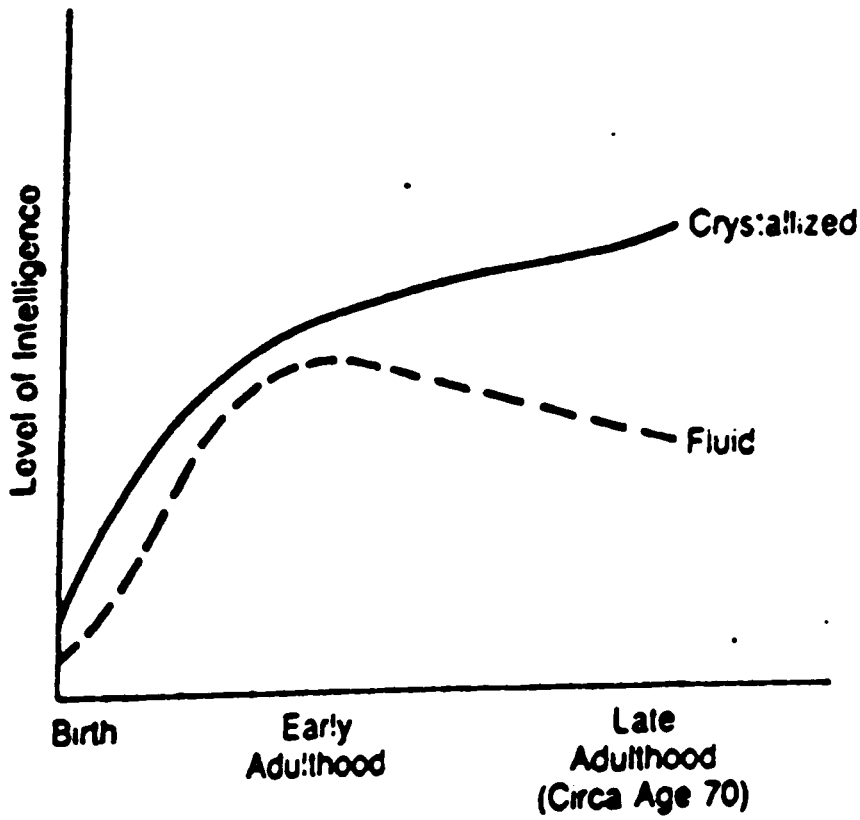

Figure 3. Hypothesized Age Changes for Fluid Intelligence and Crystallized Intelligence (Kausler, 1982, p. 586)

The Wechsler Adult Intelligence Scale (WAIS) findings support the theory of crystallized and fluid intelligence. WAIS verbal scores which would reflect crystallized intelligence show much smaller age related declines than do the WAIS performance scores which are similar to fluid intelligence.[66] Research by psychologists in recent years has just begun to explore the implications of this finding on adult members of our society.

In the previous section Piaget's theory of cognitive development and the theory of fluid and crystallized intelligence developed by Horn and Catell[67] were reviewed. Piaget's work has been extended by researchers who have found that the point at which individuals reach the formal-operational stage of development is not as precise as Piaget's work would indicate. It is apparent from the research that the vast majority of cognitive development has taken place by the time an individual has reached the early twenties. Researchers are fairly consistent in their conclusion that an individual's level of cognitive development reaches its zenith by age thirty. The research is not conclusive as to whether cognitive levels remain constant or begin a slow decline at this point. The theory of fluid and crystallized intelligence provides evidence that the levels decline.

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[66] Schulz, R. and R. B. Ewen, *Adult Development and Aging, Myths and Emerging Realities*, Macmillan Publishing Company, New York, 1988

[67] *Op. Cit.*

Learning Strategies

The concrete-operational and formal-operational stages of development, according to Piaget, describe how an individual assimilates environmental inputs. Research that has been conducted on individual learning styles has extended the model developed by Piaget.

Learning style refers to the way an individual filters, conceptually organizes and processes stimuli so that the environment takes on meaning.[68] Schmeck (1983)[69] defines learning style as a predisposition on the part of students to use a particular learning strategy regardless of the operation being learned. Learning strategy is defined as a pattern of information processing activities used to prepare for an anticipated test of memory. Messick (1976)[70] defines cognitive style as a general, habitual mode of processing information. Based upon the definitions of cognitive and learning style, Schmeck states:

> Individuals' learning styles are simply the cognitive styles that they evidence when confronted with a learning task.[71]

The use of one term instead of the other is a function of the particular research work that is being examined and not an indication that different topics are being

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[68] *Op. Cit.*, Chen and Olson

[69] *Op. Cit.*, Schmeck

[70] *Op. Cit.*, Messick

[71] *Op. Cit.*, Schmeck

discussed.[72] The following section reviews some of the studies that have examined cognitive and learning styles employed by individuals.

The Pask Studies

In studies by Pask (1972, 1976) students were given material that they were instructed to understand and not to simply memorize. Students were required to "teach-back" the material they had just learned. Based on analysis in the "teach-back" phase, students were classified as using two learning strategies.[73] The study identifies one strategy as holistic, emphasizing the functional relation between parts and wholes. Individuals employing the holistic strategy are using an approach called comprehensive learnings. Users of the holistic approach attempt to first assess the "big picture" before focusing on specifics.

The second approach to learning is the serialist strategy. This group manifests a style referred to as operation learning. Operation learners process data in a linear fashion. These individuals approach tasks in a methodical fashion and are concerned with detail and procedure. According to Pask, this individual "sees the trees but misses the forest." Pask states that the most competent student will be

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[72] *Ibid.*

[73] Pask, G. and B. C. E. Scott, "Learning Strategies and Individual Competence," *International Journal of Man-Machine Studies*, 1972, pp. 217-253; Pask, G., "Conversational Techniques in the Study and Practice of Education," *British Journal of Educational Psychology*, 1976, Vol. 45, pp. 12-25 and "Styles and Strategies of Learning," *British Journal of Educational Psychology*, 1976, Vol. 46, pp. 128-148

the one who employs a comprehensive approach to establish an overall model but operationalizes it using a serialist approach.

The Marton and Saljo Study

Marton and Saljo (1976) gave students articles to read and told them they would be asked questions on the articles when they were finished.[74] The students were intentionally given vague instructions so that a wider variation in approach might be observed. Two learning outcomes were observed in this study: conclusion-oriented and description-oriented. The conclusion-oriented outcome was characterized by an attempt on the part of the subject to summarize the main argument as well as supporting evidence. This attempt to evaluate the main argument in relation to supporting evidence was referred to as a deep-level approach. The description level outcome was characterized by an attempt to focus on specific facts and pieces of disconnected information which were memorized. This descriptive approach is referred to as a surface-level approach.

The Svensson Study

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[74] Marton, F. and R. Saljo, "On Qualitative Differences in Learning, I. Outcome and Processes," *British Journal of Educational Psychology*, 1976, Vol. 46, pp. 4-11 and "On Qualitative Differences in Learning, II. Outcome as a Function of the Learner's Conception of the Task," *British Journal of Educational Psychology*, 1976, Vol. 46, pp. 115-127

Svensson (1977)[75] interviewed thirty first-year education students in order to gather information to describe the various approaches used by these students in their normal studies. He found that a deep-level approach produced superior examination performance. Marton and Saljo's 1976 study[76] indicated that a question lacking in depth encouraged a surface-level learning approach. Only sixteen of the thirty students consistently employed a deep-level learning approach in the experiment and only ten of these sixteen had clearly extended this approach into their normal studies. In addition, Svensson demonstrated that a lack of interest, as well as anxiety, increased the likelihood of a shallow-level approach being employed.

The Entwistle Study

A study performed by Entwistle (1968)[77] attempted to isolate student personality types as well as motivational differences that would help predict academic performance. The Eysenck Personality Inventory was administered to seventy-two graduate students at Aberdeen University. The study isolated three major student orientations. The "meaning" individual displays intrinsic motivation and operates somewhat independently of the course syllabi. The "reproducing" stu-

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[75] Svensson, L., "On Qualitative Differences in Learning, III. Study Skill and Learning," *British Journal of Educational Psychology*, 1977, Vol. 47, pp. 233-243

[76] *Op. Cit.*

[77] Entwistle, N. and J. D. Wilson, "Personality, Study Methods, and Academic Performance," *University Quarterly*, 1970, Vol. 24, pp. 147-156

dent is extrinsically motivated by fear of failure, dependent upon the syllabi, and tends to memorize. The "achieving" student is extrinsically motivated by hope for success and is self-confident.

Integrating The Findings of The Entwistle, Pask, and Marton & Saljo Studies

Each of Entwistle's three "types" motivates the student to use a particular approach in studying. These approaches can be compared to the research findings of Pask and Marton and Saljo.[78] The student who is interested in "meaning" adopts a deep-level approach (Marton and Saljo) or a holistic strategy (Pask). The individual with the "reproducing" orientation adopts a surface-level approach (Marton and Saljo) or a serialist strategy (Pask). The achieving orientation results in an individual undertaking an approach that will produce the highest grades.

The Perry Study

Perry (1970)[79] identified three stages through which students passed during their four years of college. The first stage is categorized by students seeing information as being either true or false. The learning task that is taking place during this phase is the storing of truth in memory. Students at this phase of development

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[78] *Op. Cit.*

[79] Perry, W. F., *Forms of Intellectual and Ethical Development in the College Years: A Scheme*, Holt, Rinehart & Winston, New York, 1970

process information at the surface level (Schmeck). The second stage or "dualistic" phase occurs when students begin to feel that all information has validity since there is no such thing as absolute truth. The final stage is one of "commitment." In this stage the student recognizes that any issue can have more than one legitimate side, but from a pragmatic standpoint it is often wise to make a rational commitment to one side of the issue. The characteristics of this final stage are similar to those characteristics exhibited by a cognitively complex individual. At the point of cognitive complexity, an individual also begins to see two legitimate sides to most issues.

Summary of the Relationships Between Learning Strategies and Piaget's Theory

Researchers need to uncover all of the relationships that exist between individual learning strategies and Piaget's cognitive development continuum. It seems quite likely that an individual's level of cognitive development will be a constraining factor in determining the particular learning strategy employed.[80] While it has been shown that as many as 50 percent of all adults may be functioning at a concrete-operational level in all or a major proportion of their activities, the level that the other 50 percent are operating at may be governed by how familiar an individual is with a content area. Individuals are more inclined to employ a deep

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[80] Biggs, J. B., "Developmental Processing, Study Processes, and Learning Outcomes," in J. R. Kirby and J. B. Biggs (Eds.) *Cognition, Development, and Instruction*, Academic Press, New York, 1980

processing strategy only after they have become comfortable with the subject area.[81]

Various approaches employed by students in processing information have been examined in the previous section on "Learning Strategies." These approaches vary for the individual student over time and across subject areas. It may be useful to understand the developmental process that has theoretically occurred during the period when accounting professionals were students. Additionally, if accounting educators are interested in attracting abstract students, it is also important to determine whether the abstract level of students can be enhanced by formal training.

Cognitive Training

It has been recognized for many years that one of the primary aims of education, especially at the college level, is to foster students' ability to think critically, to reason and to use judgment effectively in decision making.[82] In 1933 John Dewey argued that the major purpose of education is learning to think.[83]

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[81] *Op. Cit.*, Entwistle and Wilson

[82] McMillan, James H., *Enhancing College Students' Critical Thinking: A Review of Studies Research in Higher Education*, Vol. 26, No. 1, 1987

[83] *Ibid.*

In a 1984 report published by the National Institute of Education, it is recommended that college curricula ensure "the development of capacities of analysis, problem solving, communication, and synthesis:"[84]

> [F]aculty and academic deans...design and implement a systematic program to assess the knowledge, capacities, and skills developed by students...[and]...it is especially important that these assessments allow for judgments of the impact...on analytic reasoning, and the ability to synthesize.[85]

In 1985 the Association of American Colleges issued "Integrity in the College Curriculum: A Report to the Academic Community." In this report it is suggested that students must learn "to reason well, to discover the legitimacy of intuition, to subject data to the probing analysis of the mind."[86] The development of abstract logical thinking and inquiry skills is also encouraged.

Successful performance in many college courses requires some level of formal-operational thinking.[87] It is quite probable therefore that the thinking level of most college students does not coincide with the levels of thought processing required in their respective courses. Tomlinson-Keasey (1972), as well as Kangas and Bradway (1971), clearly conclude in their studies that educators cannot assume that *all* students can use abstract thinking skills.

If a majority of students are not consistently operating at a level of formal reasoning, a goal of educators should be to improve the reasoning levels of students.

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[84] National Institute of Education Report, 1984, p. 43

[85] *Ibid.*, p. 55

[86] Association of American Colleges, "Integrity in the College Curriculum: A Report to the Academic Community," 1985, p. 15

[87] Collea, Francis P. and Susan G. Nummedal, "Development of Reasoning in Science (DORIS): A Course in Abstract Thinking," *Journal of College Science Teaching*, Vol. 10, 1980, pp. 100-102

While it is quite easy to articulate the goal of educators, it is quite another problem to agree on which reasoning skills to teach as well as how best to teach them.[88]

Are there courses, concepts, experiences, and specific programs that could be used to enhance intellectual development in college students? Can educators develop teaching strategies to ease the transition from concrete to formal thinking? Is it possible to develop curricula with the specific intent of developing cognitive skills instead of leaving those skills to be developed within the confines of conventional courses? How can this intellectual growth that we are attempting to enhance be measured? The following section contains a discussion of the problems associated with attempting to enhance cognitive development, as well as an examination of the research studies that have attempted to improve critical thinking skills.

Impact of Environment on Cognitive Development

How one develops cognitively is related to the environment with which one interacts. In a "unilateral environment" an individual is faced with ready-made rules and any required response is elicited through a series of rewards and punishments.[89] This environment restricts the variety of perceptions and responses

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[88] Nummedal, S. G., "The Role of Confirming and Disconfirming Evidence in Judgments of Covariation Between Events," Paper presented at the 12th Symposium of the Jean Piaget Society, Philadelphia, Pennsylvania, June 1982

[89] Harvey, O. J. *et al.*, *Conceptual Systems and Personality Organization*, John Wiley, New York, 1961

available to an individual. An example of this teaching approach would be the situation where: (a) a task is broken down into components, (b) the components are examined singularly and interfacing between components is not shown, (c) are taught rules of integration as a separate topic. Reading is a topic that is taught in this manner. Letters are first learned, followed by rules of phonetics, and then rules of combination.[90]

This simplified approach to teaching is an accepted practice in both industry and education.[91] This type of training places few demands on an individual and therefore can be used over a wider variety of individuals.

The unilateral approach to instruction is successful in getting the student to produce some required response. The problem that is created under a unilateral approach is that, because the environment is oversimplified, the evolution to more complex levels of information processing is retarded.[92] For example, two individuals may achieve similar examination scores, however, there may be differences in how the information might then be used in novel settings.

Another method of training is referred to as the interdependent or inductive approach. With this approach the individual must generate a diagram of a given situation as well as rules of integration that fit this diagram. While this environ-

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[90] *Ibid.*

[91] Schroder, H. M. *et al., Human Information Processing,* Holt, Rinehart, and Winston, Inc., New York, 1967

[92] Anderson, A. R. and O. I. Moore, "Autotelic Folk-Models," *Sociological Quarterly,* Vol. 1, 1960, pp. 203-216

ment does not impose rules in the unilateral sense, it must possess all the required components needed to achieve a particular goal. This approach encourages exploration of the environment and allows the individual to experience the consequences of a particular action. Where the unilateral style of teaching is characterized by response patterns based upon fixed rules, the interdependent approach encourages a response based upon adaptive behavior that is driven by self-generated rules. The advent of the computer has made implementation of the interdependent approach easier. Development of a complex computer program requires an individual to take existing knowledge and apply it in a novel setting.

To foster conceptual level growth, David E. Hunt has attempted to match appropriate academic environments with student conceptual levels. His model matches alternative ways of controlling the students' environment (employing various teaching strategies) with students' conceptual levels. Hunt treats conceptual development in terms of interpersonal maturity and conceptual complexity. Interpersonal maturity starts at some point when a person is unsocialized and develops until an individual is dependent and conforming.[93]

Conceptual level matching models were tested as part of an overall evaluation of the effectiveness of several summer Upward Bound programs.[94] Upward Bound was a pre-college enrichment program sponsored by the U.S. Office of Economic

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[93] Hunt, D. E., *Matching Models in Education: The Coordination of Teaching Methods with Student Characteristics*, Ontario Institute for Studies in Education, 1971

[94] Hunt, D. E. and B. R. Joyce, "Teacher Trainee Personality and Initial Teaching Style," *American Educational Research Journal*, 1967, Vol. 4

Opportunity for culturally disadvantaged high school students in which the students attended special programs on college campuses for six to eight weeks in the summer. As part of a national evaluation of these programs, twenty-one of the total two hundred and fourteen programs were examined. From these twenty-one programs, measures were administered to approximately sixteen hundred students at the beginning and end of the summer, so that change indices could be calculated.

The twenty-one target programs were first classified into two groups, structured approach and flexible approach. These two groups were further classified into low and high conceptual levels (CL) on the basis of the predominant CL of the students in each program. Student's change scores were then considered in terms of the degree of change in matched programs (structured - low CL and flexible - high CL) against the change in mismatched programs (structured - high CL and flexible - low CL). For four of the seven measures--attitude to summer program, motivation for college, possibility of college graduation, and interpersonal flexibility--students in matched programs showed significantly greater change than in mismatched programs.

For two of the remaining measures--locus of internal control and self-evaluated intelligence--there was a borderline tendency for students in matched programs to undergo greater change. An important conclusion reached by Hunt, *et al.*, was that it is important to consider the kind of student in relation to the program in order to understand the nature of the changes that will occur.

The first requisite of a matching model is to establish the long-term goals characterizing the desired state.[95] To aim for general improvement is insufficient; the assumed desired state toward which the intervention is aimed must be explicit. Abstract conceptual structure together with its associated characteristics of creativity, flexibility, stress tolerance and broad spectrum coping power, is the desirable, adaptive state.[96]

> In stressing adaptability to change, we have been less concerned with the level of performance in a relatively constant environment... Conceptual evolvement is described in terms of increasing effectiveness of adaptability to change.

The suggestion of change or modification will therefore refer to intervention with the ultimate aim of increasing conceptual level.

The method of measuring CL was developed to index an individual's position on the continuous CL dimension rather than to follow the developmental stage notion exclusively. The classification of individuals according to their CL may be useful for research or decision making, but it is important to emphasize that such classification is based upon similarity in conceptual orientation and does not imply that these persons are all at the same stage of development.

In the accounting literature, as well as the literature of other disciplines, it is suggested that the enhancement of cognitive levels through training is a desirable goal of education. To achieve this goal, it is necessary for educators to understand how various learning environments interact with cognitive development.

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[95] *Op. Cit.*, Hunt, 1971

[96] Harvey, O. J., David E. Hunt and Harold M. Schroder, *Conceptual Systems and Personality Organization*, Wiley, 1961, p. vi

The interaction of cognitive development with various media, audio-visuals and computers, has received considerable attention. This interaction is examined in the following section.

The Cognitive Effects of Interaction with Media

Greenfield (1984)[97] explores the cognitive effects of various media (audio, video, and computers) and their role in education. Greenfield's article is adapted from an address entitled, "Mind and Media: Implications of Television, Video Games, and Computers for Education and Cognitive Development," presented at the 11th Western Symposium on Learning, Western Washington University, Bellingham, Washington, April 1985. Because of its unique technical nature, each medium is particularly suited to deliver certain kinds of information. In addition, a medium's profile has implications for cognitive development: each medium calls upon and develops a particular set of abilities to process and produce information. Greenfield argues that each medium is filled with its own biases and contrary to popular assumptions, a medium is not a neutral transmitter of information. For example, an individual's inner reflections can be well-represented using the print medium. Novels are quite often filled with this type of reflection. Television, on the other hand, does not convey the inner thoughts of individuals quite so easily, but is better for presenting dynamic visual images.

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[97] Berger, Dale E., *et al.*, (Eds.) *Applications of Cognitive Psychology: Problem Solving, Education, and Computing*, Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey, 1987

Radio and other audio media have their own set of strengths. In a study comparing cognitive effects of radio and television, subjects were given the same story presented in one of two media: radio (audio) or television. Recall of dialogue was found to be superior after the radio version.[98] The study concluded that the visual image, rather than reinforcing the dialogue, acts as a distraction. The strength of television is its ability to present several pieces of information on a screen simultaneously. This medium is therefore particularly suited to teaching spacial information.[99]

Also according to Greenfield, a medium's informational bias has implications for cognitive development. Print and radio media seem to be superior in stimulating the cognitive process of imagination. This conclusion follows from a study performed by Greenfield where subjects were allowed to both listen and watch an incomplete version of a story on radio and television. The subjects were then asked to complete the stories. The measure of imagination was how many novel elements were introduced into the continuation. An element was considered novel if it had not appeared in the story just heard or seen by the subject.

According to a study by Salomon (1979)[100] television enhances cognitive development in the area of mental representation of space. At a time in Israel when

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[98] Greenfield, P. and J. Beagles-Roos, "Cognitive Effects of Television and Radio on Children from Different Socio-Economic and Ethnic Groups," paper presented at the meeting of the Society for Research in Child Development, Detroit, Michigan, 1983

[99] Sturm, H. and S. Jorg, *Information Processing by Young Children: Piaget's Theory Applied to Radio and Television*, K. G. Saur, Munich, 1981

[100] Salomon, G., *Interaction of Media, Cognition, and Learning*, Jossey-Bass Publishers, San Francisco, 1979

"Sesame Street" was the only children's program available, Salomon found that heavy viewers of the show did better on the "Changing Points of View Test" than did light viewers of the show. The Changing Points of View Test measures an individual's ability to measure space in his or her mind. For example, the test will show a picture of an artist in front of an easel painting a picture of a girl sitting on a window sill. The picture would be from the perspective of an individual looking across the room from a position behind the artist. The test then gives four alternative choices of what the room looks like from the perspective of the girl sitting on the window sill. Salomon hypothesizes that television will often show the same scene from several angles. Apparently, the effect of such repeated exposure to changes in physical points of view is to develop spatial skills.

Video games appear to build upon and utilize the visual-spatial skills being developed through television. Video games represent a complex system where the rules are not known in advance. The rules become known through a process of trial and error. The process of making observations, formulating hypotheses, and figuring out rules through a trial and error process is basically the cognitive process of inductive discovery.[101] In a 1985 study, Greenfield tested whether video games could function as a method of informal training for scientific-technical thinking. Two parallel transfer tasks were developed involving the operation of electronic circuits presented schematically on a video screen. One of these tests was given as a pretest and one as a posttest to novice game players. After two

[101] *Op. Cit.*, Greenfield

and one-half hours of playing the video game, evolution in these novice game players improved significantly from pretest to posttest. A control group (not exposed to the video game) did not vary in test performance from pretest to posttest. A group of expert game players were also tested. They scored as high on the pretest as the novice group had performed on the posttest after the video game exposure. An interesting result of this study is that the expert game players had not performed significantly better than the novice game players who had only been exposed to videos for two and one-half hours. Greenfield suggests that a law of diminishing returns must exist with regard to the value of video games as informal training for scientific discovery processes.

Computers offer as a strength the ability of the user to interact with complex systems.[102] Computer programs can have multiple, interacting, dynamic variables. Researchers have gone so far as to suggest that many computer skills are dependent on visual memory. The best predictor of how easily novice adults would learn word processing skills is dependent upon their spacial memory for arrangement of objects.[103] Young children picked up programming LOGO more easily if they were able to shift visual perspectives at the outset.[104]

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[102] *Op. Cit.*, Greenfield

[103] Gomez, L. M. *et al.*, "Learner Characteristics that Predict Success in Using Text-Editor Tutorial," Proceedings of Human Factors in Computer Systems Conference, Gaithersburg, Maryland, March 1982, "How Interface Design Determines Who Has Difficulty Learning to Use a Text Editor," Proceedings of the Human Factors In Computing Systems Conference, Boston, December 1983

[104] Roberts, R., "The Role of Prior Knowledge in Learning Computer Programming," In D. Kaye (Chair) "Computers, Video Games, Children," New Western Psychological Association, Los Angeles, April 1984

Ferguson (1977)[105] argues that the language of technology is basically a nonverbal one and that people involved in technology need to be able to think in terms of visual images. He further states that engineering schools educate students by analysis of systems using numbers rather than visual images. This system has a bias in that it produces a lack of people who have the skills to deal with real machines and materials.

The unique effect on cognitive development offered by each of the various media is examined in the previous section. If we, as educators, are to assist in the development of student's cognitive levels[106] (abstract thinking), it is important that we understand the impact of potential classroom tools. In summary, the print medium is the best medium in which to present inner reflections. Television, which does not convey the inner thoughts of individuals quite so easily, is well suited for the presentation of dynamic visual images. The strength of television is its ability to present several pieces of information on a screen simultaneously. This medium is therefore particularly suited to teaching spacial information. Computers offer as a strength the ability of the user to interact with complex systems.

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[105] Ferguson, E. S. "The Mind's Eye: Nonverbal Thought in Technology," *Science*, Vol. 197, 1977, pp. 827-836

[106] *Op. Cit.*, Shute

Critical Thinking Courses Developed by Colleges

To improve the reasoning abilities of students, a number of universities have attempted to develop courses that have as a specific purpose, the improvement of student thinking skills. Examples of these universities are: California State University--Fullerton (Project DORIS), University of Nebraska-- Lincoln (Project ADAPT), Xavier University in Louisiana (Project SOAR), and West Virginia University (Guided Design).

In 1983 the California State University system's interest in student critical thinking skills resulted in this largest university system in the country's requiring all graduating students to have completed a course in critical thinking. This requirement has been satisfied by the member universities with more than one type of course.

One course that has been used to satisfy this critical thinking requirement was developed at the California State University campus at Fullerton. In 1977, as part of a National Science Foundation funded project, design of a course entitled, "Development of Reasoning in Science (DORIS)" was initiated.[107] The course was designed with the express intent of teaching the models of reasoning that form the basis of understanding the subject matter of chemistry, earth science, mathematics, and physics.

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[107] *Op. Cit.*, Collea, *et al.*

An examination of first-year offerings in these courses produced the following five models of reasoning:

1. Hypothetico-deduction.

2. Combinational reasoning.

3. Isolation and control of variables.

4. Proportional reasoning.

5. Correlational reasoning.

These five models of reasoning are essentially the same as the five patterns that constitute Piaget's formal-operational reasoning patterns.[108]

The goal of the DORIS course is to teach thinking skills that can be used across a wide variety of other courses. The concept of thinking skills learned in one class having transference value in other courses is not unique. Some of the reasoning models that students are exposed to in algebra and calculus courses will be used later in chemistry, physics, and psychology courses.[109] What makes the DORIS course unique is that the critical thinking skills themselves are being taught in a separate course.

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[108] *Op. Cit.*, Inhelder and Piaget

[109] *Op. Cit.*, Nummendal

The University of Nebraska developed the ADAPT program with an emphasis on reasoning-skill development. The program attempted to enhance those skills that are developed in the formal-operational levels as described by Piaget. Results of this study have not been published at this time.

Xavier University offers a course (Project SOAR) that attempts to develop problem-solving abilities for entering freshmen. Cognitive reasoning, probabilistic reasoning, combinatorial reasoning, and correlational reasoning are emphasized in this program. The research findings of Project Soar provide evidence of significant increases in reasoning abilities. These findings have been questioned based on the single group, pretest-posttest design.[110]

Guided Design is a program developed at West Virginia University. This program teaches problem-solving by isolating the various steps involved in solving problems. The students are self-paced and faculty provide periodic feedback during the various steps of the program. This program has been widely adopted and reports successful results.[111] It is important to note that when measured by the Watson-Glaser Test, the guided design program failed to reveal significant enhancement of critical thinking skills.

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[110] Carmichael, J. W., *et al.*, Project Soar (Stress on Analytical Reasoning) 1980, *The American Biology Teacher*, 42(3), pp. 169-173

[111] Stonewater, J. K., "Strategies for Problem-Solving," In Young (Ed.) *Fostering Critical Thinking*, 1980, pp. 33-58

Is It Possible to Teach a Student How to Think?

The teaching of critical thinking skills in a separate course is a concept that has not received universal approval. McPeck (1981)[112] argues that critical thinking occurs only within specific fields. Since most critical thinking skills are domain specific, McPeck believes that there is little value in designing specific courses to enhance such skills.

McPeck states that there is the misconception that, by teaching one or more logical systems or models, generalized critical thinking skills will be enhanced. He argues that in the past 125 years many diverse logics have been developed. Boolian and non-Boolian algebra, multivalued logics, model logics, deontic logics, quantum logics and decision-theoretic models are some examples. In each of these examples the notion of validity is relatively defined according to the rules of inference that are peculiar to itself. Formation rules and rules of detachment are designed to do certain kinds of work by sanctioning some inferences and prohibiting others. The very proliferation of these logics testifies to the fact that different areas of human inquiry require different methods of validation. No single logical system can capture the validation procedures of every discipline, nor all the problem areas within a single discipline. The range of human experience is too diverse to allow us to hope, much less think, that a single logic or two could capture all such reasoning.

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[112] McPeck, J. E., *Critical Thinking and Education*, St. Martin's Press, New York, 1981

Contemporary programs in critical thinking attempt to bypass the problem of having knowledge of a field as though it were common knowledge. McPeck believes that this view not only represents a very shallow, or superficial understanding of the cognitive ingredients of critical thinking, but it also underestimates and plays down the real complexities that usually underlie even apparently common or everyday problems.

In any event, the education aspirations of our schools are set higher than the treatment of issues that could otherwise be solved by common sense. Where common sense can solve a problem, there is hardly a need for special courses in critical thinking. And where common sense cannot solve a problem, one quickly finds the need for subject-specific information. Hence, the traditional justification for subject-oriented courses.

> It is all too common, however, for specific subject-oriented courses to permit information and authority to rule in the place of reason, and where authority reigns unreflective obedience will follow. Critical thinking, by contrast, requires knowledge of the reasons that lie behind the facts and various voices of authority. Without such knowledge, even someone who is disposed to think critically has no basis for the suspension of his belief and thus no grounds for forming an opinion of his own. An epistemological orientation towards the teaching of various courses is one that can provide those reasons, since epistemology is none other than the analysis and study of the various kinds of good reason for beliefs.[113]

Tests used to measure critical thinking skills in pretest and posttest situations are also subject to the same criticisms. Both the Cornell Critical Thinking Test and the Watson-Glazer Test require that the subject have knowledge of information not presented in the critical thinking course.[114] While questions themselves require

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[113] *Op. Cit.*, McPeck, p. 31

[114] *Ibid.*, pp. 131-151

the use of logic to answer, a lack of base levels of knowledge in other subject areas makes it difficult, if not impossible, to answer questions.[115]

This criticism does not suggest abandonment of teaching critical thinking skills but rather an attempt to teach thinking in terms of knowledge structure-process interactions. This position is based in large part on the cognitive psychology literature that has been used in the expert problem solving research.[116] The critical thinking skills courses that are currently offered indicate that McPeck's critcisms are not universally accepted. Appendix F reports studies that have investigated the enhancement of critical thinking.

Summary

The purpose of this study is to investigate the level of cognitive complexity exhibited by individuals in the work environment. The previous section included research on individual cognitive development, learning strategies, environmental interactions, and the teaching of cognitive skills.

Piagetian theory provides the framework for research in cognitive development. Researchers have extended Piaget's work by examining when individuals develop

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[115] *Ibid.*

[116] Chase, W. G. and H. A. Simon, "Perception in Chess," *Cognitive Psychology*, 1973, Vol. 4, pp. 55-81

formal operational reasoning skills. Cognitive researchers have also examined the learning strategies employed by individuals when processing information. It is apparent from these studies that at least half of the college students tested have not reached the level of formal operational thought, and a substantial number of these individuals never will. As it is apparent from the research that individuals may not reach the formal operational stage, an area of increasing interest is the teaching of critical thinking skills.

A number of colleges have incorporated critical thinking courses. At this time it is debatable whether critical thinking can be taught outside of a specific discipline. With accounting programs moving in the direction of a five-year requirement, the validity of adding critical thinking courses to the core curriculum is an issue that will have to be considered. How specific environments may enhance the learning of critical thinking skills is also examined in this section.

CHAPTER 4

COGNITIVE RESEARCH IN ACCOUNTING

How researchers have applied cognitive development theories in the accounting domain is examined in this chapter. Some of these applications include investigating the relationships between cognitive style and information processing and describing the levels of cognitive complexity exhibited by accounting students and the cognitive style of individuals employed as accountants.

Human Information Processing

A number of papers dealing with the importance of human information processing in the designing of accounting systems have appeared in the accounting liter-

ature. These papers emphasize cognitive styles and cognitive complexity.[117] Harvey, Hunt, and Schroder (1961) have worked extensively with the construct of cognitive complexity.[118] Researchers in this area extend Piaget's work in cognitive development. Based on the similarity of research in this area, the terms cognitive complexity and formal-operations are strongly related if not, in fact, synonymous.[119]

Accounting researchers have been concerned with the impact of individual psychological differences on decision making.[120] In this area researchers examine the individual psychological differences among users of financial information to determine what kinds of financial information most closely suits users' information processing needs. Benbaset and Dexter (1979)[121] believe that studies that examine user information processing needs will eventually assist in the preparation of improved information systems designs.

Ferdinand Gul[122] incorporated the role of personality with individual cognitive style to determine the effect on decision making. Gul investigated the effects on

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[117] Driver, M. and T. Mock, "Human Information Processing, Decision Style Theory, and Accounting Information Systems," *The Accounting Review*, July 1975, pp. 490-508

[118] Harvey, O. J. and D. E. Hunt and H. M. Schroder, *Conceptual Systems and Personality Organization*, John Wiley & Sons, 1961

[119] *Op. Cit.*, Shute

[120] See, for example, Dermer (1973), Lusk (1973), and San Miguel (1976).

[121] Benbaset, I. and A. S. Dexter, "Value and Events Approach to Accounting: An Experimental Evaluation," *The Accounting Review*, October 1979, pp. 735-749

[122] Gul, Ferdinand A., "The Joint and Moderating Role of Personality and Cognitive Style on Decision Making," *The Accounting Review*, April 1984, pp. 264-277

tolerance for ambiguity (a personality variable) and field dependence (cognitive style variable) on decision making behavior and suggested that future accounting research may find that personality and cognitive style interact to affect and moderate the accounting decision making relationship.

Miller and Gordon (1975)[123] and Miller (1972)[124] focused upon the individual's "conceptual level." Miller and Gordon investigated an individual's ability to assimilate financial information and to generate meaningful conclusions as the number of dimensions perceived increased. Individuals who make fine discriminations within a complex environment are considered to have an abstract conceptual structure, i.e. they are cognitively complex. People who process information more easily when confronted with a fixed set of tasks are considered to have a concrete conceptual structure. An individual with a concrete conceptual structure copes with a complex environment by eliminating information from consideration and acting upon an abridged information set that is consistent with the needs of his conceptual structure. Another distinction between individuals with concrete and abstract structures is the abstract individual's ability to adjust quickly to changes in subject matter, grasp the essentials of a given whole, break it into parts and isolate and synthesize these parts.[125]

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[123] Miller D. and L. Gordon, "Conceptual Levels and the Design of Accounting Information Systems," *Decision Sciences*, Vol. 6, 1975, pp. 259-269

[124] Miller, H. "Environmental Complexity and Financial Reports," *The Accounting Review*, January 1972, pp. 31-37

[125] *Ibid*, Miller, 1972

Accounting researchers believe that, as the financial environment becomes increasingly complex, there is a greater demand for abstract thought. Beyond some level of environmental complexity, a conceptual circuit breaker appears to activate and abstractness is decreased. In other words, beyond some maximum point of environmental complexity, any additional amounts of information added to the environment, regardless of importance, will reduce conceptual structure and result in a more concrete decision model. Because the abstract individual is operating at a higher conceptual level, greater amounts of financial information can be encountered before the circuit breaker is activated. (See Figure 4.)

Cognitive Research Examining Accounting Students

Several measures have been developed to assess the position of an individual on a concrete-abstract continuum. Tuckman and Orefice (1973)[126] classified 120 first-year students in an introductory accounting course at a community college into two categories: abstract-thinking and concrete-thinking. The classification built upon the previous work of Hunt (1971) and defined more concrete as categorical, black and white thinking, averse to ambiguity, and governed by external standards. The abstract person was defined as being capable of utilizing

[126] Tuckman, Bruce W. and Dominick S. Orefice, "Personality Structure, Instructional Outcomes, and Instructional Preferences," *Interchange* , Spring 1973, pp. 43-48

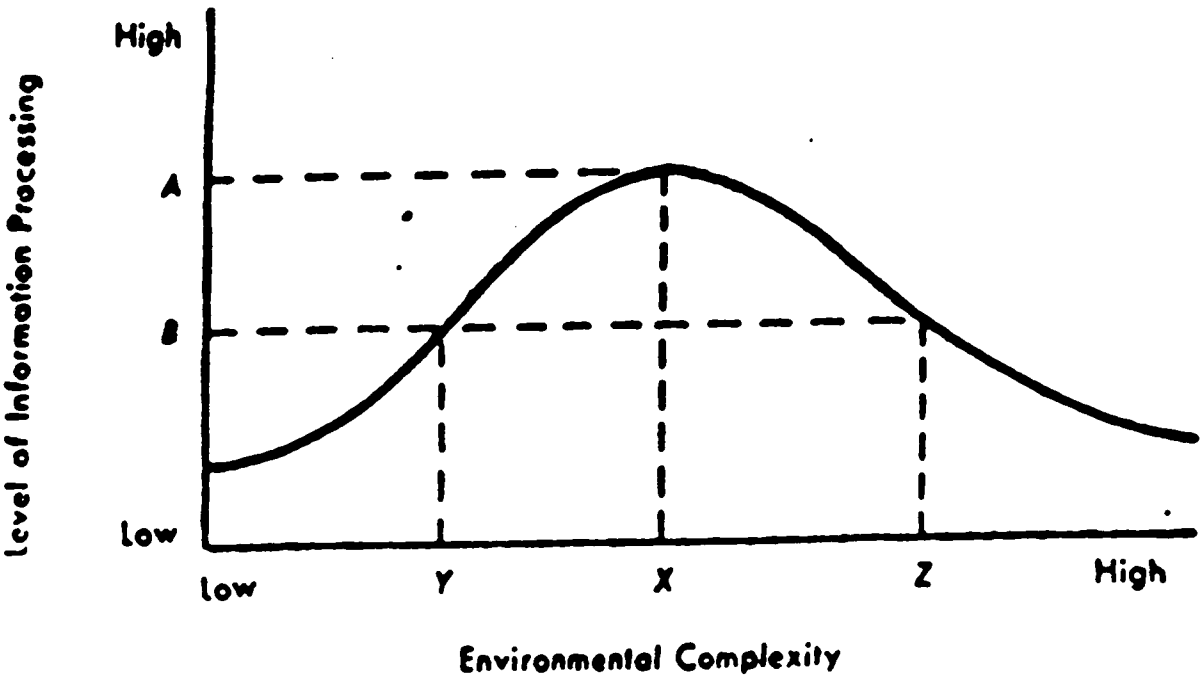

Figure 4. Concrete–Abstract Continuum [Schroder, Driver and Streufert (1967)]

many alternative interactive processes and being able to cope with situation change over time.

Tuckman and Orefice hypothesized that in less structured learning situations, abstract students perform better and are happier. However, they were unable to demonstrate that abstract students performed better in less structured situations. They hypothesize that the reason this performance could not be demonstrated was due to the fact that course content for all four tested learning situations was essentially concrete in nature. In addition, the achievement instruments used to measure performance were traditional instruments that measure only memory and associate processes in the cognitive domain. Tuckman and Orefice demonstrate that abstract students do perform better than concrete students in less structured situations, however, these abstract students still have the ability to perform well within a structured environment. Thus, they should perform well on a test that requires only low conceptual levels regardless of the learning environment. The researchers in this study did not incorporate the impact of motivation on the individual's performance.

In 1979 Shute[127] used a conceptual level based upon a theory of cognitive development originally hypothesized by Inhelder and Piaget (1958). Inhelder and Piaget[128] identified four levels of cognitive development in childhood and adolescence of which the last two are concrete-operational and formal-operational.

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[127] *Op. Cit.*,

[128] *Op. Cit.*, Amernic and Beechy, 1984, p. 304

These last two levels correspond to the concrete-abstract continuum referred to in this paper.

Shute's[129] research was conducted on 179 accounting students in twelve sections of eight different accounting courses. Shute used a cognitive assessment instrument developed by Tomlinson-Keasey and Campbell (1978).[130] This instrument has not been formally validated. While the lack of validation has not prompted criticism of the Shute study, this instrument has been criticized in the psychology literature.[131] The findings from the Shute study indicate that approximately one-third of college seniors are at the concrete-operational stage (concrete), one-third are at the formal-operational (abstract) stage, and one-third are in transition between the two stages. He found that "there does not appear to be a consistent relationship between cognitive level and class performance" while on the other hand he found that formal-operational (abstract) students performed better than operational (concrete) students on both concrete and formal abstract examination questions.

Shute[132] concludes that if there are accounting problems in the profession that require the use of abstract reasoning abilities, then students without these abilities must either be assisted in acquiring these abilities or counseled to change their

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[129] *Op. Cit.*, Shute, 1979

[130] Tomlinson-Keasey, C. and T. Campbell, "Cognitive Pretest and Post-test, Scoring and Rationale for Formal Operational Assessments," Unpublished Paper, University of California- Riverside, 1978

[131] See Peel (1971); Karplus, *et al.* (1977); and Karplus (1977)

[132] *Op. Cit.*, Shute, AAA, p. 39

Table 2. Classes Included in Shute's Sample

Course Name	Course Code	No. of Students Completing Course
Lower Division		
Introductory Acct.	10311*	27
Introductory Acct.	10312**	29
Introductory Acct.	10322**	23
Introductory Acct.	10411*	10
Introductory Acct.	10412**	14
Introductory Acct.	10422**	16
Upper Division		
Survey of Acct.	30614***	16
Managerial Acct.	30812**	11
Intermediate Acct.	31412**	8
Advanced Acct.	40412**	17
Graduate		
Advanced Acct.	80412**	2
Contemporary Managerial Acct.	90012**	6
Total		179

* Presession Class - three weeks
** First Summer Session - five weeks
***Eight Week Session - eight weeks

area of interest from accounting to another field. Because cognitive abilities are required for long-term professional success as an accountant, it is essential that we know as much about them in accounting students as we can know with the use of available research tools.

An area not considered by Shute nor Tuckman and Orefice was the relationship between accounting students' cognitive levels and their performance on and preference for unstructured course material. Research performed by Amernic and Beechy[133] addressed this issue of preference by hypothesizing that students who score low in cognitive complexity will prefer directed accounting materials. Their research subjects were 131 university students enrolled in a nine week, third year introductory financial accounting course. This course was selected because the students had exhibited widely varying levels of tolerance for ambiguity in the past years. This situation suggested that a reasonably wide variation in conceptual level would be present.

At the beginning of the second week of class, the Paragraph Completion Test (PCT) was given to students to measure their conceptual levels. The results of the paragraph completion test were compared with student responses to a questionnaire that asked students to state their preference for structured versus unstructured course material. Amernic and Beechy did not find significant differences between high and low conceptual groups in their preference for structured versus unstructured course materials. Amernic and Beechy hypothesize that this result

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[133] *Op. Cit.*, Armenic & Beechy, 1984

may have been caused by instructors' emphasizing the importance of being able to perform in unstructured environments.

If, as the literature suggests, there is value in attempting to enhance students' capacity for abstract thinking, it may be wise to review the requirements of the measures used to evaluate accounting students as well as Accounting programs. A study by Baker and Simon (1985)[134] indicated that a high percentage of CPA examination questions require concrete-operational reasoning skills. In the November 1982 exam, 97% of the Practice I and II multiple choice questions were at the concrete-operational level. In their review of past CPA exams, Baker and Simon indicated that the Auditing section was the one area that included any degree of questions that would be categorized as formal-operational (abstract). The results of these findings may lead accounting researchers to reassess the current thrust of the CPA examination.

Cognitive Research Examining Accounting Employees

Collins and Milliron (1987)[135] used Kolb's Learning Style Inventory to measure the learning styles of 380 practicing accountants. This sample consisted of 294

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[134] Baker, Richard E. and John R. Simon, "An Assessment of Cognitive Demands of the Uniform CPA Examination and Implications for CPA Review Preparation Courses," *Journal of Accounting Education*, Vol. 3, No. 2, Fall 1985, pp. 15-29

[135] *Op. Cit.*

large CPA firm members, 36 small CPA firm members, and 50 accountants in industry. The Kolb Learning Style Inventory categorizes individuals into one of four quadrants: accommodators, divergers, convergers, and assimilators.

Individuals in the first quadrant are referred to as accommodators. An accommodator tends to be adaptive and risk-taking, performs well in situations that require adapting to changing circumstances, and enjoys carrying out plans and tasks and getting involved in new experiences. Individuals in the second quadrant are referred to as divergers. These individuals perform well in situations that call for the generation of alternative ideas and implications. They tend to have broad cultural interests and are people-oriented. Individuals in the third quadrant are referred to as convergers. These individuals perform well in situations where there is a single correct solution to a problem. They prefer dealing with technical tasks rather than social and interpersonal problems. Individuals in the fourth quadrant perform well in situations requiring the assimilation of disparate observations into an integrated explanation. They tend to be less interested in people and practical operations and more interested in ideas and abstract concepts.

Collins and Milliron attempted to identify a dominant learning style among accounting practitioners in general and to determine whether there are learning style differences between accounting occupations. These researchers suggest that cognitive style measures might be a useful feature of a model for predicting success in the accounting profession. Such potential appears especially relevant to

educators in view of the American Association of Collegiate Schools of Business's (AACSB's) favored response to current budgetary pressures, which is to reduce enrollment and focus available resources on students with the greatest potential for success (McKibbin and Porter, 1985).[136]

Collins and Milliron concluded that practitioners from small CPA firms, large CPA firms, and industry, regardless of whether the practitioners are auditors, tax accountants, consultants or other types of accounting specialists, exhibit similar learning styles. When the entire sample from this study was broken down into management and staff components, both groups were found to be operating at the same abstract-concrete level; however, as the rank of an individual increases, there was a decrease in "feeling" oriented individuals. Individuals at the management levels were more task oriented.

Summary

Accounting researchers have applied the results of research by psychologists in examining several areas of interest. In decision usefulness studies, accounting researchers have examined the information preferences of users of financial statements. They found that the usefulness of financial information is related to the amount of information presented and the level of cognitive complexity exhib-

[136] McKibbin, L. E. and L. Porter, "Future of Management Education Development," Draft Report to the American Association of Collegiate Schools of Business, 1985

ited by the user. While the cognitively complex individual is able to process greater amounts of financial information, beyond some maximum point of environmental compexity, any additional amounts of information added to the environment, regardless of importance, will reduce conceptual structure and result in a more concrete decision model.

Another application by accounting researchers is the examination of the cognitive complexity of college students. These researchers have examined students' cognitive levels and their preferences for unstructured course material and have found that a large number of students are not yet at the formal-operational stage of cognitive development. Accounting researchers have not been able to determine whether preference for material is related to cognitive levels.

Researchers have also examined the learning styles exhibited by accountants in various career paths and have found no differences between career paths. However, as the rank of an individual increases, differences in learning styles were noted.

CHAPTER 5

METHODOLOGY

As previously stated, the purpose of this study is to investigate whether or not there are significant differences in the cognitive complexity of accounting graduates in different occupational categories and across income levels within occupational categories.

The following two null hypotheses represent the research questions:

H1: There are no differences in conceptual levels between employment groups (Tax, Audit, Financial, Managerial, Business/NonAccounting and Other/NonAccounting).

H2: There are no differences in conceptual levels within employment categories over salary levels.

Specific steps taken to complete the study are described in this chapter. They consist of (1) rationale for the sample selected, (2) describing the instrument used to collect data, and (3) the method of statistical analysis.

Rationale for Sample Selected

According to the previously described study by Deanna Kuhn and her associates (1977),[137] individuals achieve the full extent of their cognitive abstract development by the time they reach their late twenties. Six, seven, and eight years after graduation cognitive styles are stationary. The subjects in a sample drawn from earlier years after graduation would be in the developmental stage and therefore potentially subject to a variety of influences, including those influences found in the work environment. Evidence exists that grandfathers' occupational status, urbaness and region of origin, and number of children in the parental family may affect job placements early in an individual's career. However, by approximately the ten-year mark in an individual's career, these "noncredentializing" social characteristics no longer have any direct bearing on job placement.[138] In addition, accounting career choices become more fixed as the years go by. It is unlikely that a person trained to be a cost accountant at the six to eight year mark in a career would subsequently become a tax accountant, for example.

The subjects of this research are undergraduate Accounting students who graduated six, seven, and eight years ago (Classes of 1980, 1981, and 1982) from James Madison University, the University of Massachusetts, the University of Tennessee, and Virginia Polytechnic Institute & State University. Based on the

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[137] *Op. Cit.*

[138] *Op. Cit.*, Kohn and Schooler, May 1982, p. 1268

foregoing discussion, this sample of accountants and their associated level of cognitive style are believed to be more representative of their respective career fields.

The Instrument to Measure Cognitive Style

In the 1979 research report sponsored by the American Accounting Association entitled "Accounting Students and Abstract Reasoning: An Exploratory Study," Shute states:

> One of the methods for measuring cognitive complexity is sentence or paragraph completion instrumentation.

According to D. E. Hunt (1978)[139]

> It would be more convenient if it were possible to assess conceptual level through an objective test which could be easily scored. Although numerous attempts have been made to devise objective measures, none of them has proven satisfactory, partly because they are susceptible to faking and partly because they deal with content alone, not how a person thinks. A thought sample is required to assess how a person thinks.

The Paragraph Completion Test (PCT) used in this study is an instrument that elicits such a thought sample. The following section describes alternatives to the PCT and the reasons why they were not utilized in measuring cognitive levels in this project.

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[139] Hunt, D. E., L. F. Butler, J. E. Noy, and M. E. Rosser, "Assessing Conceptual Level by the Paragraph Completion Method," Ontario Institute for Studies in Education, 1978

Alternatives to The Paragraph Completion Test

The Kolb Learning Style Inventory

The Kolb Learning Style Inventory (LSI) has been used to categorize an individual's emphasis on each of four learning modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Two primary dimensions (combination scores), AC-CE and AE-RO, categorize learners into four types; namely, the converger, diverger, accommodator, and assimilator. Kolb argues that the four constructs measured by the LSI are "variable" and therefore should not exhibit high test-retest reliability estimates. He has also argued that the constructs indicate dominant learning abilities, and he defines them as "preferred styles that individuals tend to emphasize."[140]

Stumpf and Freedman argue that, traits that are dominant, preferred, and tend to be emphasized, should be stable over a few weeks given comparable learning environments.[141] Two published studies (Geller, 1979; Freedman & Stumpf, 1978) comparing learning experiences over short time periods using the Kolb LSI, report a test-retest reliability median of .52. Kolb argues that low test-retest reliability scores should be expected because learning is solely a function of the

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[140] Kolb, D., I. Rubin, and J. McIntyre, *Organization Psychology: An Experiential Approach*, (Third Edition), Prentice-Hall, Englewood Cliffs, New Jersey, 1979, p. 39

[141] Stumpf, S. and R. D. Freedman, "The Learning Style Inventory: Still Less Than Meets the Eye," *Academy of Management Review*, Vol. 6, No. 2, 1981, pp. 297-299

situation that an individual is exposed to at a point in time. Stumpf and Freedman (1981) state:

> If learning is solely a function of the situation, then we do not need a learning style instrument. If it is solely a function of 'dominant' traits, then such an instrument would be helpful. Most reasonable observers will probably conclude that both situation and style play a part in learning. How are we to weigh situational and individual factors when test-retest reliability in similar situations over short periods of times is so low? How is someone classified as an assimilator to know whether the classification is due to personal characteristics, situational factors, or measurement error?

They therefore conclude that the LSI is an unsatisfactory research tool in measuring learning style.

The California Test of Mental Maturity

Bartlett (1973), Nyberg and Blackmore (1981) have used The California Test of Mental Maturity (CTMM) to measure cognitive level development of high school and grade school students, respectively.[142] In a 1984 article in which the applications of the test were reviewed, subjects in all studies were at or below the high school age.[143] DeVries (1974) reported that the CTMM has not been validated for determining Piagetian levels of development.[144]

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[142] *Op. Cit.*, Shute, G. in AAA Report (1979) and Nyberg, V. and D. E. Blackmore, "A Longitudinal Study of Grade III Achievement in Edmonton Public Schools," *Alberta Journal of Educational Research*, Vol. 27, 1981, pp. 154-159

[143] Dash, Udaya and Thomas Maguire, "A Detailed Analysis of Group Differences on The California Short-Form Test of Mental Maturity Between 1956 and 1977," *The Alberta Journal of Educational Research*, Vol. 30, No. 2, June 1984, pp. 95-103

[144] DeVries, R., "Relationships among Piagetian, IQ and Achievement Assessments," *Child Development*, Vol. 45, 1974, pp. 746-756

The Clinical Interview

A method used to determine cognitive levels as identified by Piaget is the Clinical Interview. Because this dissertation study collects data from a large number of graduates across a wide geographic range, an interview approach is not practical.

The Paragraph Completion Test (PCT)

The Paragraph Completion Test is used in this study. The Paragraph Completion Method for measuring conceptual level has been developed by researchers in education and psychology over the past several years to the point where it is a standard assessment method.[145] In the 1979 American Accounting Association report "Accounting Students and Abstract Reasoning: An Exploratory Study" the Paragraph Completion Test is offered as a method for measuring conceptual levels. As previously mentioned, the Paragraph Completion Test was used by Amernic and Beechy to measure conceptual levels of accounting students in their 1984 study published in *The Accounting Review*. The PCT evaluates an individual's completion of six sentences on six topics: rules, criticism, parents, disagreement, uncertainty, and authority.

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[145] *Op. Cit.*, Amernic and Enns

"What I think about rules..."

"What I am criticized for..."

"What I think about my parents..."

"When someone disagrees with me..."

"When I am not sure..." and

"When I am told what to do..."

Figure 5. The Paragraph Completion Test

To each of these topics, the subject responds with three or four sentences, indicating a personal reaction. Each of the responses is coded according to a scoring manual. Scores from 0 to 3 indicate the following.[147]

- For a score of 0: very undifferentiated response, overgeneralized exclusion of any negative input, lack of affective control.
- For a score of 1: categorical judgments, overgeneralized and unqualified acceptance of single rule, recourse to external standards.
- For a score of 2: some form of conditional evaluation, beginning self-delineation, expression of alternatives.
- For a score of 3: taking two viewpoints into account simultaneously, coordination of evaluation of situation with differential response, and clear indications of self-delineation and internal standards.

The PCT has been administered to several thousand persons during the past few years, and some idea of this variation can be conveyed by reviewing the scores of various groups presented in Table 3.

Conceptual level (CL) is a developmental variable and a CL score, e.g. 2.0, has an absolute rather than a relative meaning. PCT scores should be analyzed within the framework of the four following conceptual levels (CL). These four

[147] *Op. Cit.*, Amernic & Beechy, 1984, p. 306

Table 3. Paragraph Completion Test Scores by Groups [Hunt, Butler, Noy, and Rosser (1978)]

Norms for Learning Style -- Adult Sample

#	Sample	Year	Mean
58	University Students	1975	1.86
59	University Students	1975	1.86
138	University Students	1976	1.63
32	University Students	1976	2.05
82	University Students	1976	1.82
57	Teacher Trainees	1972	1.55
60	Teacher Trainees	1972	1.82
57	Teacher Trainees	1975	1.78
91	Graduate Students	1972	1.85
43	Graduate Students	1974	1.93
60	Graduate Students	1975	1.82
131	University Accounting Students	1984	1.80*
494	University Accounting Alumni	1989	1.70**

*Armenic & Beechy sample
**Riordan Dissertation sample

levels have been described in terms of learning style, or need for structure, as follows:

Structure Needed			
Much	Some	Less	Little
0-1.0	1.1-1.4	1.5-1.9	2.0 +

Cognitively complex individuals require less structure.[147] A score of 1.8 and 1.6 should be viewed from the perspective that both scores reflect an individual that needs less structure.

Test score evaluators are encouraged in the instruction manual to judge the underlying conceptual structure which generates the response rather than their actual content. In some cases where the response is insufficient, an unscorable category is used.

A person's CL Index is calculated as a composite of his six scores. Two procedures for aggregating scores are used: the first is a simple average of all scorable responses, and the second is the average of the highest three scores. This latter more commonly used approach is based upon the rationale similar to the "ceiling" on Binet tests (that is, if a person scores on one or two occasions at a higher level,

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[147] *Ibid.*

then this score must be an accurate reflection of his underlying structure).[148] A positive aspect of this instrument is

> [I]t is difficult, if not impossible, to simulate high scores, i.e. under 'fake good' instructions, conceptual level scores decrease.[149]

In other words, even when subjects believe they know the desired response, they are unable to manipulate the outcome. With trained raters, inter-rater reliability usually falls within the .8 to .85 range.[150] Reliability describes the characteristic of two independent raters arriving at the same score when grading one set of six responses. In many of the studies reported, two judges have scored all tests in order to sharpen precision.

Scores of inter-rater reliability achieved in studies using The Paragraph Completion Test are summarized in Table 4. According to Hunt[151] there is a positive correlation between CL and intelligence. This relation, though significant with the fairly large samples, is a modest one. In groups of fairly heterogeneous intelligence, the correlation between PCT and intelligence can be high. For more intellectually homogeneous groups, such as college students, the correlation is typically positive but small ($<.20$). In groups with high-ability/achievement

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[148] Schroder, Harold M. and Michael J. Driver and Siegfried Streufert, *Human Information Processing*, Holt, Rinehart and Winston, Inc., 1967, p. 195

[149] *Op. Cit.*, Hunt, *et al.*

[150] *Op. Cit.*, Hunt, 1971

[151] *Ibid.*

persons, conceptual levels can vary enormously.[152] Gardiner and Schroder (1972) have reported a test-retest correlation of .67 for college students.[153]

Method of Collecting Data

To collect a large number of observations over a large geographic area, data were collected using a two-page mail survey. The survey was first mailed on June 13, 1988, to 1205 potential respondents from the following institutions:

James Madison University	220
University of Massachusetts	115 (limited sample)
University of Tennessee	340
Virginia Tech	530

A follow-up letter and duplicate survey were mailed on July 22, 1988. All surveys and return envelopes were coded with identifying numbers to avoid the inconvenience of a second mailing to individuals answering the first request and to avoid including duplicate surveys from the same individual after the second mailing. Each potential repondent was assured anonymity and received a

[152] *Op. Cit.*, Hunt, *et al.*

[153] *Op. Cit.*, Hunt, *et al.*, p. 42

Table 4. Inter-rater Reliability Coefficients for Paragraph Completion Test [(Hunt, Butler, Noy, and Rosser (1978)]

Investigator	Year	r	N	Subjects
Arsenault	1972	.86	25	Grade 9 students
Bachor	1976	.85	40	Community College students
Bundy	1968	.85	40	School Principals
Bunt	1976	.93	40	University students
Chan	1975	.82	20	High School students
Cross	1966	.86	31	High School students
		.79	22	Parents of students
Heck	1971	.96	30	Teacher trainees
Olson	1970	.94	25	Theological interns
		.91	25	Supervisors
Raphael	1975	.91	20	Grade 12 students
Robertson	1973	.89	84	Grade 8 students
*Armenic & Beechy	1984	.88	131	University accounting students
*Riordan	1989	.92	494	University accounting alumni

*Supplied

postage-paid business reply envelope to use when returning the survey. As each survey was returned, the date of receipt was logged. Copies of the initial correspondence, the second contact letter, and the two-page survey are included in Appendices A B, and C, respectively.

Scoring the Instrument

Each of the subject's responses to the PCT was scored by two expert raters. The two raters are Ph. D. candidates at the University of Michigan specializing in cognitive development. The graders were recommended by Dr. Chris Peterson of the University of Michigan, Psychology Department, formerly on the faculty at Virginia Polytechnic Institute & State University. A report of the grading process is included as Appendix D. Five actual responses are presented in Appendix E. To facilitate reading, the text of these responses has been printed in the following section. The examples are selected to demonstrate the nature of the responses that result in various PCT scores. Appendix D contains an explanation on the logic used in scoring several of the individual items contained in the five responses.

Response No.	Scores on Each PCT Topic	Avg. of Highest 3
1	2.0, 3.0, 2.5, 3.0, 2.0, 2.0	2.80
2	2.5, 2.0, 2.5, 1.5, 2.5, 1.5	2.50
3	1.0, 1.0, 2.5, 1.5, 2.0, 1.5	2.00
4	1.5, 2.0, 1.0, 2.0, 1.5, 2.5	1.83
5	1.0, 1.5, 1.0, 2.5, 1.0, 1.0	1.66

TEXT OF RESPONSES 1 THROUGH 5

RESPONSE #1 (OVERALL 2.8)

WHAT I THINK ABOUT RULES...

They exist because they serve a purpose. However, we need to look beyond and realize when it is time to change them. (2.0)

WHEN I AM CRITICIZED...

Depending who criticizes me, I try to objectively evaluate if the criticism was warranted and if not I should learn from it or change. (3.0)

WHAT I THINK ABOUT PARENTS...

I love and respect my own, but parents are as different as the children they have. (2.5)

WHEN SOMEONE DOES NOT AGREE WITH ME...

I try to see there point of view, if I am not

sure about my own. Depending on the
situation or stick to my guns. (3.0)

WHEN I AM NOT SURE...

I try to reason it out or do more research. (2.0)

WHEN I AM TOLD WHAT TO DO...

I'll follow instructions as long as they do
not interfere with my ethics and my logic. (2.0)

RESPONSE #2 (OVERALL 2.5)

WHAT I THINK ABOUT RULES...

Certain rules are necessary to give boundaries. Too many rules restrict creativity and imagination and show a lack of trust in individuals to make the right choice. If they are equally acceptable options, but one is to be followed for facility, then one should be made. (2.5)

WHEN I AM CRITICIZED...

I immediately try to decide if it is justified. If it is, I accept it after it hurts a little less. If it isn't justified, I must decide if it worth correcting the situation and either talk to the person or let it slide. If the criticizer's motives are to hurt me, talking to them won't improve matters. I just accept it without fighting back. (2.0)

WHAT IT THINK ABOUT PARENTS...

Parents should not abdicate their responsibility to teach and train their children. It appears that parents today are so afraid of being rejected by their kids, they let anyone else define their morals, taste, and manners. I hate to see undisciplined children---they turn into undisciplined adults and society deteriorates. (2.5)

WHEN SOMEONE ELSE DOES NOT AGREE WITH ME...

I try to see the value of what they are saying. If it is a good idea I just hadn't thought of, we go with their idea. If I still feel I am right, I try to persuade them through logical argument why my way is better. If I am just emotionally attached to the idea, I may have to give it up. (1.5)

WHEN I AM NOT SURE...

I try to think it through logically from the beginning or put down the pros and cons. If I can't arrive at the obviously right answer, I go with the one that seems to have the least drawbacks. (2.5)

WHEN I AM TOLD WHAT TO DO...

I evaluate whether it's appropriate or justified. If it is, I do it. If the person has no authority to tell me what to do, I reset it and will only do it if it seems the best thing to do. I let the person know

that I am doing it because its best, not because they said to do it. (1.5)

RESPONSE #3 (OVERALL 2.0)

WHAT I THINK ABOUT RULES...

I think about consistency. I feel rules are necessary and help things run smoothly and predictably. I do not like chaos or disorganization, so I like having rules to follow. (1.0)

WHEN I AM CRITICIZED...

I get defensive and embarrassed. I try to redeem or explain myself. If that is not acceptable I withdraw and try not to be criticized about the particular subject again. (1.0)

WHAT I THINK ABOUT PARENTS...

I think about hardworking, caring, ever-present, ever-supportive people. I hope I

will be just as loving, but maybe not as rigid as my parents, with my children. (2.5)

WHEN SOMEONE DOES NOT AGREE WITH ME...

I often get irritated at first. But I then try to explain my position fully and to include supporting facts. I also try to understand the other person's position. (1.5)

WHEN I AM NOT SURE...

About something I try to get additional information from someone knowledgeable about the subject, or from some reference material. I lose confidence in myself a little or a lot depending upon how not sure I am. I also try to look at all options. (2.0)

WHEN I AM TOLD WHAT TO DO...

I most times follow through. That is, if that person has the authority and permission to tell me what to do. I do not, however, allow myself to be dominated. (1.5)

RESPONSE #4 (OVERALL 1.83)

WHAT I THINK ABOUT RULES...

Rules are necessary in order to insure that individual rights are not carried to the extreme where they infringe on the good of the population. However, these rules should be created through a democractic process. (1.5)

WHEN I AM CRITICIZED...

I try to react in a rational way, i.e., try not to overreact. If the criticism is justified, I make an attempt to address the problem to improve the situation. If the criticism is unjustified, I will communicate my feelings with sound evidence supporting my case. (2.0)

WHAT I THINK ABOUT PARENTS...

My parents and family are very important to me. We are a very close family, and my parents keep in fairly close contact with each other. I think children raised by parents in a successful marriage have a very strong headstart on life. (1.0)

WHEN SOMEONE DOES NOT AGREE WITH ME...

I have no problem if someone does not agree with me. If it is an objective difference, I will state the facts as I best know them. If it is a subjective opinion, I am not afraid to speak my feelings. (2.0)

WHEN I AM NOT SURE...

I don't move ahead on something if I am not sure of what I'm doing. I will make the effort to reasearch the facts to better understand what I am doing. I will not speak with authority if I am not sure of the answer. (1.5)

WHEN I AM TOLD WHAT TO DO...

If I am told what to do and it makes sense given the situation, I will do it. I don't like to have something dictated to me but prefer to discuss the current needs and what should be done to agree on the best approach. (2.5)

RESPONSE #5 (OVERALL 1.66)

WHAT I THINK ABOUT RULES...

I do not have any problem with rules. I do not mind following them nor do I feel limited by them. They are made for a reason and should be abided by. (1.0)

WHEN I AM CRITICIZED...

I try not to take criticism personally, but to learn from my mistakes. There are right and wrong ways to criticize and if done properly can be most helpful. (1.5)

WHAT I THINK ABOUT PARENTS...

Parents are the best influence on a child's life and I feel strongly that you need both parents in a good family situation to be able to grow up in the best environment. (1.0)

WHEN SOMEONE DOES NOT AGREE WITH ME...

In this situation I try to be open and listen to the other side because no one is right all the time. If you react negatively, that person will be afraid to ever question you again, whether you were right or not. (2.5)

WHEN I AM NOT SURE...

I don't go forward easily unless I am sure of myself. I try my best to become sure but am leary if not. (1.0)

WHEN I AM TOLD WHAT TO DO...

I don't mind being told what to do as long as it is done in the proper state of mind

and not in a demeaning manner. I follow orders well and don't feel intiidated by them. (1.0)

Method of Statistical Analysis

The first research question posed is:

> Are there differences in the conceptual levels of accounting majors employed in various accounting career paths?

To gather information with which to test this question, respondents were asked to select the category which best described their current career status. Categories consisted of Tax, Audit, Financial, Managerial, Business (Non-Accounting), and Non-Business. Respondents' scores on The Paragraph Completion Test were then analyzed to determine whether or not there were significant differences in scores between these groups.

The second research question posed is:

> Are there differences in the conceptual levels of individuals who are most successful within each career field?

One possible measure of success is an individual's job title. Because there are many job titles used within the career groups in this sample, use of job title as a surrogate for success is inappropriate. Assuming successful performance is re-

warded with promotions accompanied by salary increases, the use of salary as a surrogate measure of success is appropriate.

The subjects in this study come from a fairly homogeneous population. They are all accounting majors who have graduated from four comparable universities. As previously described in this study, there is a significant but modest correlation between PCT scores and intelligence in homogenous groups. SAT score was used in this study as a covariate to control for intelligence.

A two-way analysis of covariance with one covariate to control for intelligence was used to analyze the differences between mean PCT scores for the respective sample groups. The general ANCOVA model is:

$$Y' = Y - \beta(X - \overline{X}) = \mu + \alpha_j + \gamma_k + \alpha\gamma_{jk} + \varepsilon$$

where

Y' is the Adjusted Paragraph Completion score; the measure of conceptual level provided by the grading of The Paragraph Completion Test adjusted by the covariate for intelligence.

Y is conceptual level as measured by The Paragraph Completion Test provided by the grading of The Paragraph Completion Test.

X is self-reported SAT score; the measure used as a covariate to control for differences in intelligence.

α_j is income level, where j = 1,2 (1 = < \$45,000 and 2 > \$45,000).

γ_k is career field, where k = 1,2,3,4,5,6 (1 = auditing; 2 = financial; 3 = managerial and 4 = tax accounting; 5 = non-accounting; 6 = non-business).

$\alpha\gamma_{jk}$ is the interactive effect of income level and career field.

The classes and levels of the model are shown in Figure 6.

Two assumptions underlying the application of the analysis of variance technique are (1) normal distribution of the population from which the sample is drawn and (2) homogeneity of variance. This second assumption simply means that the population variances of each sample are assumed to equal one another. An additional assumption underlying ANCOVA is that the slope of the regression of the dependent variable on the covariate is the same across populations. There is no guarantee that the assumptions are justified; however, the analysis of variance procedure is insensitive to even flagrant violations of the assumptions.[154]

[154] Keppel, Geoffrey, *Design and Analysis, A Researcher's Handbook*, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1982

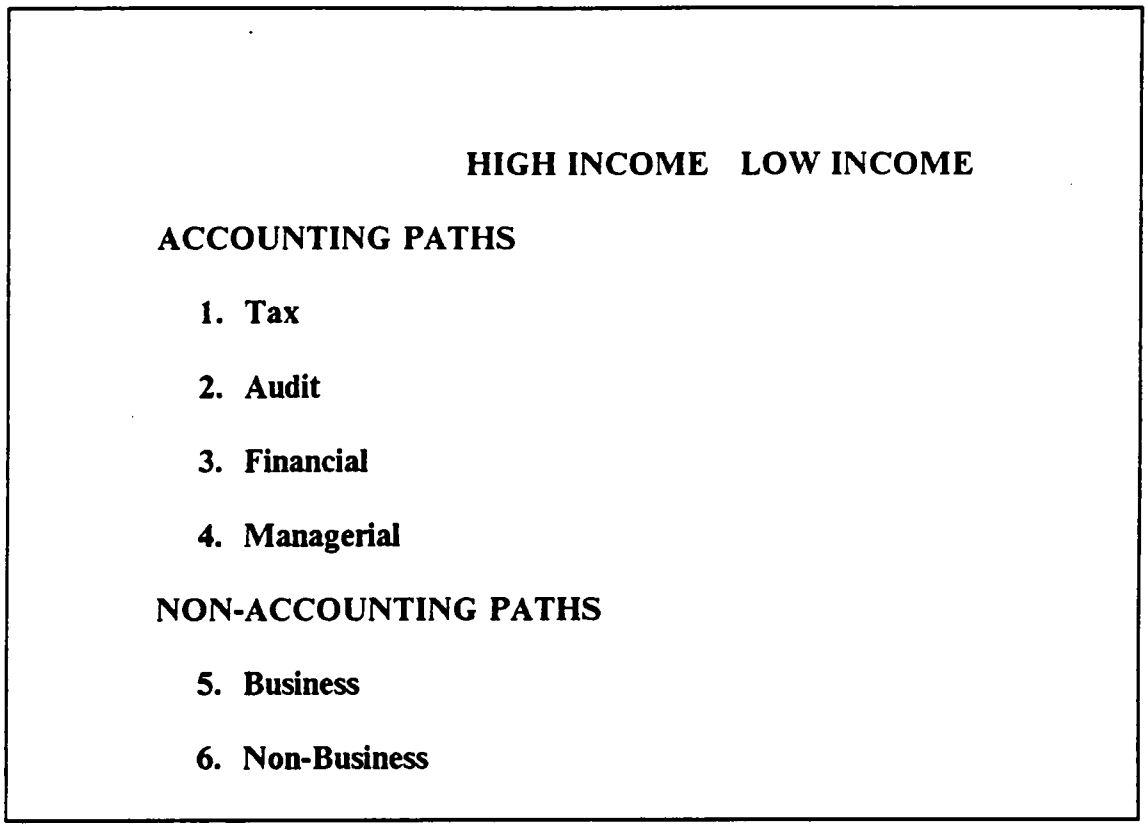

Figure 6. General Model

Summary

In this chapter the methods used for collecting, measuring, and analyzing the data are described. Results of analyzing the data, limitations, and contributions of the research study, as well as areas for future research, are discussed in Chapter 6.

CHAPTER 6

THE DATA AND ITS IMPLICATIONS

The results of data analysis and implications of the findings are discussed in this chapter. Specifically, survey response, descriptive data, and results of testing the two hypotheses are reported.

Survey Response

As reported in Table 5 on page 113, of the 1158 surveys delivered (by first-class mail), a total of 508 individuals responded (a response rate of 44 percent).

Of the 508 surveys returned, 494 were analyzed. Fourteen surveys were returned without completing the instrument. The relationships in the general model were

Table 5. Number in the Sample and Response Rates

	FIRST MAILING 4/15/88	SECOND MAILING 5/9/88	TOTAL RESPONSE
SAMPLE			
Initial sample, as described in Chapter 5	1205	810	1205
Less Nondeliverable surveys	40	7	47
FINAL SAMPLE			1158
RESPONSE			
From first mailing	355		
(Percent response)	30%		
From second mailing	---	153	---
(Percent response)	---	19%	---
OVERALL RESPONSE RATE	---	---	44.0%

tested using the 494 scorable tests. Table 6 provides a summary of respondents' answers to Page 1 of the mail survey.

Results of Testing Null Hypotheses Nos. 1 and 2

The first null hypothesis is that there are no differences in cognitive levels across various career paths. The second null hypothesis is that there are no differences in cognitive levels between income groups. Income level is a categorical variable representing (1) annual incomes less than or equal to $45,000 and (2) annual incomes greater than $45,000. The decision to use these two levels was made after inspection of the distribution. This dividing line between upper and lower income levels resulted in 170 responses being classified as high income and 324 responses being classified as low income. The next possible cut-off is annual incomes greater than $55,000. Using this cut-off point results in an insufficient number of observations in the cells.

According to a national survey prepared by Robert Half International, Inc. (1989) managers in large public accounting firms earn between $38,500 and $60,000; managers in medium size accounting firms earn between $38,000 and $52,000. Managers in large corporations earn between $36,000 and $52,000.[155] The position of manager is reached by an individual who has achieved some degree of career success. Based on the salary ranges reported for managers, the use

[155] *Working Women*, January 1989

Table 6. Characteristics of Respondents

Reported Career Fields	No.
Audit	89
Business/Non-Accounting	65
Financial	161
Managerial	67
Non-Business	43
Tax	69
Total	494
Reported Salaries	
Less than $25,000	47
$25,001 to $35,000	105
$35,001 to $45,000	173
$45,001 to $55,000	138
$55,001 to $65,000	20
More than $65,000	11
Total	494
Reported SAT Scores	
Less than 800	3
800 to 900	16
901 to 1000	89
1001 to 1100	158
1101 to 1200	166
1201 to 1300	51
More than 1300	11
Total	494

of $45,000 as the cut-off captures the upper-end of the manager's salary range, as well as the salary range for individuals whose careers have progressed beyond the manager's rank. These national statistics on salary levels provide suppport for the use of the chosen income level (greater than $45,000) as a surrogate for success.

Prior studies have indicated that there is a small positive ($r < .20$) association between PCT scores and intelligence.[156] SAT scores are used as a covariate to control for this relationship in testing the two hypotheses. The relationship between PCT and SAT in this study is within this reported range (corr = +.10; p = .02).

The number of subjects in each cell of the model for statistical analysis is reported in Table 7. For example, the tax group has 15 subjects in the high income level and 54 in the low income level. The mean Paragraph Completion Test score and standard deviation for each cell are also reported. Marginal values for each career group are also reported in Table 7.

As reported in Table 8, analysis of covariance provides no basis for rejecting the first hypothesis ($p = .4720$) concerning differences between career groups. The second null hypothesis is rejected at the alpha = .10 level ($p = .0872$). This result suggests that there is a significant difference in cognitive levels between income groups. Analysis of the data failed to yield a significant interaction effect.

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[156] *Op. Cit.*, Hunt, *et al.*

A summary of the results of analysis of variance without the covariate of intelligence is presented in Table 9. Removing the covariate from the statistical analysis does not alter the level of significance of the main income effect.

Test for Non-Response Bias

Assuming late respondents share characteristics with non-respondents, a statistical analysis was performed to test for late response bias. An analysis of variance across respondents of the first mailing (351) and respondents of the second mailing (143) provides statistical evidence to accept the null hypothesis that the groups do not exhibit significantly different Paragraph Completion Test Scores ($F = .63$; $p = .43$).

Testing for Compliance with Assumptions Underlying ANOVA Technique

As stated in Chapter 5, the analysis of variance procedure is insensitive to flagrant violations of assumptions concerning normality of distribution of the population and homogeneity of variance. However, tests were performed to provide assurance that the data does not violate these statistical assumptions. First, the distribution of the Paragraph Completion Scores within each of the twelve cells was plotted in order to inspect the shapes of the distributions. Second, a formal test was used to determine whether or not it is feasible to assume that the populations for these samples ($r = 12$) have equal variances. Bartlett's Test was used

because it can accommodate unequal sample sizes. The appropriate decision rule is that, if the test criterion is less than or equal to the specified percentile of the Chi-Square distribution with r-1 degrees of freedom, then the hypothesis of equal population variances remains feasible. The test criterion at alpha = .05 for 12 populations is 19.68. Bartlett's test criterion in this study is 17.5893. Because 17.5893 < 19.68, the hypothesis of equal population variance was not rejected. While the hypothesis was not rejected at the alpha = .05 level, the use of an alpha level of .10 or .20 would have resulted in a rejection of the assumption of equal population variances. However, the rejection of the assumption of equal population variances is not flagrant and, as was noted earlier, should not greatly change the probabilities associated with the F tests reported in Table 8.

Table 7. Descriptive Results

	INCOME LEVELS								
	HIGH			LOW			COMBINED		
	n	$\bar{x}$	sd	n	$\bar{x}$	sd	n	$\bar{x}$	sd
CAREERS									
1. Tax	15	1.69	.41	54	1.66	.46	69	1.67	.44
2. Audit	34	1.71	.57	55	1.68	.52	89	1.69	.54
3. Financial	57	1.82	.52	104	1.69	.39	161	1.73	.44
4. Managerial	21	1.68	.47	46	1.63	.42	67	1.65	.44
5. Business Non/Acct	29	1.83	.46	36	1.70	.42	65	1.77	.44
6. Non/Bus Other	14	1.60	.50	29	1.63	.37	43	1.62	.41
TOTAL	170			324			494		

Overall PCT Mean 1.70
Overall PCT SD .46

Table 8. Analysis of Variance With One Covariate

DEPENDENT VARIABLE: PCT

SOURCE	DF	SUM OF SQS (Type I)	MEAN SQ	F VALUE	PR>F
Model	23	5.5465	0.2416	1.16	.27
Error	473	97.3107	0.2070		
Career	5	0.9456	0.1891	0.91	.47
Income	1	0.6082	0.6082	2.94	.09
Career*Income	5	0.3257	0.0651	0.31	.90
SAT(Career*Inc)	12	3.6670	0.3056	1.48	.13

Table 9. Analysis of Variance

DEPENDENT VARIABLE: PCT

SOURCE	DF	SUM OF SQS (Type I)	MEAN SQ	F VALUE	PR>F
Model	11	1.8795	0.1709	.82	.62
Error	482	100.9777	0.2095		
Career	5	0.9456	0.1891	0.90	.48
Income	1	0.6082	0.6082	2.90	.09
Career*Income	5	0.3257	0.0651	0.31	.90

Implications

It has been suggested that the accounting profession should attract more abstract-thinking students who can succeed in a rapidly changing, complex environment. The findings of this study provide evidence that individuals earning higher salaries in accounting careers are more cognitively complex. The significant difference in salary levels suggests that the work environment is rewarding the ability to function in a complex environment.

The American Institute of Certified Public Accountants has voted to require incoming members to have five years of college education beginning in the year 2000. According to the American Accounting Association Report (1979), the additional credit hours available as a result of the five-year requirement may accommodate the need for enhancement of critical thinking skills. Researchers who have investigated the reasons why college students choose accounting over such other professions as law and medicine have concluded that one reason is the length of time required in completing the degree. Increasing the length of time to complete the accounting curriculum may negatively influence career choice for potential accountants.

The results of the statistical analysis provide evidence that there are no significant differences between cognitive levels of individuals employed in various accounting career paths and former accountants now employed outside the profession. These

results are consistent with the findings of Collins and Milliron (1987) who found no differences in learning styles between individuals employed in various accounting careers.[157] A possible explanation for the outcome in both of these studies is that the sample of accountants is drawn from a fairly homogeneous population. For example, students entering college may exhibit a wide range of cognitive levels; however, academic majors may attract individuals with similar cognitive levels.

Another implication of not finding significant differences between individuals employed in the various career paths may be that, if critical thinking is incorporated into the curriculum, that it need not favor one accounting discipline, tax, auditing, managerial or financial, over another. However, before the teaching of critical thinking skills is incorporated into the accounting curriculum, the debate on whether or not critical thinking skills are capable of enhancement in this manner should be evaluated. McPeck[158] has argued that critical thinking skills are subject specific and cannot be taught as a separate course. If one accepts McPeck's argument, then the approach to enhancing critical thinking skills in accountants is to require more undergraduate work in math and science, subjects where, according to McPeck, critical thinking skills are learned.

Collins and Milliron (1987) have suggested that the results of their research on accountants' learning styles have raised a host of issues, including how closely

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[157] *Op. Cit.*,

[158] *Op. Cit.*

learning style may affect promotion and how the nature of accounting work may influence the learning style of those remaining in accounting practice.

Both issues are addressed in this study. First, the significant difference in cognitive levels between the high and low income levels suggests that abstract thinking may be rewarded. A second important result is that cognitive levels of accountants who have left the profession are not significantly different from the levels of those remaining in the profession after six, seven, and eight years. If the exiting group had been found to be more abstract, it perhaps would have placed a responsibility on educators to counsel potential accounting majors that the more abstract students fit the profile of accounting majors leaving the profession.

Some researchers have investigated differences in the cognitive demands required by the various parts of the Uniform CPA Examination. These studies have shown that the CPA Exam is testing at a rather concrete level. One purpose of the CPA Exam is to ensure that candidates have achieved a minimum educational standard. Any changes that might be contemplated in the examination should at least consider the cognitive demands of the accounting environment.

While the more cognitively complex individual can be a desirable addition to the profession, it is important to consider whether or not homogoneity is a desired state. How much the accounting profession benefits from diversity is still unknown.

Research Contribution

The results of this dissertation study contribute to the body of knowledge concerning cognitive complexity by investigating (1) whether or not there are differences in cognitive levels of accounting graduates who are employed in accounting-related, business and nonbusiness occupations and (2) whether differences in cognitive levels within specific career fields are associated with differences in income levels. Previous studies have examined learning styles employed by individuals both as students in college and employees in the workplace. While learning style represents a preference for a particular learning environment, cognitive complexity is a measure of an individual's achieved cognitive development. Although numerous attempts have been made to devise objective instruments that will measure cognitive complexity, none of them has proven satisfactory because they deal with content alone, not with how a person thinks. Because a thought sample is required to assess how a person thinks,[159] the Paragraph Completion Test (PCT) is the preferred tool for measuring conceptual level.

According to Chen and Olson (1989)[160] researchers believe that objective measures are unlikely to be suitable for measuring cognitive complexity because concrete subjects can respond abstractly when an abstract response is presented to them. The Paragraph Completion Test is an instrument that assesses cognitive com-

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[159] Hunt, D. E.; L. F. Butler; J. E. Noy and M. E. Rosser, "Assessing Conceptual Level by The Paragraph Completion Method," The Ontario Institute for Studies in Education Informal Series/3, 1978.

[160] *Op. Cit.*

plexity based upon six thought samples per individual. Collecting and scoring a measure of cognitive complexity for a large number of accounting graduates using the preferred subjective approach contributes to existing knowledge. This knowledge, as explained in the previous section, has implications for vocational counseling and accounting education.

A further contribution to existing knowledge is made by employing a sample of individuals who have graduated from undergraduate accounting programs six, seven, and eight years ago. Steele,[161] a partner in charge of a major office of a Big Eight firm, provided statistics for his firm for the past ten years, indicating that 80 percent of newly hired accountants leave public accounting within five years and that relatively few accountants leave after the fifth year. The large CPA firm provides accounting graduates with their initial exposure to various accounting occupations. If 80 percent of accountants hired by large CPA firms change employers within five years, any attempt to categorize career choice in the early years of employment is premature and results in the misclassification of an individual's chosen career field. Previous research has not addressed this issue in the choice of subjects.

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[161] Steele, C. G., "Discussants Response to J. E. Sorenson, T. Sorenson, J. Rhode, and E. Lawler, A Behavioral Study of Staff Retention in the Public Accounting Profession," Symposium on Auditing Research, 1974 (Urbana, Champaign: University of Illinois), 1976

Limitations

There are many limitations which can affect a study of this type. Some which may affect this study are: (1) the sample is not scientifically selected and may not be representative; (2) there may be non-response bias; and (3) the demographic information is self-reported.

The sample of four universities used in this study was not randomly selected. Respondents may not be representative of all accounting undergraduates. Research samples that require alumni mailing lists are limited by the number of schools willing to provide the necessary information (names, addresses, majors, and completion dates of graduates). Furthermore, the costs of scoring The Paragraph Completion Test is a limiting factor in determining sample size. (The cost of scoring the 494 instruments in this study was $2,000.00.)

Demographic information is self-reported. Two items that may be subject to bias are achieved SAT score and current salary level. The SAT score is used a surrogate for intelligence in this study. Because there is only a small correlation between intelligence and cognitive level, any self-reporting bias will not significantly affect the outcome of the study. Because the first hypothesis is analyzed without using the salary variable, the outcome of testing this hypothesis would not be affected by limitations in the measurement of this variable.

A limitation of the data results from repondents not being asked if they were unemployed or housewives or househusbands. Such respondents would most likely describe their career fields as "NonBusiness" and report incomes of less than $25,000 per year. Failure to pose this question may confound the responses reported in the "NonBusiness and Low Income" category.

Areas for Future Research

Researchers of fluid and crystallized intelligence have suggested that cognitive development peaks by age thirty and then begins to decline. This decline has been questioned by other researchers. The subject of adult cognitive development is an area requiring additional empirical research. These studies should focus upon Piaget's formal-operational level. While there is nearly universal acceptance of Piaget's work, a great deal of the current literature fails to develop adequate links with Piagetian theory.

Another area to be considered for future research is whether or not an individual's cognitive complexity is associated with his or her preference for abstract vs. concrete environments. The one study that posed this question relied upon self-reported preferences. As was previously stated, the researchers believe the subjects' answers were biased by the subjects' belief that preference for an abstract environment was desirable.

Further research is required in order to determine whether critical thinking skills can be taught independent of traditional subject areas. In order for this question to be answered, it is also necessary that more sophisticated instruments be developed that can measure whether or not these critical thinking courses have had an impact on the student's cognitive development.

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APPENDIX A

FIRST CONTACT LETTER JUNE 13, 1988

The R. B. Pamplin College of Business
Department of Accounting

Blacksburg, Virginia 24061

June 13, 1988

(Name and Address)

Dear

A recent vote taken by the AICPA membership will increase the amount of coursework required of new members. This additional coursework will require a major restructuring of accounting programs by the year 1995. Academicians need to consider a variety of issues before the change can be implemented.

As an accounting graduate, even if you no longer work in the profession, you are in the position to provide insight into the needs of students of a five-year program. For this reason I am asking for your participation in this study which gathers new information about learning style, how individuals who have successfully completed an accounting program solve problems. Dr. Jan Williams provided your name as a University of Tennessee alumnus. In addition to providing insight in designing the restructuring of five year programs, the information will be useful in providing student guidance and in designing textbooks.

To ensure that the results are representative of accounting graduates, it is important that each questionnaire be completed and returned. You may be assured of complete confidentiality. There is an identifying number on the questionnaire for mailing purposes only. If you answer this first request, we will check your name off of the mailing list and not inconvenience you with a second mailing. At no time will the information you provide be associated with your name. Reporting will be in aggregate form only.

I understand the great demands on your time, but your responses are of significant value in understanding how to improve accounting education.

Very truly yours,

Michael P. Riordan, CPA

APPENDIX B

FOLLOW-UP LETTER JULY 22, 1988

The R. B. Pamplin College of Business
Department of Accounting

Blacksburg, Virginia 24061

July 22, 1988

(Name and Address)

Dear

About four weeks ago I wrote to you asking for your help in contributing information that would help us to measure the learning styles of accounting graduates.

If you have already answered our questionnaire, please accept our thanks. If you have not had an opportunity to return your answers, we would greatly appreciate your completing the enclosed questionnaire and returning it at your earliest convenience.

In order for the results of the study to be representative of all of our Accounting graduates, it is important that you return your questionnaire. We understand how busy you are, but only people like you can contribute the information we need. The questionnaire takes less than fifteen minutes to complete.

Sincerely,

Michael P. Riordan, CPA

APPENDIX C

MAIL SURVEY

INSTRUCTIONS

Please check the item that BEST describes:

Your present career field:

_____Managerial/Cost
_____Financial
_____Business/Non-Accounting
_____Audit
_____Tax
_____Non-Business

Your present salary:

_____Less than $25,000
_____$25,001 to $35,000
_____$35,001 to $45,000
_____$45,001 to $55,000
_____$55,001 to $65,000
_____More than $65,000

Your SAT scores (to the best of your knowledge):

_____Less than 800
_____800 to 900
_____901 to 1000
_____1001 to 1100
_____1101 to 1200
_____1201 to 1300
_____More than 1300

On the following page you are asked to complete six open-ended statements with approximately three sentences per statement. While you need not limit the number of sentences in your response, you must complete each statement within *TWO MINUTES*.

There are no right or wrong answers, so give your own ideas and opinions about each topic. Indicate the way you *REALLY* feel about each topic, not the way others feel or the way you think you should feel.

Continued

WHAT I THINK ABOUT RULES. . .

WHEN I AM CRITICIZED. . .

WHAT I THINK ABOUT PARENTS. . .

WHEN SOMEONE DOES NOT AGREE WITH ME. . .

WHEN I AM NOT SURE. . .

WHEN I AM TOLD WHAT TO DO. . .

APPENDIX B

The University of Michigan

DEPARTMENT OF PSYCHOLOGY

580 UNION DRIVE
ANN ARBOR, MICHIGAN 48109-1346

To: Mike Riordan
From: Armen Asherian & Scott Bunce
Ref: Qualifications of scorers and use of the scoring procedure

I. Qualifications of Scorers

Dr. Christopher Peterson, Professor of Clinical Psychology at the University of Michigan, recommended us as assistants in scoring the Paragraph Completion Tests. As doctoral students in personality psychology, we have extensive experience in personality assessment techniques and in research methods. We have recently completed Prof. David Winter's course in personality assessment at a distance in which we studied assessment techniques comparable to the Paragraph Completion Test. Prof. Peterson is familiar with our experience in the area of assessment and considered us appropriate candidates to score a projective test such as the Paragraph Completion Test.

II. Scoring Procedures

We studied the Paragraph Completion Test manual and all of the practice examples in the manual. Once we had achieved an agreement of 0.85 with both the "expert" scorers and among ourselves we scored all 494 responses independently. Upon completion of the scoring, we reviewed and discussed possible discrepancies. Final scores had no more than 0.5 difference, and there were very few of these.

In our opinion, most of responses were typical of the examples provided in the Paragraph Completion Test manual. We have provided a brief summary of eleven typical responses and how the individual paragraphs were scored.

III. Explanations of Example Responses

Examples of a 1.0 Rating

response 5, stem WHAT I THINK ABOUT RULES...

Rules are seen as categorically good (a 1.0 response). They are seen as serving a good function but this is not evaluated as in a 1.5 or a 2.0 answer.

response 5, stem WHAT I THINK ABOUT RULES...

There is no evaluation of the request per se (as in a 2.0 response). The subject only evaluates the way in which the request is given. The subject does not display the hostility and egocentricism of a 0.0 or 0.5 response. Since there is no evaluation of the authority or request and little evidence of concern of a threat to their independence as would be found in a 1.5 score. This response is purely categorical in nature.

response 5, stem WHEN I AM CRITICIZED...

Criticism is not seen as categorically right or wrong (a 1.0 response), rather the subject is open to learning from mistakes (a 1.5 response). However, the subject does not question the motive for criticism (a 2.0 response) but sees it as either helpful or not.

Response 4, stem WHEN I AM NOT SURE...

This individual displays the avoidance of authority that may characterize a 1.0 or a 1.5 response, but not a 2.0. The person has more tolerance for ambiguity than a 1.0 respondent would, but still seeks closure on research. Thus, we scored it 1.5.

Response 4, stem WHEN SOMEONE DOES NOT AGREE WITH ME...

This subject is open to disagreement, and does not display the egocentric nature of a 1.0 or a 1.5 response. The individual does not reveal an awareness of other's feelings, however, as in a 2.5 response, so it scores a 2.0.

Response 3, stem WHEN I AM NOT SURE...

The emphasis in this response is an exploration of options. The subject places personal stock in his/her ability to resolve the dilemma, showing a need of independence, typical of a 2.0 answer. There is no emphasis on procedure, however, as is necessary for a 2.5 rating.

Response 1, stem WHEN I AM NOT SURE...

Though brief, this answer places emphasis on personal decision in the matter, with on evidence of instability in unresolved issues. It does not place emphasis on procedure (a 2.3 response) so it receives a 2.0.

Response 3, stem WHEN I AM TOLD WHAT TO DO...

The primary evaluative criteria used in this response are personal involving both ethos and logic. The premium placed upon independence is typical of a 2.0 response. The specific variables are not considered however; neither is the intent or the position of the teller, which are necessary to score it a 2.5.

Response 2, stem WHAT I THINK ABOUT RULES...

This respondent realizes that roles have a purpose, but can also be i, a response at the 2.0 level. Rules are seen as important, and that equal options can be designated of facility. The subject makes no final position regarding rules as a class necessary for a 3.0 score, thus we gave is a 2.5.

Response 1, stem WHAT I THINK ABOUT PARENTS...

This person evidences a feeling for the individuality of both parents ans their children. They do not show insensitivity toward the feelings of their parents (as in a 2.0 response), yet it is not elaborate enough in the area of the relationship to warrant a 3.0. Hence, we score it a 2.5.

Responses 1, stem WHEN I AM CRITICIZED...

The respondent evaluates:

I. The person criticizing him/her.
II. Whether the criticism is warranted.
III. The applicability of criticism.

Thus the person is open to criticism, but does not take it blindly. No responsibility of the decision to change is taken upon him/herself, thus warranting a 3.0 rather than a 2.5.

If you require any additional information about the scoring procedure please contact us at the University of Michigan, Department of Psychology, Ann Arbor, MI 48109-1346.

Armen Asherian

Scott Bunce

Appendix E

Examples of The Paragraph Completion Test Responses

Response No. 1

WHAT I THINK ABOUT RULES...

They exist because they serve a purpose. However, we need to look beyond and realize when it is time to change them.

WHEN I AM CRITICIZED...

Depending who critizes me, I try to objectively evaluate if the criticism was warranted and if I should learn from it or change.

WHAT I THINK ABOUT PARENTS...

I love and respect my own, but parents are as different as the the children they have.

WHEN SOMEONE DOES NOT AGREE WITH ME...

I try to see their point of view, if I'm not sure about my own. Depending on the situation I will compromise or stick to my guns.

WHEN I AM NOT SURE...

I try to reason it out or do more research.

WHEN I AM TOLD WHAT TO DO...

I'll follow instruction as long as they do not interfere with my ideas and my logic.

Response No. 2

WHAT I THINK ABOUT RULES...

Certain rules are necessary to give boundaries. Too many rules restrict creativity and imagination and show a lack to trust in individuals to make the right choice. If there are equally acceptable options, one one is to be followed for facility, then a rule should be made.

WHEN I AM CRITICIZED...

I immediately try to decide if it is justified. If it is, I accept it after it hurts a little less. If it isn't justified, I must decide if it is worth correcting the situation and either talk to the person or let it slide. If the criticizers motives are to hurt me, talking to them won't improve matters - I just accept it without fighting back.

WHAT I THINK ABOUT PARENTS...

Parents should not abdicate their responsibility to teach and train their children. It appears that parents today are so afraid of being rejected by their kids, they let everyone else define their morals, tastes, and manners. I hate to see undisciplined children - they turn into undisciplined adults and society deteriorates.

WHEN SOMEONE DOES NOT AGREE WITH ME...

I try to see the value of what they are saying. If its a good idea I just hadn't thought of, we go with their idea. If I still feel I'm right, I try to persuade them through logical argument why my way is better. If I'm just emotionally attached to his ideas, I may have to give it up.

WHEN I AM NOT SURE...

I try to think it through logically from the beginning or put down the pros and cons. If I can't arrive at the right answer, I go with the one that seems to have the least drawbacks.

WHEN I AM TOLD WHAT TO DO...

I evaluate whether its appropriate or justified. If it is, I do it. If the person has no authority to tell me what to do, I resent it and will only do it if it seems the best thing to do. I let the person know that I'm doing it because it's best, not because they said to do it.

Response No. 3

WHAT I THINK ABOUT RULES... I think about consistency. I feel rules are necessary and help things run smoothly and predictably. I also do not like chaos or disorganization so I like having rules to follow.

WHEN I AM CRITICIZED..., I get defensive and embarrassed. I try to redeem or explain myself. If that is not acceptable I withdraw and try not to be criticized about the particular subject again.

WHAT I THINK ABOUT PARENTS... I think about hard working, caring, ever-present, ever-supportive people. I hope I will be just as loving, but maybe not as rigid, as my parents, with my children.

WHEN SOMEONE DOES NOT AGREE WITH ME... I often get irritated at first. But I then try to explain my position fully and try to include supporting facts. I also try to understand the other person's position.

WHEN I AM NOT SURE... I about something I try to get additional information from someone knowledgeable about the subject or some reference material. I lose confidence in myself, a little or a lot depending on how not sure I am. I also try to look at all options.

WHEN I AM TOLD WHAT TO DO..., I most times follow through That is I that person has the authority + permission to tell me what to do. I also do not however, allow myself to be dominated.

Response No. 4

WHAT I THINK ABOUT RULES...

Rules are necessary in order to ensure that individual rights are not carried to the extreme when they infringe on the good of the population. However these rules should be created through a democratic process.

WHEN I AM CRITICIZED...

I try to react in rational way ie. try not to over react. If the criticism is justified I make an attempt to address the problem to improve the situation. If the criticism is unjustified I will communicate my feelings with sound evidence supporting my side.

WHAT I THINK ABOUT PARENTS...

My parents and family are very important to me. We are a very close family and my parents keep a family close contact with each other. I think children raised by parents in a successful marriage have a very strong head start in life.

WHEN SOMEONE DOES NOT AGREE WITH ME...

I have no problem if someone does not agree with me. If it is an objective difference I will state the facts as I see them. If it is a subjective opinion, I'm not afraid to speak my feelings.

WHEN I AM NOT SURE...

I don't move ahead on something if I am not sure of what I am doing. I will make the effort to research the facts to better understand what I am doing. I will not speak with authority if I am not sure the answer.

WHEN I AM TOLD WHAT TO DO...

If I am told what to do and it makes sense given the situation, I will do it. I don't like to hear something dictated to me, but prefer to discuss the current needs and what should be done to agree on the best approach.

Response No. 5

WHAT I THINK ABOUT RULES...

I do not have any problem with rules. I do not mind following them nor do I feel limited by them. They are made for a reason and should be abided by.

WHEN I AM CRITICIZED...

I try not to take criticism personnally, but to learn from my mistakes. There are right and wrong ways to criticize and if done properly can be most helpful.

WHAT I THINK ABOUT PARENTS...

Parents are the best influence on a child's life and I feel strongly that you need both parents in a good family situation to be able to grow up in the best environment.

WHEN SOMEONE DOES NOT AGREE WITH ME...

In this situation I try to be open and listen to the other side because no one is right all the time. If you react negatively, that person will be afraid to ever question you again, whether you were right or not.

WHEN I AM NOT SURE...

I don't go forward easily unless I'm sure of myself. I try my best to become sure but am leary if not.

WHEN I AM TOLD WHAT TO DO...

I don't mind being told what to do as long as it is done in the proper state of mind and not in a demeaning manner. I follow orders well and don't feel intimidated by them

Appendix F

Studies Investigating Critical Thinking Skills

PROBLEM	DESIGN	SUBJECTS	INSTRUMENTS	RESULTS
		Bailey (1979)		
To study the effect of a special instructional paradigm emphasizing problem solving on critical thinking	True experimental pretest-posttest control group	University students randomly assigned to either a zoology or botany course	Watson-Glaser Critical Thinking Appraisal	Significant gains in critical thinking were obtained for the treatment group; no significant differences were reported in comparing the two classes.
		Beckman (1956)		
To study the extent to which courses in argumentation and discussion improve critical thinking	Nonequivalent pretest-posttest control group	303 students in 8 colleges and universities	Watson-Glaser Critical Thinking Appraisal	No significant difference between the experimental and control classes. The differences in mean gain between colleges was significant.
		Coscarelli and Schwen (1979)		
To ascertain the effects of three representation modes on critical thinking	Nonequivalent pretest-posttest control group	190 introductory chemistry students in 10 lab classes at a large university	Watson-Glaser Critical Thinking Appraisal	No significant differences among the three groups.
		Dressel and Mayhew (1954)		
a) To assess the gain in critical thinking of freshmen students enrolled in social science courses	Pretest-posttest	1,752 freshmen students attending 11 colleges	Test of Critical Thinking in Social Science developed by a team of experts for a comprehensive evaluation of general education.	Students from all institutions showed a significant gain; students scoring lower on the pretest showed the greatest gain.

PROBLEM	DESIGN	SUBJECTS	INSTRUMENTS	RESULTS
b) To assess the gain in critical thinking of upper-class students	Repeated measures (three times)	236 students from several institutions	Test of Critical Thinking in Social Science	Students' scores continued to increase for three groups of students and remained constant for one group
c) To evaluate the effect of different course materials or instructors on critical thinking	Nonequivalent pretest-posttest comparisons group instructional	Approximately 680 students in 14 different groups	Test of Critical Thinking in Social Science	There was no significant difference among classes that used different methods; significant differences were found among sections of the same course taught by different instructors.
d) To assess the gain in science reasoning over a one year period for freshmen taking general education courses	Pretest-posttest	990 freshmen from 7 colleges	Test of Science Reasoning and Understanding. Developed for this study to assess science problems and conclusions.	Significant gains were reported for six colleges, with significant variations between the colleges. Large gains were found for initially low students; small or insignificant gains reported for initially high scoring students.
e) To assess the relationship between gain in science reasoning over a one year period and type and amount of science taken freshmen and sophomore students	Nonequivalent pretest-posttest control group	Approximately 470 students from 7 colleges	Test of Science Reasoning and Understanding for	Two colleges reported no significant differences when comparing students taking science with students not taking science. One college reported gains of students taking science equal to gains of students taking a logic course. Three colleges showed

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				significantly higher gain score for students taking specific science courses such as biology or physical science than students taking general science no science.
f) To assess the effect of science classes emphasizing critical thinking objectives as compared to science classes not stressing these objectives on gain scores of science reasoning	Nonequivalent pretest-posttest control group groups.	1075 students from 3 colleges	Test of Science Reasoning and Understanding	No significant differences were found comparing posttest scores of nonrandomized
g) to assess change in critical thinking of college freshmen after one year of general education coursework	Pretest-posttest problem,	1002 students from 7 colleges the greatest gain.	A Test of Critical Thinking. Prepared to assess the abilities of defining a selecting pertinent information, recognizing assumptions, formulating hypotheses, and drawing conclusions.	Significant gains reported for all colleges. Students scoring low initially showed Students scoring high initially showed little or no gain.
		Fishbein (1975)		
To determine the effect of three methods of grouping students on critical thinking	Nonequivalent pretest-posttest control group	359 community college students in six classes	Watson-Glaser Critical Thinking Appraisal	Students grouped complimentarily, in which they were alike on all four personality functions, or heterogeneously, with wide variations of personality variables, scored significantly higher than students grouped randomly.
		Gressler (1976)		

To investigate the effect of a foundations research course on critical thinking	Matched two group posttest only design course and	62 graduate students	Watson-Glaser Critical Thinking Appraisal	No significant differences between students who had taken the research students who had taken a similar number of graduate hours, but not the research course.
		Hanconck (1981)		
To study the effect of Guided Design in the development of critical thinking by comparing a class taught with Guided Design to a traditionally taught class	Nonequivalent pretest-posttest control group	234 in two sections of the same class	Watson-Glaser Critical Thinking Appraisal	No significant differences between the two classes.
		Hardin (1977)		
To test the effect of a self-paced system of instruction compared to a lecture approach to instruction	Nonequivalent pretest-posttest control group	62 university students enrolled in two physics classes	Logical Reasoning Test. Watson-Glaser Critical Thinking Appraisal	No significant differences were obtained between the pretest and posttest of both groups, and no significant differences were obtained between the self-paced and lecture groups.
		Hayden (1978)		
To compare critical thinking abilities of students taking BSCS minicourses to students taking traditional minicourses	Two group posttest only	74 university nonscience majors enrolled in a biology course	Watson-Glaser Critical Thinking Appraisal	No significant differences were obtained in comparing the two groups.
		Jackson (1961)		
To compare gains on critical thinking of college debaters to comparable	Nonequivalent pretest-posttest matched control group	Students from 9 colleges	Watson-Glaser Critical Thinking Appraisal	In five colleges, debate students scored significantly higher gains

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control groups				than controls. In four colleges the controls outgained the debaters.
		Jones (1974)		
To study the differences in critical thinking between traditional and values clarification methods of teaching two interdisciplinary general education courses	Nonequivalent pretest-posttest control group	163 university freshmen	Watson-Glaser Critical Thinking Appraisal	Traditional social science course had significantly lower posttest scores than either experimental group. No significant pretest-posttest differences were reported for the experimental groups.
		Logan (1976)		
To investigate the relationship between amount of sociology and critical thinking	Eight cohort groups compared	874 students ranging from freshmen to graduate level	Locally developed 20 item test to assess the inclination and ability of students to, without prompting or directions, think critically about statements on contemporary social issues	Students at all levels scored very low on both inclination toward and competence in critical thinking. Graduate students scored slightly higher than undergraduates. Undergraduates taking a course specifically designed to develop habits of critical thinking showed significantly higher scores for both inclination toward and ability to think critically than did a comparable group just beginning the course.
		Lyle (1958)		
To study the effect of a special psychology course designed	Nonequivalent pretest-posttest control group	55 students in two sections taught by the same instructor	A Test of Critical Thinking developed by Dressel and	No significant differences between matched students.

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To enhance critical thinking compared to a traditionally taught psychology course		Mayhew (1954)		
		Mentkowski and Strait (1983)		
To assess changes in critical thinking of students taking a curriculum structured to enhance critical thinking and other cognitive achievement outcomes of college	Longitudinal repeated measures over 3 1/2 years; cross sectional, freshmen and senior cohort groups compared	350 college students	Test of Thematic Analysis, Analysis of Argument. Watson-Glaser Critical Thinking Appraisal	No significant differences were found on any of the instruments comparing freshmen and senior cohort groups; the repeated measures showed significant positive gains on the Watson-Glaser; no significant differences for the Test of Thematic Analysis or the Analysis of Argument.
		Shuch (1975)		
To compare achievement in critical thinking of students using electronic calculations to students using paper and pencil calculations	Two group posttest only	112 community college students in four classes	Watson-Glaser Critical Thinking Appraisal	Contrary to the research hypothesis, students using paper and pencil calculations achieved significantly greater scores than students using electronic calculations.

		Smith (1977)		
To study the relationship between specific classroom behaviors and critical thinking	*Single group pretest-posttest*	*138 undergraduate students in 12 classes in a small, liberal arts college*	*Modified Flanders Interaction Analysis. Watson-Glaser Critical Thinking Appraisal. Chickering Critical Thinking Behaviors*	*No change in scores on the Watson-Glaser. Significant positive relationship between change in critical thinking scores (Watson-Glaser) and reported critical thinking behavior (Chickering), and student participating, faculty encouragement, and use of student ideas, and peer-to-peer interaction.*
		Susksringarm (1976)		
To study the effect of BSCS (emphasizing inquiry and higher order thinking) compared to traditional biology and instruction on critical thinking	*True experimental Solomon Four Group*	*152 university students in four classes*	*Watson-Glaser Critical Thinking Appraisal (translated)*	*Students taught with BSCS instructional materials scored significantly better than students taught using traditional methods*
		Tomlinson-Keasey and Eisert (1977)		
To evaluate the impact of the second year of a comprehensive program to enhance critical thinking of freshmen	*Nonequivalent pretest-posttest control group*	*104 university freshmen*	*Watson-Glaser Critical Thinking Appraisal*	*Treatment group showed statistically significant gains reported for*

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Tomlinson-Keasey, Williams and Elsert (1977)

To evaluate the impact of the first year of a comprehensive college program to enhance critical thinking of freshmen	*Nonequivalent pretest-posttest matched control group*	*184 university freshmen*	*Locally developed test of logical operations, including drawing conclusions and probability*	*No significant difference between the treatment and two comparison groups.*

Whitla (1977)

To assess changes in cognitive abilities during the under graduate college years	*Nine cohort groups compared*	*182 freshmen in 3 cohorts; 142 seniors in 2 cohorts; 43 sophomores; 1192 alumni in 4 cohorts*	*Test of Logic and Rhetoric Analysis of Argument. Test of Thematic Analysis. Thematic Appreciation Test (cognitive maturity section)*	*With the exception of natural science seniors upperclass students composed more forceful and logical essays than freshmen. Upperclass students are significantly more able to compose more effective and logical arguments, use analysis skills, and use causal explanations than freshmen.*

Williams (1951)

To compare gains on initial thinking of college debaters to comparable control groups	*Nonequivalent pretest-posttest matched control group*	*Debate students and control students from one university*	*Watson-Glaser Critical Thinking Appraisal*	*No significant differences between the treatment and control groups*

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