

AN ABSTRACT OF THE THESIS OF

Leslie K. Hickcox for the degree of Doctor of Education in  
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Title: An Historical Review of Kolb's Formulation of  
Experiential Learning Theory

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Abstract approved: \_\_\_\_\_  
Kenneth M. Ahrendt

The central purposes of this study were to review the historical sources of David Kolb's formulation of experiential learning theory, and to determine the effect and application of Kolb's theory and Learning Style Inventory as reflected in the literature between 1971 and 1990.

It was found that Kolb based his experiential learning theory on Dewey's descriptions of learning which were the earliest conceptualizations used in Kolb's theoretical framework; as well as the learning theory of Lewin's, the source of Kolb's initial conceptualizations of the learning cycle model; and Piaget's cognitive developmental theory. The investigator also found that the psychological constructs of fields of consciousness by William James (1899), were clearly correlated with Kolb's four phases of his learning cycle model.

Curry's learning style topology and psychometric evaluation favorably supported Kolb's Learning Style Inventory. Curry classified Kolb's LSI as an information

processing inventory with strong reliability, fair validity, and as the only LSI from which four other learning style instruments were developed.

A majority (61.7%) of the studies examined found that Kolb's theory and LSI were useful in five academic areas: accounting and business education, the helping professions, medical professions, postsecondary education, and teacher education. An understanding of and use of Kolb's learning cycle model will assist educators to organize curricula to focus on one or more of the four key learning environments. Researchers need to have a knowledge of and understanding of Kolb's formulation of experiential learning theory before they conduct research related to learning style theories.

In a 1990 interview Kolb stated that dual knowledge creates dual perceptions of the world, which are either concrete or abstract and are equally valued. The two types of knowledge are described by Kolb's two oppositional learning processes of apprehension and comprehension. The reception of dual inputs creates our individuality. It is a genetic plan for the development of the unique self.

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An Historical Review of Kolb's Formulation of  
Experiential Learning Theory

by

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# An Historical Review of Kolb's Formulation of Experiential Learning Theory

## CHAPTER I

### INTRODUCTION

In the late 1960's psychological researchers focused their attention on individual differences. Empirically, learning styles, or cognitive styles, (often used synonymously), are relatively stable attributes, preferences, or habitual modes used by individuals to organize and process information for problem solving (Kolb, 1984; Messick, 1976). Educational researchers sought to operationalize these differences in terms of cognition. In the past 20 years a plethora of learning style theories and inventories have evolved. Kogan (1980) defined nine different major cognitive style constructs. Messick (1976) identified more than 20 dimensions of cognitive styles. Curry (1987) has examined and psychometrically rated 21 learning style inventories developed in North America, Australia, England and Israel, alone.

Perhaps the most widely applied and analyzed learning style model, experiential learning theory, and inventory are Kolb's formulation and Learning Style Inventory (LSI). According to Van Cleaf and Schkade "Kolb's description of differences among learning styles has captured the essence of indicators described by others" (Van Cleaf & Schkade, 1987, p. 26). The investigator found over 50 dissertations

which focused on Kolb's LSI or experiential learning theory. Murrell and Claxton (1987) observed that Kolb's greatest contributions were to illuminate the role of learning in individual development.

David Kolb's formulation of experiential learning theory was drawn from observations of college undergraduate, graduate and adult learner populations, as well as from earlier learning theories (Kolb, 1984). Kolb integrated the works of Dewey, who focused on the role of experience in learning; Lewin, who stressed the importance of the learner being active in learning; and Piaget, who described intelligence as the result of the interaction of the person and the environment. Kolb also drew upon the writings of Carl Jung, Erik Erikson, Carl Rogers, Fritz Perls, Abraham Maslow, and Paulo Freire. He initially published his theory in 1971 in a work entitled Organizational Psychology: An Experiential Approach (1971). In 1984, Kolb again, published his theory in his book Experiential Learning: Experience As The Source Of Learning And Development (1984).

#### Statement of the Problem

This study focused on an historical review of the literature and research which served as a foundation to David Kolb's formulation of experiential learning theory. Kolb's theory and Learning Style Inventory have stimulated

the thinking and research of a diverse number of educators throughout the past 20 years. To date, no historiography has been conducted on Kolb's theory or LSI, particularly with reference to higher education and adult education. Therefore the goals of this study were to historically review the origins of Kolb's experiential learning theory, and report the effects of the theory and LSI in American higher and adult education between 1971 and 1990.

Numerous studies, between 1971 and 1990, have focused on Kolb's experiential learning theory and/or inventory. The studies fall into four major categories: 1) LSI administered to various special populations; 2) LSI validity and reliability studies; 3) cross-professional qualitative and quantitative studies on learning styles and Kolb's formulation of experiential learning theory; and 4) learning styles reviews and topologies of which Kolb's theory and LSI are one component.

### Rationale

The effects of Kolb's experiential learning theory and LSI in American higher education and adult education settings is of particular interest to the investigator. The investigator has been an instructor in higher and adult education settings throughout the past 15 years, and has administered the LSI since 1987. The fact that the inventory has been revised not only once, but twice, (1981

and 1985), is exceptional. Typically, inventories are designed and used in their original format. The only other learning style inventory that has been revised is the Dunn, Dunn and Price LSI. Furthermore, according to the Social Sciences Citation Index, Kolb has been cited 679 times between 1971 and 1989. These citations are in articles which emphasize, in whole or in part, Kolb's theory and/or LSI. Kolb's theory or LSI is the focus of over 57 dissertations.

To date, it appears that research has not been conducted which specifically studies the historical development of Kolb's theory and its effects in higher education and adult education settings. It is appropriate at this time to conduct research which will summarize the origin and development of Kolb's formulation of experiential learning theory, and interpret its effects in higher and adult education settings.

### Justification

Kolb's theory and LSI have been extensively studied and applied across a number of fields including: accounting and business education, cross-cultural education, counselor education and supervision, chemical engineering education, medical education, remedial and developmental education, educational psychology,



instructional media education, social science education, and vocational education.

The LSI was tested and developed within undergraduate and graduate student settings. It has been rated "strong" in terms of reliability and "fair" with regard to construct validity (Curry, 1987). The Kolb LSI is one of five learning style instruments listed in the Mitchell (1985) edition of the Mental Measurements Yearbook. It is one of the only learning style instruments listed in the Conoley and Kramer (1989) edition of the Mental Measurements Yearbook. It has been administered to a wide cross section of college and adult learners. The 1981 LSI was administered for psychometric purposes, to 1,933 adults ranging from 18 to 60 years. Two-thirds of the group had undergraduate degrees or higher. They represented a wide range of educational backgrounds and occupations, including teachers, counselors, engineers, salespersons, managers, doctors, and lawyers.

Kolb's formulation of experiential learning theory and inventory have been the basis for at least four other learning style inventories: McKenney and Keen (1974); Honey and Mumford (1982); Marshall and Merritt (1985); and Gregorc and Ward (1977). Considering the widespread use of Kolb's theory and inventory throughout the past 20 years it is important that an historical study point out the origin

of the theory and its implications within American higher education and adult education settings.

### Limitations

This study is a historiographic study on the background, development and application of Kolb's formulation of experiential learning theory and LSI, respectively. The research centered on the historical roots of Kolb's experiential learning theory. The historical background focused on three major theorists who influenced the theoretical framework of Kolb's theory: Dewey, Lewin, and Piaget. Other key theorists whose ideas had some impact on Kolb's theory were also discussed (e.g. James, Jung, Watson). An overview of the historical development of learning style research was also presented. The survey of learning style inventories was limited to North American and Australian learning style instruments.

The effects and applications of Kolb's theory and LSI in higher education and adult education settings, within five major academic categories, (accounting and business education, the helping professions, the medical professions, postsecondary education, and teacher education), were described according to findings reported in the literature.

Only studies conducted during the 1971 to 1990 period were considered.

### Purpose of the Study

The purpose of this study was twofold:

1. To provide an historical overview of the origin and development of Kolb's formulation of experiential learning theory and to survey the major North American and Australian learning style inventories; and to
2. To determine the use and effects of Kolb's formulation of experiential learning theory and inventory in American higher education and adult education settings between 1971 and 1990.

The three major objectives of the study were:

1. To describe the historical background which led to the development of Kolb's formulation of experiential learning theory.
2. To determine the application and effects of Kolb's formulation of experiential learning theory and/or the LSI in American higher education, 1971-1990.
3. To determine the application and effects of Kolb's formulation of experiential learning theory and/or the LSI in American adult education settings, 1971-1990.

## Methodology

Historical studies often present the development over time of a central concept, and then analyze the evolution of that concept. The central concept discussed in this study was the origin and development of Kolb's formulation of experiential learning theory. The interpretation of this concept was the discussion of the effects of Kolb's theory and LSI in American higher education and in adult education.

The topics researched were the origin of experiential learning theory, six key learning theorists Kolb referred to, an overview of American and Australian learning style research, and the studies of Kolb's theory and/or LSI as related to higher education and adult education. The research for the secondary and primary sources was derived from the following: library searches via ERIC, Education Index, Dissertation Abstracts, and primary source research on Kolb's work (interview with Kolb, 1990). Citation research was used as evidence of the application and impact of Kolb's theory and LSI. The search descriptors included: Kolb Learning Style Inventory, Kolb experiential learning theory, learning styles, adult education and learning styles, higher education and learning styles, Kolb Learning Style Inventory and adult education, and Kolb Learning Style Inventory and higher education, Kolb experiential

learning theory and adult education, and Kolb experiential learning theory and higher education.

### Definition of Terms

LEARNING ABILITY - According to Messick (1976) "ability dimensions essentially refer to the content of cognition or the question of what - what kind of information is being processed by what operation in what form? The concept of ability implies the measurement of capacities in terms of maximal performance, with the emphasis upon level of accomplishment" (Messick, 1976, p.7). Kolb's formulation of experiential learning theory postulates that "two fundamental dimensions of the learning process, each describing basic adaptive processes, standing in dialectical opposition" exist (Kolb, 1984, p.74). He further explains that the prehension dimension opposes the processes of apprehension and comprehension. This means that the orientation toward concrete experience, (apprehension), opposes abstract conceptualization, (comprehension). The transformation dimension opposes the processes of intention and extension. This proposes that the orientation toward reflective observation, (intention), opposes active experimentation, (extension) (Kolb, 1984). These four adaptive processes in opposition are the four major learning abilities of Kolb's formulation of experiential learning theory. Figure 1A illustrates Kolb's

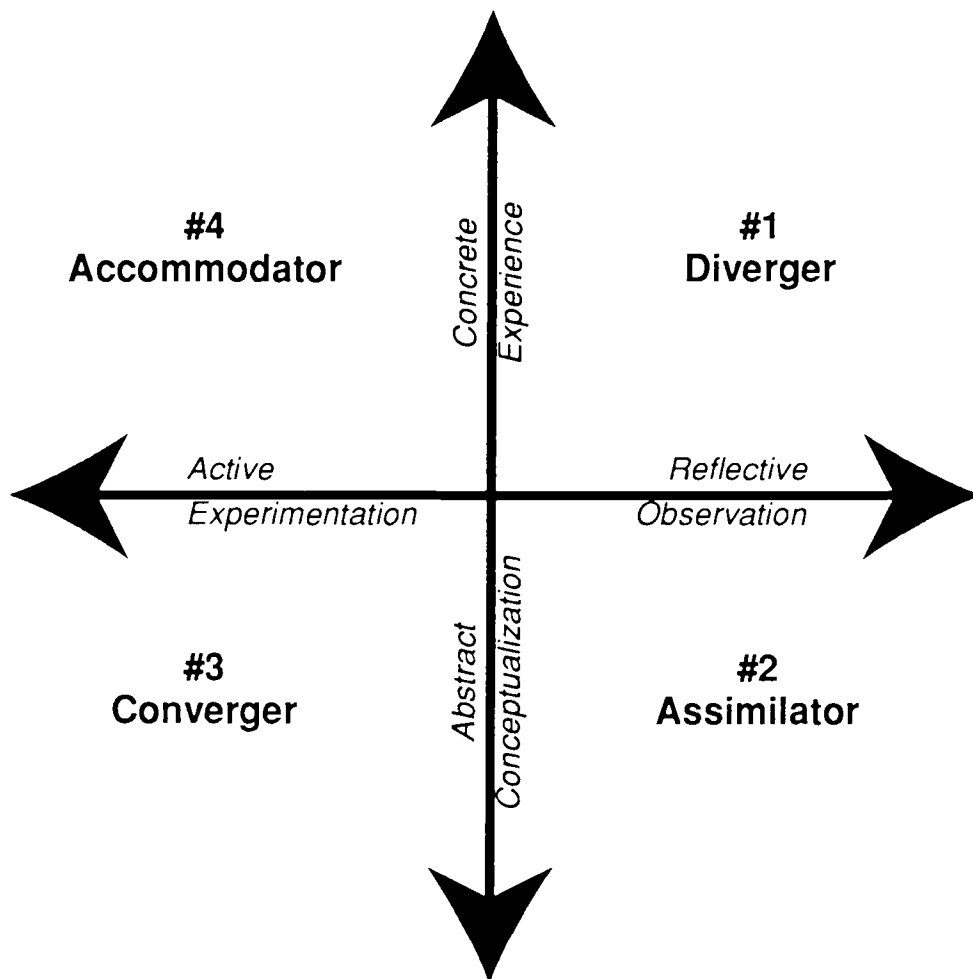


Figure 1A

Kolb's Learning Abilities and Learning Styles

model of the four learning abilities and the four learning styles.

LEARNING STYLES - As presented by Kolb (1984) and Messick (1976), learning styles, also termed cognitive styles, are relatively stable attributes, preferences or habitual modes used by individuals to process information for problem solving (Kolb, 1984; Messick, 1976). Messick clarifies that learning styles are not simple habits in terms of learning theory, for they are not directly responsive to the principle of acquisition and extinction (Messick, 1976). They develop slowly and experientially and do not appear to be easily modified by specific instruction or training (cited in Kagan & Kogan, 1970; Kogan, 1971). Learning styles entail generalized habits of information processing, but they also develop in congenial ways around underlying personality trends (Messick, 1976). Thus, learning styles are closely interrelated with affective, temperament, and motivational structures as part of the total personality (Shapiro, 1965).

KOLB'S EXPERIENTIAL LEARNING THEORY - Kolb presented two major concepts of the human learning process: perceiving termed prehension, and processing termed transformation. On the perceiving scale two predominant types are found to be preferred by the learner: concrete experience (CE), and abstract conceptualization (AC). The two key preferences

of the process scale are reflective observation (RO) and active experimentation (AE). These four preferences are called learning abilities. The combination of two preferred learning abilities creates four learning styles. It is theorized that one learns best through the learning cycle. This is experienced with the sequence of CE, RO, AC, and AE.

KOLB'S LEARNING STYLE INVENTORY - One's learning preferences for perceiving and processing, and in turn, one's learning style are determined by taking the Kolb Learning Style Inventory. The four learning styles identified by the LSI are as follows: Diverger (preferring CE and RO), Assimilator (preferring AC and RO), Converger (preferring AC and AE), and Accommodator (preferring CE and AE).

LEARNING - The following definitions by Curry (1987), and Kolb (1984) respectively, will apply to this study: (1) "This term will refer to intended learning in contrast to unintended learning. Intended learning is both a process and a product. The process is adaptive, future focused and holistic, affecting the individual's cognitive, affective, social and moral volitional skills. The product is observable as a relatively permanent change in behavior or potential behavior. The process is observable in the improved ability of the individual to adapt to



environmental stimuli" (Curry, 1987, p. 5). (2) "Learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it" (Kolb, 1984, p.41).

AC, AE, CE, RO - see Kolb's Experiential Learning Theory and Kolb's Learning Style Inventory

LSI - see Kolb's Learning Style Inventory

### Summary

This study focused on the historical development of Kolb's learning theory. It also analyzed the impact of Kolb's formulation of experiential learning theory and LSI between 1971 and 1990. The effects of the theory and LSI in American higher education and adult education settings was of particular interest to the investigator. It has been determined that no other previous historiographic study has been conducted with regard to Kolb's theory or LSI. With this study, a bit more light may be shed on the influence and contribution of Kolb's experiential learning theory and Learning Style Inventory.

## CHAPTER II

AN HISTORICAL REVIEW OF THE CONTRIBUTIONS OF  
DEWEY'S, LEWIN'S AND PIAGET'S LEARNING THEORIES TO  
KOLB'S FORMULATION OF EXPERIENTIAL LEARNING THEORYIntroduction

The experiential learning movement is a central issue in the historical discussion of Kolb's formulation of experiential learning theory. This movement has emerged through many of the theories and works of John Dewey, Kurt Lewin and Jean Piaget as conceptualized by David Kolb. As one studies the philosophic premises and critical approaches of experiential learning theory, the works of Dewey, Lewin and Piaget are considered the foremost intellectual foundation of experiential learning theory. These three theorists are considered the foundation of Kolb's formulation of experiential learning theory because each theorized about similar core concepts of learning, and presented them in either a conceptual, cyclic, or developmental format. Each theorist also emphasized the importance of experience and/or the environment in the learning process.

The focus of the chapter is a review of the experiential learning movement and the theories and key concepts of Dewey, Lewin and Piaget as discussed by Kolb, with regard to their contributions to Kolb's formulation of experiential learning theory.

### John Dewey and the Experiential Learning Movement

According to David Kolb (1984), John Dewey is the most influential educational theorist of the 20th century. The experiential learning movement is attributed to Dewey's educational philosophy. His theory best articulates the experiential education learning programs in higher education (Kolb, 1984).

In recent years there has been an increasing group of educators who view experiential education as a way to revitalize the university curriculum (Baker, Simon & Bazeli, 1987; Brown & Burke, 1987; Coulter, Coulter, Widing & Schultz, 1990; Garvey, Bootman & McGhan, 1984; Kurzich, Friesen & VanSoest, 1986; Laschinger, 1989; Murrell & Claxton, 1987; Wolfe & Byrne, 1976). Experiential education also offers a means of coping with change in higher education, as well as a means for the growing need for lifelong learning in our educational systems (Kolb, 1984).

Throughout the last forty years, many of Dewey's ideas have been incorporated into traditional education programs (Kolb, 1984). Dewey's concepts, which were developed for coping with change and for lifelong learning, have been adopted by experiential educators. The best of traditional and experiential education has been integrated with the following programs and methods in higher education:

internships, apprenticeships, work/study programs, cooperative education, studio arts, laboratory studies, and field projects (Kolb, 1984). As explained by Keeton & Tate:

The learner is directly involved with the realities being studied rather than merely thinking about the encounter or considering the possibility of doing something with it (Keeton & Tate, 1978, p. 2).

### Historical Background on Dewey

In 1938 John Dewey wrote Experience and Education in an effort to address the growing conflict between "traditional" education and "progressive" education, and to propose direction for change. He wrote in a dialectical format the contrasting approaches of the two educational philosophies:

If one attempts to formulate the philosophy of education implicit in the practices of the new education, we may, I think discover certain common principles.... To imposition from above is opposed expression and cultivation of individuality; to external discipline is opposed free activity; to learning from texts and teachers, learning through experience; to acquisition of isolated skills and techniques by drill is opposed acquisition of them as means of attaining ends which make direct vital appeal; to preparation for a more or less remote future is opposed making the most of the opportunities of present life; to static aims and materials is opposed acquaintance with a changing world (Dewey, 1938, p. 19-20).

He explained progressive education as follows:

fundamental unity of the newer philosophy is found in the idea that there is an intimate and necessary relation between the processes of actual experience and education (Dewey, 1938, p. 20).

Dewey's explanation of the contrasts between traditional and progressive education speak directly to the contrasting approaches of traditional and experiential higher education today. The experiential educators of today continue to emphasize the importance of individuality in education, open-ended student-based activity, and learning through experience.

The progressive education movement initiated by Dewey, challenged the idealist educational philosophy. William James (1907) termed the idealist philosophy as the rationalist. Kolb claimed that rationalist philosophy dominated thinking about learning and education since the Middle Ages (Kolb, 1984).

Dewey's model of learning is quite similar to Lewin's model, although Dewey makes more explicit the developmental nature of learning implied in Lewin's theory (Kolb, 1984). Dewey describes how learning transforms the impulses, feelings and desires of concrete experience into higher order purposeful action.

The formulation of purposes is, then, a rather complex intellectual operation. It involves: (1) observation of

surrounding conditions; (2) knowledge of what has happened in similar situations in the past, a knowledge obtained partly by recollection and partly from the information, advice and warning of those who have had a wider experience; and (3) judgement, which puts together what is observed and what is recalled to see what they signify. The intellectual anticipation, the idea of consequences, must blend with desire and impulse to acquire moving force. It then gives direction to what otherwise is blind, while desire gives ideas impetus and momentum (Dewey, 1938, p. 69).

Dewey's model originally presented concepts similar to the four stages of Kolb's learning cycle. Dewey's conception of impulse, observation, knowledge and judgment, correlates essentially with Kolb's concrete experience, reflective observation, abstract conceptualization and active experimentation. Dewey introduced the learning dialectic process, integrating experience and concepts, observation and action, as dialectical opposites to be chosen between in the learning process. From Dewey's perspective the major dialectic taking place in learning is between the impulse that gives ideas their "moving force" and reason that gives desire its direction. Figure 1B illustrates Dewey's model of experiential learning.

For Dewey, continuity of experience was a critical truth of human existence, which was central to his theory of learning. Dewey wrote,

The principle of continuity of experience means that every experience

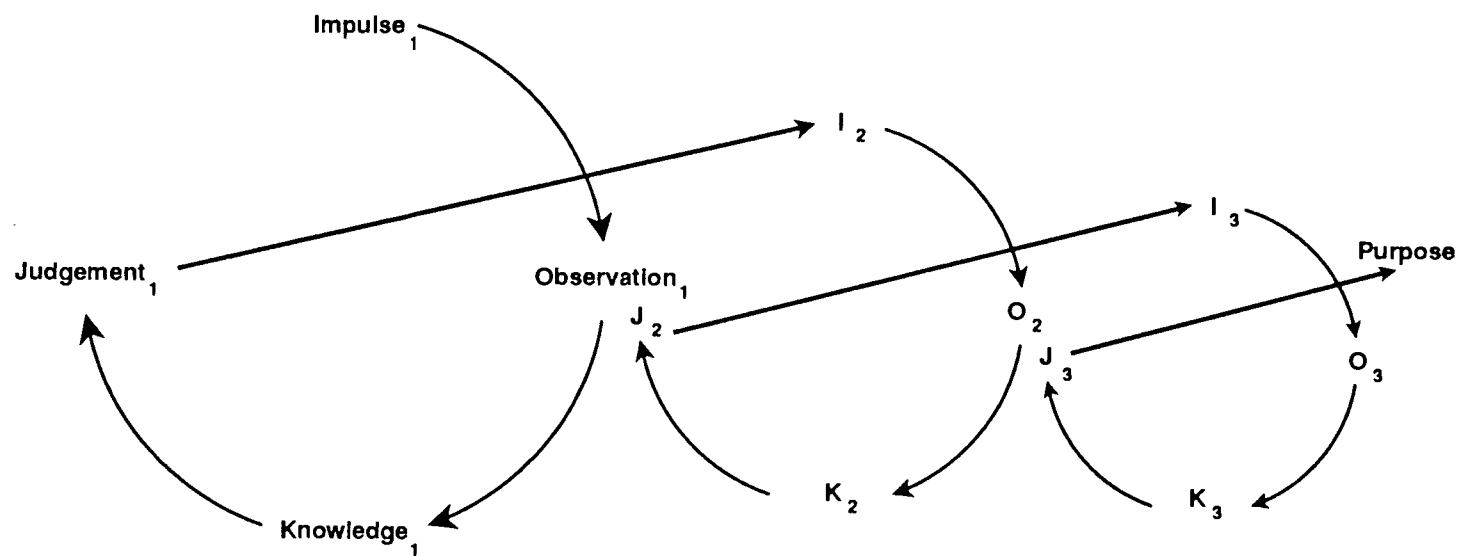


Figure 1B

Dewey's Model of  
Experiential Learning

(D. A. Kolb, 1984)

both takes up something from those which have gone before and modifies in some way the quality of those which come after.... As an individual passes from one situation to another, his world expands or contracts. He does not find himself living in another world but in a different part or aspect of one and the same world. What he has learned in the way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with situations which follow (pp. 35, 44).

Dewey described the transactional relationship between the person and the environment, which is symbolized in the dual meaning of the word experience: (1) both personal and subjective, a person's internal state, and (2) the objective and environmental. These two forms of experience interrelate in very complex ways. Dewey described it this way:

Experience does not simply go on inside the person. It does go on there, for it influences the formation of attitudes of desire and purpose. Every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had.... The environment, in other words is whatever conditions interact with personal needs, desires, purposes, and capacities to create the experience which is had. Even when a person builds a castle in the air he is interacting with the objects which he constructs in fancy (pp. 39,43).

Although Dewey refers to the relationship and difference between the objective and subjective conditions of experience as interaction, his meaning is unclear, in



Kolb's opinion. To Kolb the word transaction is more appropriate than interaction between the person and environment in experiential learning. He explained that transaction has a more fluid connotation. The use of interaction is too mechanical, involving unchanging separate entities. Transaction describes a more interpenetrating relationship between objective conditions and subjective experience. Once they become related, both are essentially changed (Kolb, 1984).

Dewey's model of learning is more phenomenological and descriptive than Piaget's learning model. Yet, Dewey's model is corroborated by Piaget's structural dimensions of cognitive development. Piaget's four dimensions are phenomenalism/constructivism, and egocentricism/reflectivism. The first two concepts of Piaget's dialectic correspond with Dewey's impulse/knowledge dialectic. The second two concepts of Piaget's correspond with Dewey's judgement/observation dialectic of his learning model. Figure 2A shows the correlation between Dewey's and Piaget's models of learning.

The concept of contextualism is a philosophical approach on which Dewey based much of his writings. Contextualism is an "alternative epistemological root metaphor" used to understand human individuality (Kolb, 1984, p. 63). In contextualism the person is examined in the context of the emerging historical event. In this

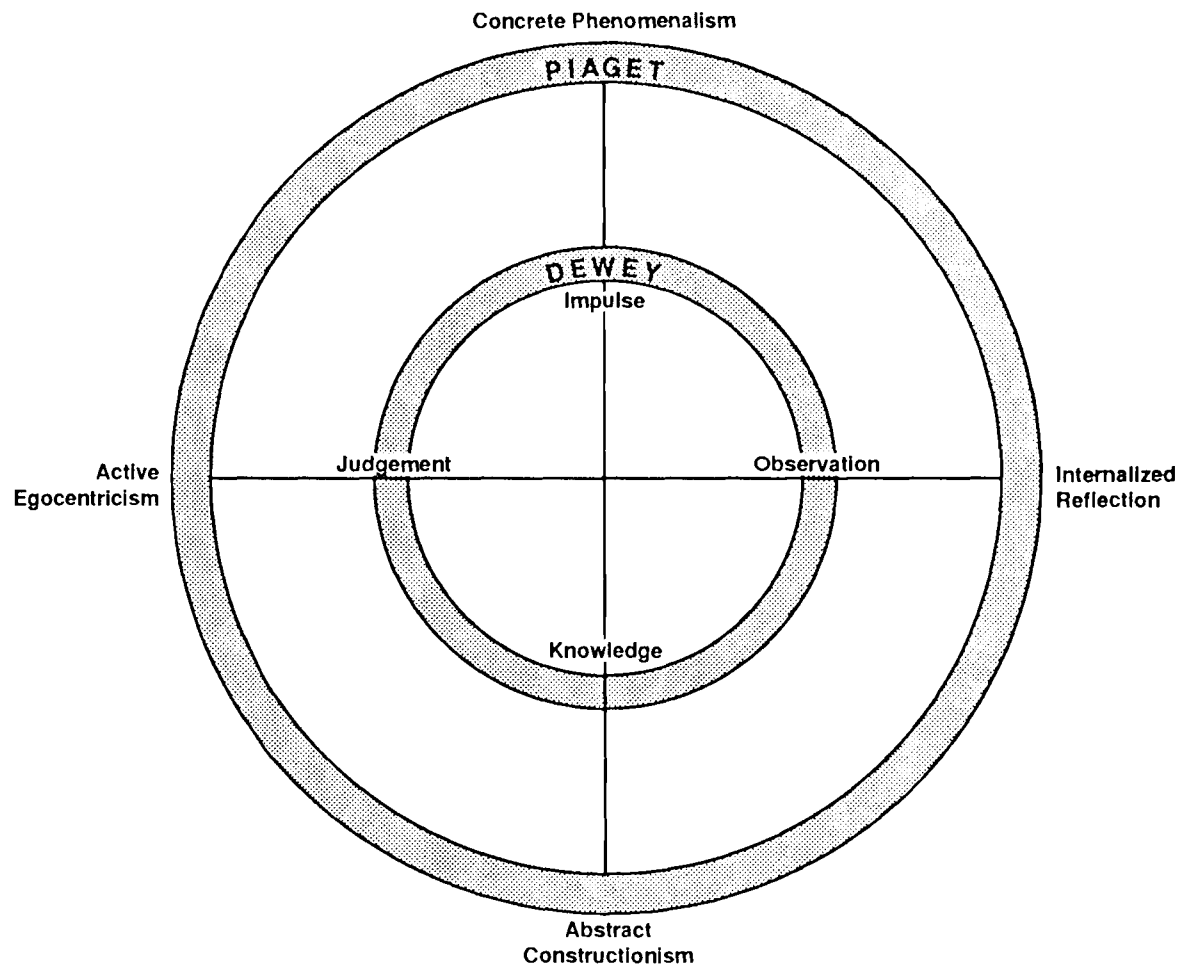


Figure 2A  
Dewey's and Piaget's Models of Learning: A Correlation

(D. A. Kolb, 1984)

process both the person and event are shaped. The reality is constantly being created by the person's experience.

Dewey (1958) wrote,

An individual is no longer just a particular, a part without meaning save in an elusive whole, but is a subject, self, a distinctive centre of desire, thinking and aspiration (p. 216).

Dewey wrote in Experience and Nature that the earlier dogmatic intellectualism of science created an unnatural separation of primary experience from nature. This occurred when nature became indifferent and dead, and humans were alienated from subjective experience. This type of thinking strongly aligns with contextualism.

According to Kolb (1984), the implication of the contextual study of human individuality is that psychological types or styles, are not fixed traits but stable states. Kolb (1984, p. 63) further states, "The enduring patterns of human individuality arise from consistent patterns of transaction between the individual and one's environment", (Kolb, 1984, p. 63). This statement aligns with Dewey's definition of contextualism.

The following discussion places Dewey among four major epistemological views as defined by Pepper. There are four key root metaphors in the epistemological literature, according to Pepper (1942):

Root metaphors are drawn from experiences of common sense and are used by philosophers to interpret the world. Each of the major philosophies has cognitively refined one of these root metaphors into a set of categories that hang together and claim validity by all evidence of every kind (Pepper cited in Kolb, 1984, p. 110).

The first of the world hypotheses in the epistemological literature, as termed by Pepper, is formism, which originated in the classical works of Socrates, Plato, and Aristotle. The second is mechanism, based on the works of Democritus, Lucretius and Galileo. The third is contextualism, a more modern world hypothesis, originating in the works of Dewey, James, Peirce, and Mead. The fourth is organicism, developed primarily from the works of Hegel and Royce. These hypotheses offer a sequence and evolution of the development and change of the major philosophic world views.

According to Kolb, in his discussion on the structure of knowledge, these four world hypotheses parallel the four types of knowledge proposed within his learning style model. The correspondence is as follows: organicism/divergent knowledge, mechanism/assimilative knowledge, formism/convergent knowledge, and contextualism/accommodative knowledge. Figure 2B diagrams the correspondence between Pepper's four world hypotheses and Kolb's structure of learning.

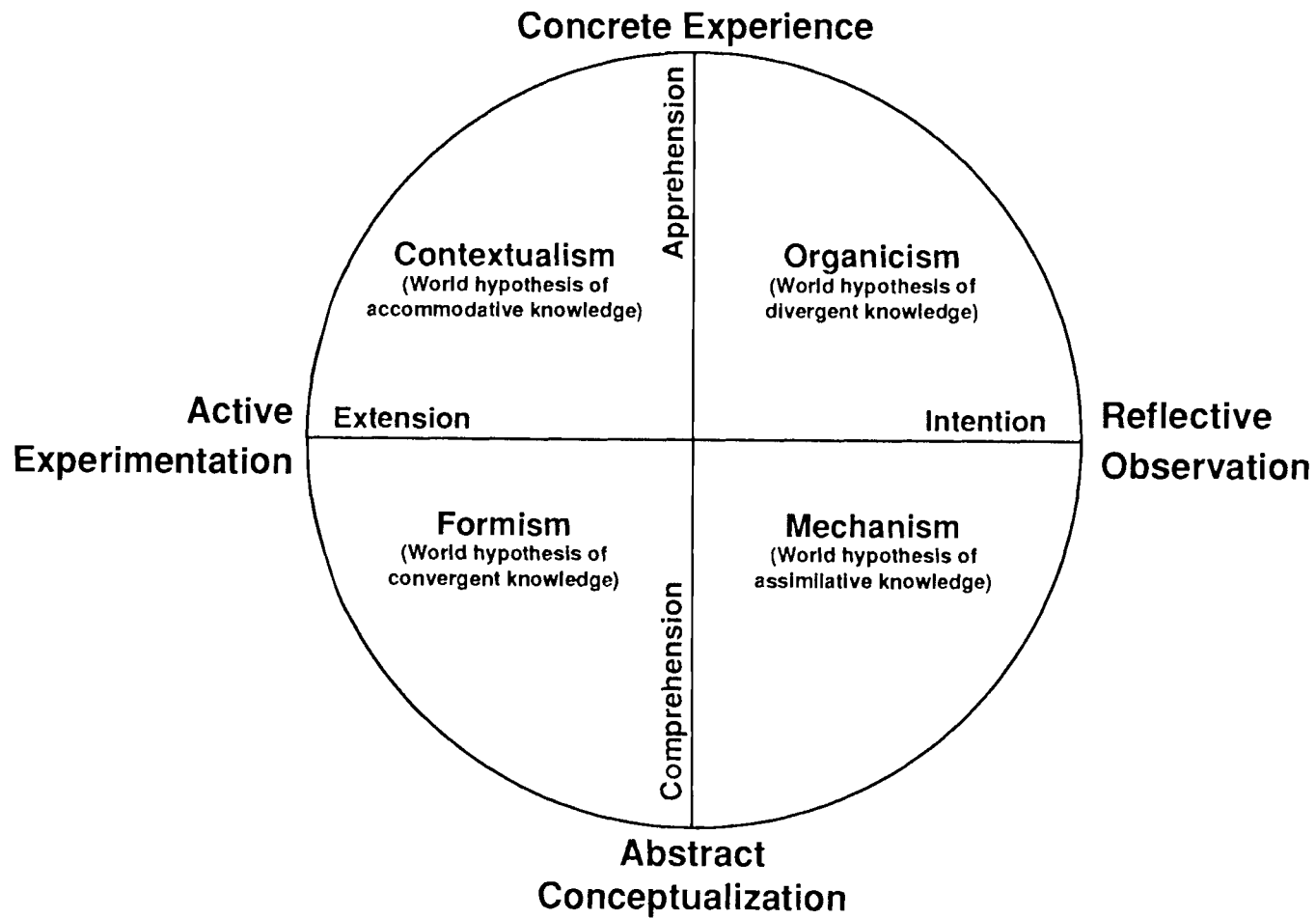


Figure 2B  
Pepper's Theory of World Hypotheses  
and the Structure of Learning

(D. A. Kolb, 1984)

Kolb stated that learning is driven by curiosity about the here-and-now and anticipation of the future.

However, it was Dewey who saw that the experiential learning cycle was not a cycle but a spiral, which filled each episode of experience with the potential for movement, from blind impulse to a life of choice and purpose. Dewey explained this idea as follows:

Each resting in experience is an undergoing in which is absorbed and taken home the consequences of prior doing, and unless the doing is that of utter caprice or sheer routine, each doing carries in itself meaning that has been extracted and conserved (Dewey, 1934, p. 56).

It should be observed that Dewey did not directly refer to a cycle or a spiral in the learning process. These terms are Kolb's interpretations of Dewey's description of learning.

Kolb discussed learning and development in higher education, by quoting Dewey on the topic of belief, expectation and societal influence:

...the ways in which we believe and expect have a tremendous effect on what we believe and expect. We have discovered that these ways are set, almost abjectly so, by social factors, by tradition and the influence of education (Dewey cited in Kolb, 1984, p. 161).

Dewey's discussion on the effects of beliefs and expectations offers an appropriate introduction for Kolb's discussion in his book, Experiential Learning: Experience

as the Source of Learning and Development, on the meaning and relationship of learning style theory to higher education. Kolb discusses the trends and observations of students and learning style research within higher education.

Kolb's views of Dewey's contributions are critical because Dewey was the first theorist to propose concepts which implied a cyclic learning process. From an overall perspective Kolb's cycle aligns with Dewey's concepts. One aspect in which they differ is the variation between Dewey's term, impulse, and Kolb's term, concrete experience. Dewey considered impulse to be a specific self initiated process in which it "provides the dynamic impetus for immediate reconstructive focus in which the fixed, acquired pattern of behavior, the habit, gets re-enacted and adapted to fit the situation" (Alexander, 1987, p. 136). Whereas, Kolb describes concrete experience as a general orientation of an individual who "focuses on being involved in experiences and dealing with immediate human situations in a personal way" (Kolb, 1984, p. 68). Both Dewey's and Kolb's concepts clearly entertain the affective as part of the learning process.

#### Kurt Lewin's Research and Experiential Learning Theory

Another tradition of experiential learning theory, which has had a wider influence is group dynamics research.

This research tradition was initiated by Kurt Lewin, the founder of American social psychology. Lewin's work has also influenced the field of organizational behavior. Lewin's influence has been felt throughout three generations of scholars and practioners in the fields of social psychology and organizational behavior (Kolb, 1984). Lewin's work on group dynamics and the methodology of action research has had the greatest impact, as well as practical significance on experiential learning theory. From his studies came T-groups and the laboratory-training method. The T-group is considered one of the most powerful educational innovations in this century (Kolb, 1984).

The action research method has proven to be a useful approach to planned-change interventions in small groups and large organizations. Today Lewin's methodologies form the basis of most organizational development. The consistent theme in Lewin's work was his concern for the integration of theory and practice.

Lewin's statement, "There is nothing so practical as good theory" symbolizes his commitment to the integration of scientific inquiry and social problem solving (Kolb, 1984, p. 9). This commitment is demonstrated with the historical event that created the "discovery" of the T-group. In 1946 Lewin, Lipitt, Bradford and Benne set out to design a new approach to leadership and group-dynamics training for the Connecticut State Interracial Commission.



The two-week training program began with an experimental approach, focusing on group discussion and decision making, in which staff and participants treated one another as peers. The training staff collected extensive observations and recordings of the group activities. When the daily sessions were over the staff met nightly to report and analyze the data. Soon the participants requested to be included in the interpretation analysis sessions. When these joint sessions occurred with the participants (sharing subjective views) and the staff (contributing objective data) the discovery was made that learning is facilitated in an environment where there is a dialectic tension and conflict between the immediate, concrete experience and analytic detachment (Kolb, 1984). By bringing together the immediate experiences of participants and the conceptual models of the staff in an open atmosphere, where inputs from each perspective could challenge the other, a learning environment occurred with exceptional vitality and creativity.

This series of events started the T-group theory and laboratory method. In the beginnings of this theory and method there existed a struggle between the "here and now" experiential orientation and the "there and then" theoretical orientation. This conflict has continued to plague Lewin's movement. In the early years of the National Training Laboratories conflict was expressed among

staff members as to how conceptual material should be integrated into the "basic encounter" process of the T-group. Later in the 1960s with the influences of the youth culture and Eastern mysticism the movement was split apart into the "West Coast" existential factions and the "East Coast" traditionalists (Argyris, 1970). Overall, the conflict between experience and theory is not unique to the laboratory-training process, and is a primary dynamic of experiential learning itself.

Lewin's laboratory-training movement has had a profound influence on the practice of adult education, training and organization development. The T-groups and laboratory method gave central emphasis to the value of subjective personal experience in learning. This emphasis has stood in sharp contrast to the behaviorist theories of learning and the classical physical science definitions of knowledge acquisition as an impersonal, logical process based on detached, objective observation. The focus on subjective experience has resulted in a strong commitment in the practice of experiential learning to existential values of personal involvement, responsibility, and humanistic values emphasizing that feelings as well as thoughts are facts (Kolb, 1984).

Inquiry in the philosophy of contextualism, which Lewin aligned with, focuses on the quality and texture of the immediate event as experienced. Thus, contextualism is

associated with phenomenology. Lewin (1951) conceived the person's life space as a field of forces in which behavior is determined by an historical causation. In this way, only forces existing in the moment, as memory, determine behavior. The contextualist works from the present event outward in what is called the operational theory of truth. The basic inquiry is how to act or think. Actions are true if they are workable; that is if they lead to a desired end state in experience.

Jerome Bruner initiated experience-based learning in the 1960s, which drew upon Lewin's theory and Piaget's cognitive developmental stages (Kolb, 1984). When experienced-based curricula was introduced in the best learning climate, it had the same stimulating effect on the learning process as Lewin's discovery of the T-group. As Bruner (1987) discussed early childhood development he referred to Piaget as "the most influential theorist of cognitive development" (p. 108). This demonstrated Bruner's continued respect and reference to Piagetian theory. The primary task addressed by experienced-based programs in the elementary and secondary was the translation of the abstract symbolic principles of science and mathematics into modes of representation that could be grasped by students at more concrete stages of cognitive development. Experienced-based learning was about the process of discovering knowledge and not just the content.

The Lewinian model of experiential learning emphasizes two dialectics: the conflict between concrete experience and abstract concepts, and the conflict between observation and action. Figure 3 diagrams Lewin's model of experiential learning.

Lewin recognized the transactional nature of the objective and subjective conditions of experience, although he chose to sidestep this issue in his famous theoretical formulation,  $B=f(P,E)$ , which indicates that behavior is a function of the person and the environment without any reference to the specific mathematical nature of that function (Kolb, 1984). In Lewin's (1951) discussion on social fields and social states he concludes,

On the whole, then, we can say that a quasi-stationary social state corresponds to equally strong opposing forces but that no general statement concerning their absolute strength is possible (p. 204).

This statement eludes to the non-mathematical nature of Lewin's field theory formulations. Lewin's position is similar to that of Bandura (1978). Bandura explained that personal characteristics, environmental influences, and behavior all operate in reciprocal determination, with each factor influencing the other in an interlocking fashion.

The concept of reciprocally determined transactions between person and learning environment is central to the laboratory-training method. Learning in T-groups is

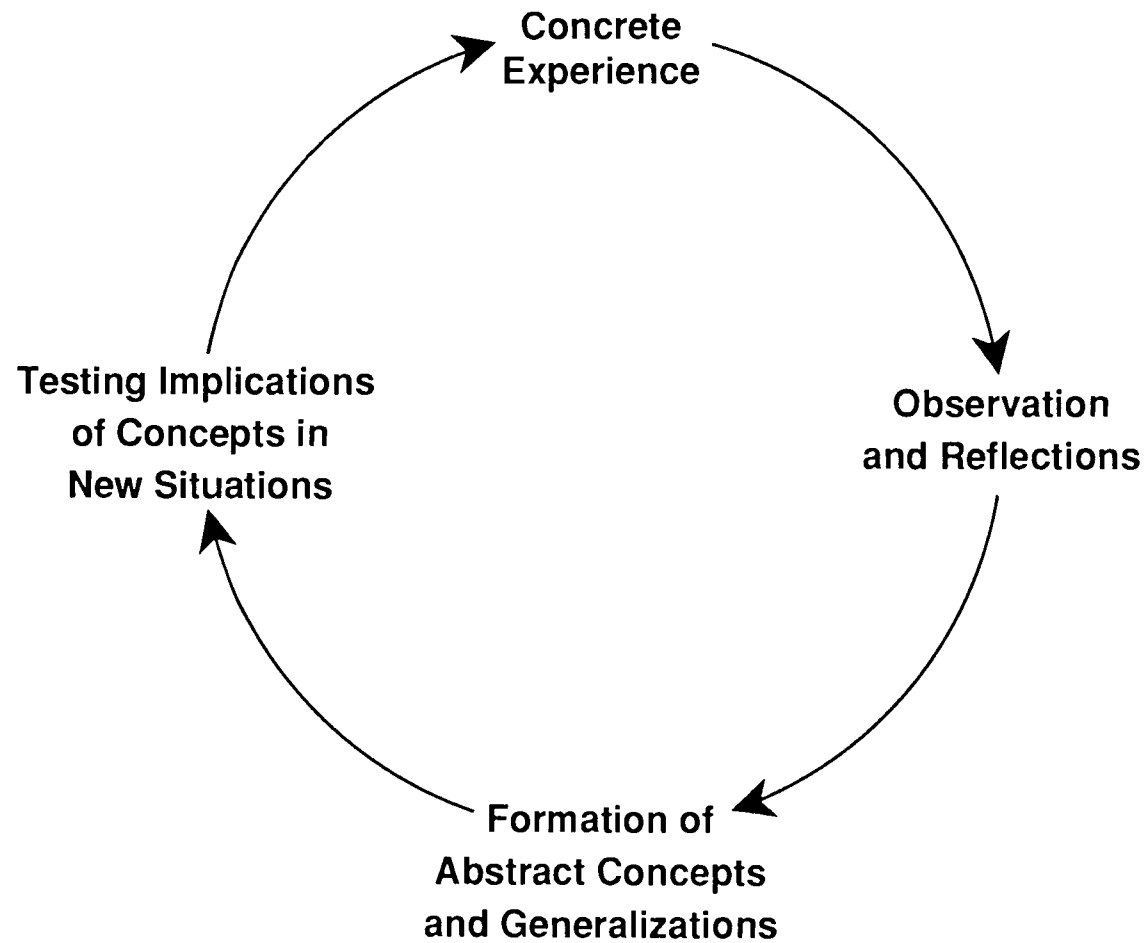


Figure 3  
Lewin's Experiential Learning Model

(D. A. Kolb, 1984)

considered to result not only from responding to a fixed environment, but from active creation by the learners of situations that meet their learning objectives (Kolb, 1984). Bradford (1964) described this learning process:

The essence of this learning experience is a transactional process in which the members negotiate as each attempts to influence or control the stream of events and to satisfy his personal needs. The individuals learn to the extent that they expose their needs, values, and behavior patterns so that perceptions and reactions can be exchanged (p. 192).

Lewin's approach to learning involved a structural analysis of the learning process. In order to do this analysis three concepts must be defined; (1) The holistic structure is defined which is interdependent on the internal components of the learning model without reliance on forces from the outside. (2) The transformation process specifies the way in which structural components transact to maintain and elaborate themselves. (3) The process of self-regulation describes how the structural system maintains its identity and integrity (Kolb, 1984).

In understanding the developmental model of experiential learning theory, and Lewin's relationship to that, it is explained that specialization of learning style characterizes early adulthood. Yet, the pattern changes in midcareer. In the middle years of life, people begin to question their purpose in life and reassess their

direction. Thus, it may be inevitable that specialization precedes integration in adult development (Kolb, 1984). Kolb (1984) explains that "wholeness cannot be fully appreciated save in contrast to the experience of fragmentation, compartmentalization and specialization" (p. 212). Lewin's observation was that "pulsation from differentiation to integration is the throb of the great engine of development is writ large as a universal social pattern of socialization" (cited in Kolb, 1984, p. 212).

A second characteristic of the integrated lifestyle is observed in the life structures of integrated people. The life structure of integrated persons are reflected in the integrative complexity of their personalities. Lewin (1951) first noted the isomorphism between the person's development level and the level of complexity of his/her lifespace. When examining the life structures of those who score high on the Adaptive Style Inventory, a measure of adaptive flexibility, one sees complex, flexible, and highly differentiated life structures, "these people experience their lives in ways that bring variety and richness to them and the environment" (Kolb, 1984, p. 223).

### Jean Piaget and Cognitive Development Theory

The third tradition of experiential learning theory represents a challenge from within the rationalist perspective, based on the works of Jean Piaget who

researched the nature of intelligence and how it develops. Piaget's theory on child development is on a level with Freud's developmental theory (Kolb, 1984). The key difference between the two was that Freud emphasized the socioemotional processes of development, and Piaget focused on the cognitive developmental process.

Piaget found the key to understanding the nature of human knowledge in his studies of the development of the cognitive processes of children. This characterizes his work as an epistemological philosopher as well as a psychologist (Kolb, 1984). It was in Piaget's psychological studies that he came across the concept that made him internationally famous. He began to work as a student of Alfred Binet, the creator of the first intelligence test. In his work to standardize test items for use in I.Q. and aptitude tests Piaget's interests began to diverge sharply from the traditional testing approach. He became much less interested in whether the answers, by children, to test problems were correct or not. He focused on the process of the reasoning that children used to arrive at their answers. He began to discover age-related similarities in their reasoning processes. He found that children at certain ages not only gave wrong answers on I.Q. and aptitude tests, but they showed qualitatively different ways of arriving at them. Thus, younger children were not dumber than older children; they actually thought



about things in an entirely different way. In the fifty years that followed his initial discovery, Piaget and his co-workers studied these ideas in thousands of ways.

In brief, Piaget's theory of cognitive development describes how intelligence is shaped by experience. To Piaget, intelligence was not an innate or internal characteristic of the individual, but a product of the interaction between the person and his/her environment (Kolb, 1984). For Piaget action was the key. In thorough descriptive studies of children (infants to adolescents) Piaget showed that abstract reasoning and the ability to manipulate symbols result from the infant's actions in exploring and coping with the immediate concrete environment; the growing child's approach to knowing changes qualitatively in successively identifiable stages.

The initial stage of development is enactive, in which knowledge is represented in concrete actions and is not separable from the experiences that stimulate it. The second stage is the ikonic, where knowledge is represented by images that have an increasingly autonomous status from the experiences they represent. The last two stages are concrete and formal operations, where knowledge is represented in symbolic terms. Symbols are capable of being manipulated internally with complete independence from the experiential reality (Kolb, 1984).

In spite of the great interest in his work in the late 1920s, Piaget's research was not recognized in the United States until the 1960s (Kolb, 1984). Piaget's work was rooted in the French rationalist tradition, which was one reason why it was not easily accepted by American psychologists, who were of the empirical tradition. Piaget's clinical methods did not seem to meet the rigorous experimental standards that characterized the behavioral research programs that dominated American psychology between 1920 and 1960. To Americans, Piaget's emphasis was more descriptive than practical. To Piaget, the pragmatic orientation of American researchers and educators, who sought to speed up the development of the cognitive stages he had defined, was disdainful.

The eventual recognition of Piaget in America was due to the parallel works of a prominent cognitive psychologist, Jerome Bruner (Kolb, 1984). Bruner found that knowledge of cognitive developmental stages made it possible to design curricula in any field in such a way that the subject could be taught respectably to learners at any age or stage of cognitive development.

Bruner focused the curriculum efforts on the science and mathematics subject areas for elementary and secondary students. However, other subjects such as social science, and other educational levels such as college freshman and sophomores, were addressed by Bruner's experienced-based

curricula. The major task of these curricula involved the translation of the abstract principles into modes of representation that could be understood by people at more concrete stages of cognitive development. Many of Bruner's learning tasks were modifications of Piaget's original experiments.

When experienced-based curricula was introduced, children and adolescents were freed from the rigid pace of memorizing presentations of science and mathematical principles. In contrast, the traditional approach can make learning advanced principles more difficult. With Bruner's approach, learning becomes individualized, concrete and self-directed. The process enables children to learn about the process of discovering knowledge, not just the content.

In many areas, the experienced-based learning program has been well received. However when introduced, it also provoked strong criticism, particularly from the teachers who had complex learning environments, and in turn whose students did not learn the principles. The early debates on the effectiveness of Bruner's learning approach were quite reminiscent of the controversies surrounding Dewey's progressive education movement, and the experience/theory conflicts related to Lewin's T-group process (Kolb, 1984).

The cognitive development tradition has had a less direct, but equally influential, effect on adult learning. Although Piaget's cognitive developmental stages terminate

in adolescence, the idea that there are defined patterns in the developmental process has been extended into adulthood by researchers. In method and concept the theories of adult development owe a great deal to Piaget's scheme. One of the first theories of adult development was proposed by Lawrence Kohlberg, who extended Piaget's early work on moral development. Kohlberg began his work on school children, but found only the early stages of moral judgment were actually achieved in childhood. He found that for many adults the challenges of the later stages still were to be developed.

In Forms of Intellectual Ethical Development in the College Years (1970), William Perry reported similar patterns in the way Harvard students' systems of knowledge evolved through the college years. The students tended to move from the absolutist, authority-centered, right-wrong views of knowledge in the early college years, to stages of extreme relativism in the later college years. The higher stages were toward personal commitment within relativism. Perry also found that the higher stages of development were not achieved by all students during college, but for many developmental challenges extended into the later adult years.

Another developmentalist theory based on Piaget was Jane Loevinger's theory of ego development. Loevinger sought to integrate theories of Kohlberg, Perry and other

developmental theorists (Harvey, Hunt and Schroder, 1961) with the socioemotional developmental theories of Erikson and others. She identified six ego development stages: impulsive, self-protective, conformist, conscientious, autonomous, and integrated. Her theory clearly identified learning and development as a life long process.

Numerous effects may result with these new theories of adult development, and the recognition that learning and development are life long processes. One effect is that social institutions realize their responsibility to conduct programs and policies in order that adults have experiences that facilitate their personal learning and development.

#### Piaget's Model of Learning

Experiential learning theory offers a view of learning that substantially differs from that of behavioral theories or learning, which are based on empirical epistemology, or the theories that underlie traditional educational methods (Kolb, 1984). These traditional methods primarily are based on a rational, idealist epistemology. Kolb's view of learning is called "experiential" for two reasons. The first is that it is based on the intellectual origins of Dewey, Lewin, and Piaget. The second reason is that it emphasizes the central role of experience in the learning process. This clearly differentiates experiential learning from the rationalist and cognitive theories of learning

that tend to place a major emphasis on acquisition, manipulation, and recall of abstract symbols.

A third differentiating concept is that experiential learning theory differs from behavioral learning theories, initiated by Watson, Hull, Skinner, and others, as they deny any role of consciousness and subjective experience in the learning process (Kolb, 1984). A fourth concept is that experiential learning does not propose a third alternative to behavioral and cognitive learning theories, but it suggests a learning theory as a framework that is an holistic, integrative approach to learning that encompasses experience, perception, cognition and behavior.

Piaget's theory of learning and cognitive development encompasses the above four aspects of experiential learning. Piaget's theory, according to Kolb, involves the dimensions of experience, concept, reflection and action, which form the basic continua for the development of adult thought (Kolb, 1984).

Piaget (1970) explained that development from infancy to adulthood moves from the concrete phenomenal view of the world to an abstract constructionist view, and from an active egocentric view to a reflective internal mode of knowing. The learning process in which this development occurs is a cycle of interaction between the individual and the environment. In this way Piaget's learning process is parallel to the models of Dewey and Lewin. In Piaget's

explanation, the key to learning lies in the interaction of the process of accommodation of concepts and schemes to experience in the world, and the process of assimilation of events and experiences from the world into existing concepts and schemes (Kolb, 1984). In Piaget's terms, learning or intelligent adaption results from a balanced tension between these two processes. However, it should be noted that these concepts of accommodation and assimilation have no specific reference to the conceptualizations Dewey and Lewin discussed in their learning models.

Another key proposal by Piaget involved the domination of one process over the other, and what resulted. If accommodation processes dominate assimilation, then imitation results; the molding of oneself to environmental factors or constraints. When assimilation predominates over accommodation, then play results; the imposition of one's concepts and images without regard for environmental realities (Kolb, 1984).

In summary, according to Kolb's interpretation of Piaget, the process of cognitive growth from concrete to abstract and from active to reflective is based on the continual transaction between assimilation and accommodation, occurring in successive stages, each of which incorporates what has gone before into a new, higher level of cognitive functioning (Kolb, 1984).

### Piaget's Theory of Cognitive Development

Piaget's work defined four primary stages of cognitive growth that evolve from birth to approximately the ages of 14 to 15. Kolb (1984) elaborated that within the first stage, 0 to 2 years, the child predominately demonstrates a concrete and active learning style. This is termed the sensory-motor stage. Learning is basically enactive through the feeling, touching and handling modes. Representation of ideas is based on action. Perhaps, the major accomplishment of this period is the development of goal-oriented behavior. According to Flavell the sensory-motor period shows a major developmental change from non-intentional habits to experimental and exploratory activity which is apparently intentional or goal-oriented (Flavell, 1963). Yet, it is clear that the child has few schemes into which s/he can assimilate events, and in turn, her/his primary approach to the world is accommodative as interpreted by Kolb. The environment plays a major role in shaping her/his ideas and intentions. In this way, learning occurs predominantly through the association between stimulus and response. The learning at this stages is termed enactive.

The second stage, 2 to 6 years, the child characteristically maintains her/his concrete orientation. The child begins to internalize actions, converting them



into images (Kolb, 1984). This is the beginning of the representational stage. Learning is predominantly ikonic in nature, through the manipulation of images and observations. As a result, the child is focused to a much lesser degree in the immediate experience, and is free to play with and manipulate her/his images of the world. According to Kolb's interpretation of Piaget, the child's primary stance toward the world is divergent. S/he is captivated with her/his new ability to collect images and to view the world from different perspectives. Bruner describes the stage as follows:

By age three the child has become a paragon of sensory distractibility... visual memory at this stage seems to be highly concrete and specific. What is intriguing about this period is that the child is a creature of the moment; the image of the moment is sufficient and it is controlled by a single feature of the situation (Bruner, 1966, p. 13).

In the third stage, ages 7 to 11 years, the extensive development of abstract conceptual powers begins (Kolb, 1984). This initial abstract developmental stage is called the stage of concrete operations by Piaget. Learning at this stage is governed by the logic of classifications and relationships.

The child further increases her/his independence from the immediate sensory world through the development of inductive learning. Flavell describes it as follows:

The structures of concrete operations are, to use a homely analogy, rather like parking lots whose individual parking spaces are now occupied and now empty; the spaces themselves endure, however, and leave their owner to look beyond the cars actually present toward potential, future occupants of the vacant and to-be-vacant spaces (Flavell, 1963, p. 203).

According to Kolb, the child in the sensory-motor stage, whose learning style predominantly demonstrates accommodative processes, stands in contrast to the child at the concrete operations stage, whose learning style is more assimilative. This child relies on concepts and theories to select and give substance to her/his experiences (Kolb, 1984).

The final stage of Piaget's cognitive developmental theory, occurs with the onset of adolescence, ages 12 to 15 years. The adolescent moves from concrete operations to the symbolic processes of representational logic, the stage of formal operations. The adolescent returns to a more active orientation, but it is an active orientation that is now modified by the development of the reflective and abstract processes that preceded it. These symbolic processes now enable the learner to engage in hypothetico-deductive reasoning, as termed by Kolb. In this reasoning s/he develops the possible implications of her/his theories and proceeds to experimentally test which of these are true. In this way, according to Kolb, her/his

basic learning style is convergent, in contrast to the divergent orientation of the child in the representational stage. Flavell describes the learner at this formal operations stage:

We see, then, that formal thought is for Piaget not so much this or that specific behavior as it is a generalized orientation, sometimes explicit and sometimes implicit, towards problem solving; an orientation toward organizing data (combinational analysis), toward isolation and control of variables, towards the hypothetical, and toward logical justification and proof (Flavell, 1963, p. 211).

Figure 4 pictures Piaget's model of learning and cognitive development.

#### Learning as a Continuous Process

With a great deal of reference to Piaget, Kolb emphasized that experiential learning assumes learning to be a continuous process grounded in experience. He stated that an educator is not only to implant new concepts, but is also called to let go of old thinking and/or modify old concepts. If the educational process begins to stimulate the learner's beliefs and theories, testing them and then integrating the new ideas into the person's belief system, the learning process is facilitated.

Piaget identified two mechanism by which new ideas are adopted by an individual: integration and substitution (Elkind, 1970). Generally, the ideas that develop through

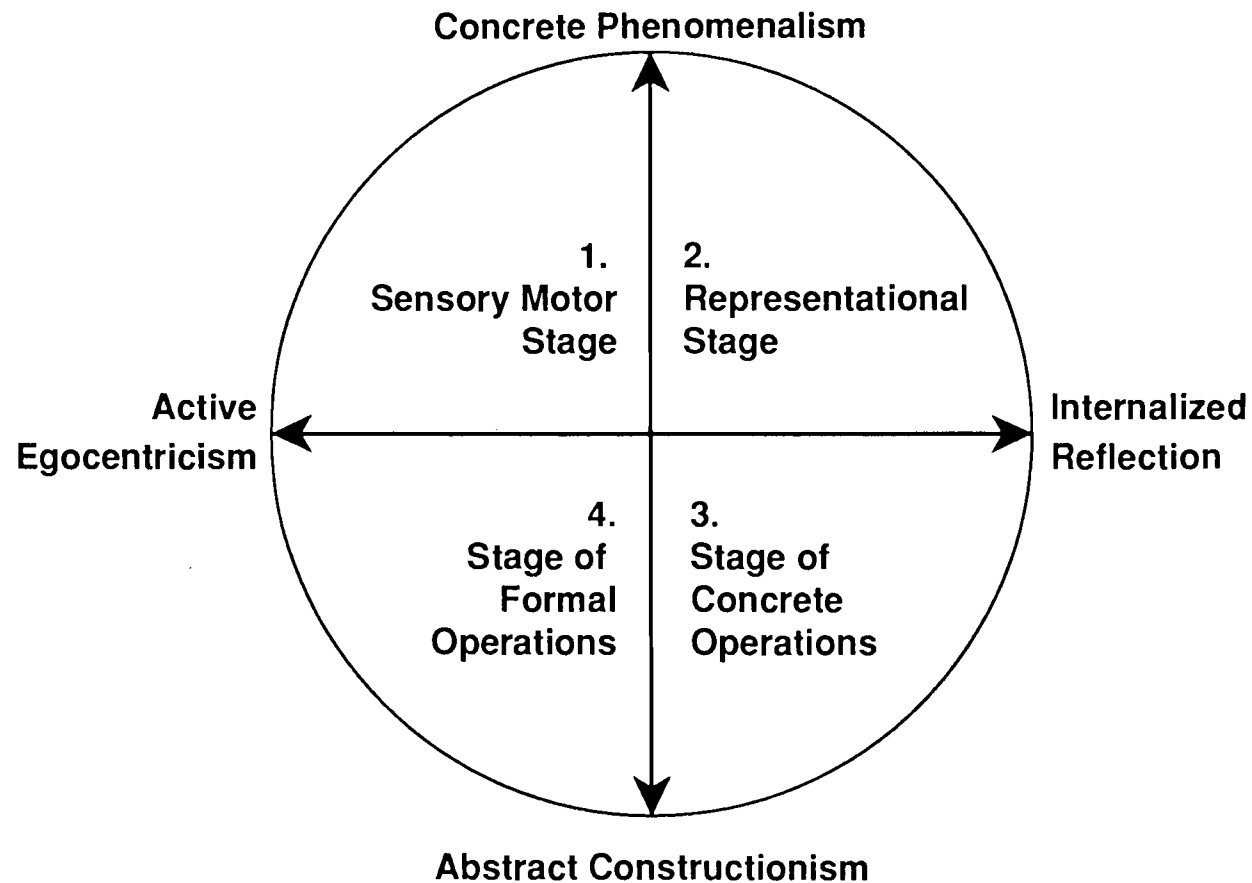


Figure 4  
Piaget's Model of  
Learning & Cognitive Development

(D. A. Kolb, 1984)

integration tend to become a highly stable part of the person's view of the world. Conversely, when the content of a concept changes by means of substitution there is always the possibility of a reversion to the earlier understanding of the concept, or to a dual theory of the world. This takes place when the theory learned via substitution is incongruent with theories that are integrated with the person's total conceptual view of the world (Kolb, 1984).

Another key discussion of Piaget concerns experiential learning theory's opposition to the behavioral outcome methodology characterized by the idealist approaches to traditional education, and the behavioral theories created by Watson, Hull, Skinner, and others (Kolb, 1984). Kolb explains that in experiential learning theory, ideas are not fixed elements of thought, as is characterized by behavioral theories, but are formed and re-formed through experience. In Dewey's, Lewin's and Piaget's learning models, learning is described as a process in which concepts are derived from and continuously modified by experience. Piaget (1970) stated that the creation of new knowledge is the central problem of genetic epistemology, since each act of understanding is the result of a process of continuous construction and recreation through the interaction of assimilation and accommodation processes. Thus, learning is an emergent process whose outcomes

represent only historical record, not knowledge of the future.

### Learning Through the Resolution of Dialectical Opposites - an Adaption Process

Another major learning topic Kolb discussed is the learning process which requires the resolution of conflicts between dialectically opposed modes. This results in adaption to the world. Kolb explained that the way in which conflicts are resolved among dialectically opposed modes (i.e., concrete experience versus abstract conceptualization, active experimentation versus reflective observation), determines the level of learning that results. Kolb (1984) stated, "if conflicts are resolved by suppression of one mode and/or dominance by another, learning tends to be focused around the dominant mode and limited in areas controlled by the dominated mode" (p. 31). This is evident in Piaget's learning model, which explains that imitation is the result when accommodation processes dominate, and play results when assimilation dominates. Another example is described by Paulo Friere, who stated that dominance of the active mode results in "activism", and dominance of the reflective mode results in "verbalism" (Kolb, 1984).

Overall, the cyclic process of experiential learning model is reflected in many of the specialized models of the

adaptive process. Dewey, Lewin and Piaget all demonstrate a common theme in their models; that all forms of human adaption approximate scientific inquiry. All three models observe the scientific method as the highest philosophical and technical refinement of the fundamental processes of human adaptation (Kolb, 1984). Resolution of dialectical opposites is a part of the adaptation process. Kolb's experiential learning model is presented in Figure 5.

#### Process and Structure in Experiential Learning as Related to Piaget

Dewey's learning model is enriched and supported by Piaget's structural dimensions of cognitive development. The same is true of Lewin's model, as discussed in the chapter summary. Piaget's dimensions are dialectically opposed concepts: phenomenism/ constructivism, and egocentricism/reflectivism. Kolb's model of experiential learning deviates from Piaget's developmental model. Piaget proposed that the two sets of dialectical opposites represent a developmental continuum, in which phenomenism and egocentricism are lower forms of knowing than are constructivism and reflectivism. Kolb proposed that the poles of these two dimensions are equipotent modes of knowing; that through ongoing dialectical transformations learning results. Kolb stated,

This learning proceeds along a third, developmental dimension that represents

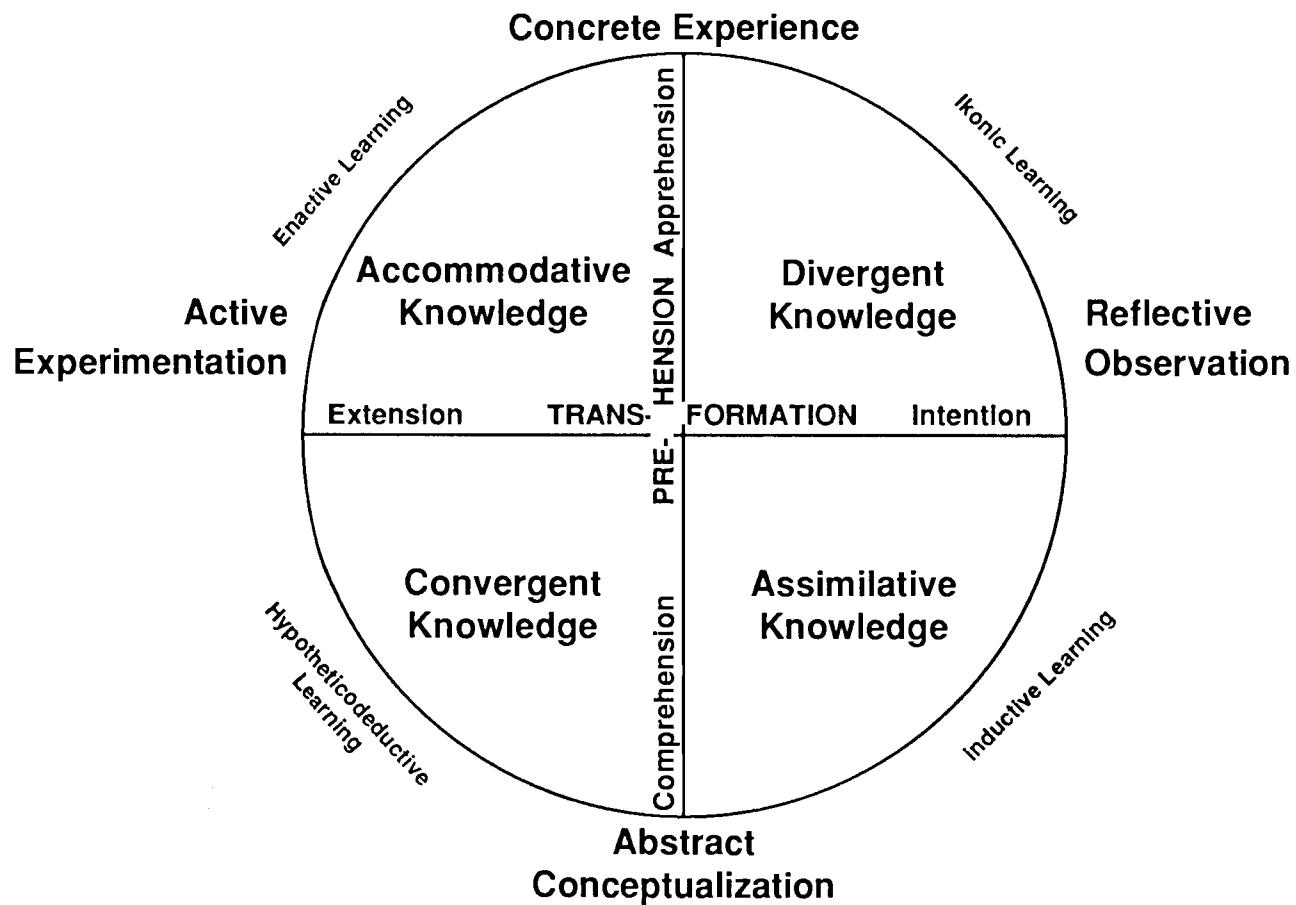


Figure 5  
Kolb's Structural Dimensions  
of Knowledge

(D. A. Kolb, 1984)



not the dominance of one learning mode over another but the integration of the four adaptive modes (p. 40).

Kolb introduced an integrative developmental scheme, as opposed to Piaget's more linear developmental model. Kolb proposed that during the stage of formal operations an individual returns at a higher developmental level to the active orientation that is characteristic of enactive learning, at stage one of Piaget's model. It is also important to keep in mind that Kolb's model is centered around an adult model of learning, whereas Piaget's model focuses on the developmental stages of children and adolescents. The two models do however, complement each other. One additional aspect to consider, which was not addressed by Kolb (1984), was that Piaget did recognize that people, at older stages, can return to cognitive functioning characteristic of the earlier stages in order to adapt.

The process of experiential learning is described as a four-stage cycle involving four adaptive learning modes: concrete experience, reflective observation, abstract conceptualization, and active experimentation. In Kolb's model concrete experience/abstract conceptualization, and active experimentation/reflective observation are the two sets of dialectically opposed concepts, or adaptive orientations. Kolb explained that the structural bases of the learning process lie in the transactions among these

four adaptive modes and the manner in which the adaptive dialectics get resolved. He initially described how

the abstract/concrete dialectic is one of prehension, representing two different and opposed processes of grasping or taking hold of experience in the world -- either through reliance on conceptual interpretation and symbolic representation, a process I will call comprehension, or through reliance on the tangible, felt qualities of immediate experience, what I will call apprehension. The active/reflective dialectic, on the other hand, is one of transformation, representing two opposed ways of transforming that grasp or 'figurative representation' of experience -- either through internal reflection, a process I will call intention, or active external manipulation of the external world, here called extension" (Kolb, 1984, p. 41).

Kolb's structures within his learning model clearly parallel Piaget's developmental learning concepts. Kolb stated that two dimensions of learning, prehension and transformation, correspond directly to Piaget's figurative and operative concepts of thinking. Although, it should be observed that Kolb has correlated Piaget's thinking concepts, (figurative and operative), to his structures of learning, (prehension and transformation). Within the literature of cognitive psychology, thinking and learning are defined as two different conceptualizations. Generally, thinking is identified as a subset of learning (Russell, 1956). Piaget (1970) described figurative and operative thinking as follows:

I shall begin by making a distinction between two aspects of thinking that are different, although complementary...the figurative aspect is an imitation of states taken as momentary and static. In the cognitive area the figurative functions are, above all, perception, imitation, and mental imagery, which is in fact interiorized imitation. The operative aspect of thought deals not with states but with transformations from one state to another. For instance, it includes actions themselves, which transform objects or states, and it also includes the intellectual operations, which are essentially systems of transformation (p. 14).

The figurative aspects of perception and imitation correspond approximately to Kolb's apprehension process, and mental imagery corresponds to Kolb's comprehension process. In relation to the operative concepts, there is an approximate correspondence between action and Kolb's process of extension, and between Piaget's intellectual operations and the intention process.

Kolb (1984) stated

that learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it (p. 41).

Figure 6 identifies the structural concepts of Kolb's model and how they parallel Piaget's learning model.

In order to understand learning, as understood by Kolb, one must understand the nature and forms of human

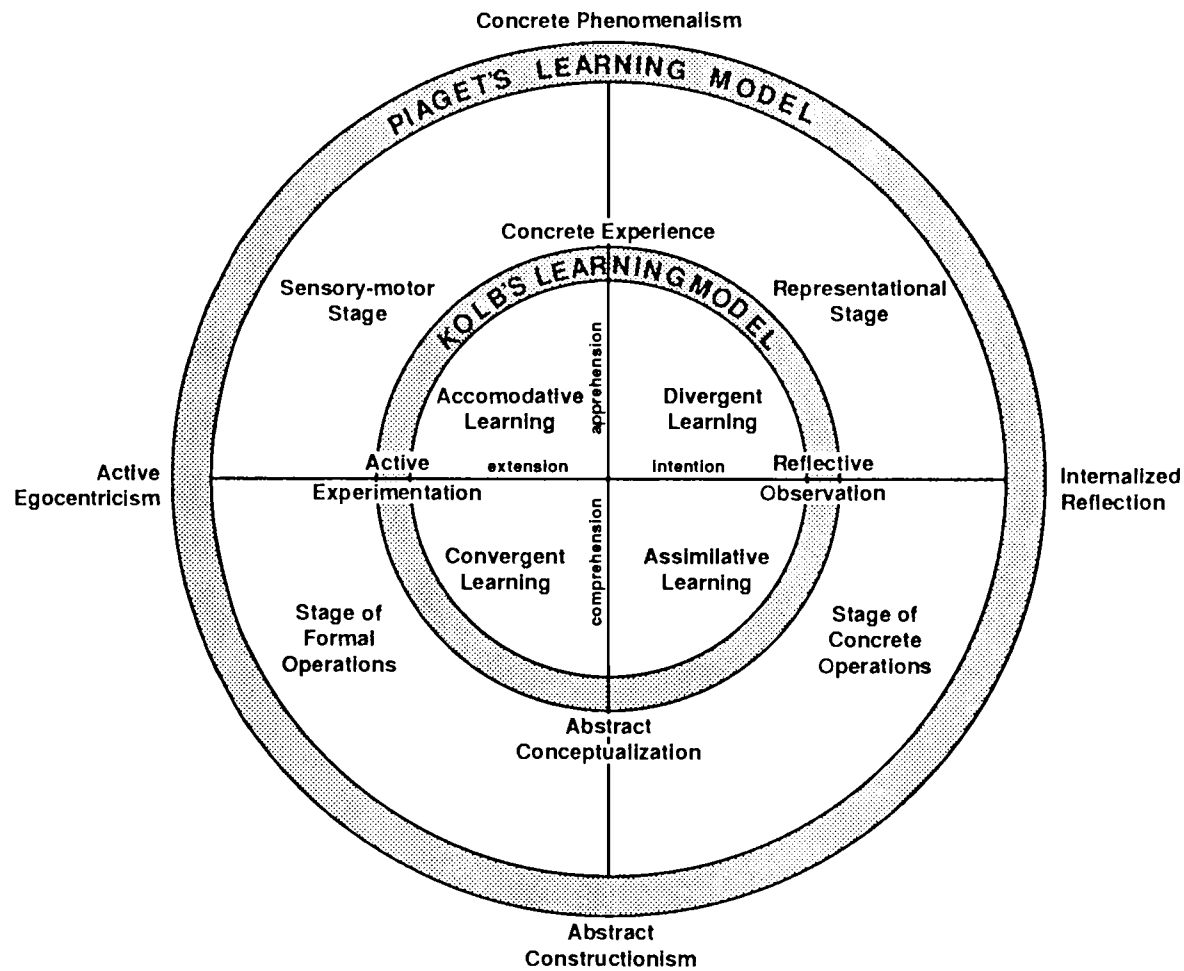


Figure 6  
 Piaget's Learning Model  
 and Its Parallels to Kolb's Learning Model  
 (D. A. Kolb, 1984)

knowledge, and the processes in which knowledge is created. Kolb related that knowledge results from the transaction between the objective and subjective experiences in the process called learning. Learning is also experientially defined by Woolfolk as "A process that occurs when experience causes a relatively permanent change in an individual's knowledge or behavior" (1990, p. 580). Thus, to understand knowledge, one must understand the psychology of the learning process. In turn, to understand learning, one must understand epistemology. This approach to learning is extensively described by Piaget (1978) in a discussion of psychology and epistemology:

...it is impossible to dissociate psychology from epistemology...how is knowledge acquired, how does it increase, and how does it become organized or recognized?... The answers we find, and from which can only choose by more or less refining them, are necessarily of the following three types: Either knowledge comes exclusively from the object, or it is constructed by the subject alone, or it results from multiple interactions between the subject and the object - but what interactions and in what form? Indeed, we see at once that these are epistemological solutions stemming from empiricism, apriorism, or diverse interactionism (p. 651).

Kolb explained that the above learning process occurs through the active extension and grounding of ideas and experiences in the external world and through internal reflection about the attributes of these experiences and

ideas (1984). The concepts of extension and intention are the basic transformation processes in learning and are generally consistent with Piaget's emphasis on the operative thought concepts, of behavioral actions (extension) that transform objects or states, and intellectual operations (intention) that are internalized actions or systems of transformation. According to Kolb, Piaget seemed to associate extensional transformation (individual actions) primarily with concrete apprehensions of the world. In contrast, intentional transformations (reflective abstractions) are reserved for logical and mathematical knowledge (Kolb, 1984). This may be related to Piaget's emphasis on child development.

From Kolb's perspective of Piaget one may observe that as children mature, reflection and abstraction quite clearly replace overt action and concrete apprehension. Piaget also viewed the transformation process of reflective abstraction as superior to the overt action of transformation. Kolb (1984) argued "that although the figurative and operative aspects develop together in childhood, in the mature adult the two dimensions are independent, producing four equipotent combinations of prehension and transformation" (p. 52). The researcher recognized that Kolb initially refers to Piaget's concepts (figurative and operative thinking), followed by his two equivalent terms (prehension and transformation), which may

have a different emphasis as they refer to learning instead of thinking.

Kolb further explained that Piaget tended to emphasize the transformational process of learning, whereas Kolb believes that both the transformation and prehension processes have equal status. Kolb's differing view of the structure of learning may only be accepted by those who accept the premise that in adulthood we have access to four types of knowledge, and in turn four learning styles.

Kolb concluded that the transformation dimension is perhaps best described by Carl Jung's concepts of introversion (intention) and extraversion (extension). In Jung's original conception of extraversion and introversion he emphasized epistemological aspects. He saw in the definition of the two concepts the psychological foundation drawn from the philosophical debate between nominalism, the view that universals and ideas exist in name only, and realism, the philosophy that universals have a real objective existence. Jung actually saw that the truth was neither in the nominalist or realist positions, but in the integration of the introverted and extraverted attitudes.

Kolb stated that Jung was the first to see extraversion associated with the feeling orientation, and introversion with the thinking orientation (Bash, 1955). In a similar way, Piaget saw the figurative dimension of phenomenalism/ constructivism and the operative dimension

of egocentrism/ reflection as related throughout the developmental process. However, Piaget does emphasize the differences between the figurative and operative dimensions of thought in his structural analysis of cognitive development. Kolb said that apprehension and comprehension are prehension processes, and intention and extension are transformation processes, and all are equipotent contributions to the learning process. This is in disagreement with Piaget's proposal that comprehension and intention are superior processes.

In Kolb's (1984) discussion on the evidence for the structures of learning, he presents a longitudinal study. The study involved changes in learning style during college, and examined the relationship between the Learning Style Inventory (LSI), and commonly used instruments designed to measure cognitive development according to Piaget, Kohlberg, Loevinger, and Perry. The analysis of the interrelationships of college student performance on these measures resulted in correlations between the concrete/abstract dimension and the cognitive development measures. The reflective/active dimension of the LSI did not result in correlations. Thus, for these college students, dimensions of learning and development designed to measure cognitive growth do not reflect movement on the reflective/active dimension. This dimension also does not correlate with age at entrance to college, which supports



the idea that the two LSI dimensions are independent of each other (Mentkowski & Strait, 1983).

In Kolb's (1984) discussion on characteristics of his learning styles, as determined by the LSI, he presented evidence for the existence of the four consistent and unique learning styles in the learning style literature. He referred to Kagan and Witkin who found, in support of Piaget's original concept, that there is a general tendency to become more analytic and reflective with age. The individual rankings within the population tested remain highly stable from the early years to adulthood (Kolb, 1984).

#### The Structure of Knowledge

In Kolb's (1984) extensive discussion on the structure of knowledge, he stated:

Individual learning styles are shaped by the structure of social knowledge and through individual creative acts; knowledge is formed by individuals. To understand learning fully, we must understand the nature and forms of human knowledge and the processes whereby this knowledge is created and recreated (p. 99).

Kolb centered the discussion on the structure of knowledge on Piaget's concepts as found in Piaget's book Genetic Epistemology (1970) where he described three approaches to learning and knowledge creation and their relation to learning from experience. Kolb quoted Piaget:

These few examples may clarify why I consider the main problem of genetic epistemology to be the explanation of the construction of novelties in the development of knowledge. From the empiricist point of view, a 'discovery' is new for the person who makes it, but what is discovered was already in existence in external reality and there is therefore no construction of new realities. The nativist or apriorist maintains that the forms of knowledge are predetermined inside the subject and thus again, strictly speaking, there can be no novelty. By contrast, for genetic epistemologist, knowledge results from continuous construction, since in each act of understanding, some degree of invention is involved; in development, the passage from one stage to the next is always characterized by the formation of new structures which did not exist before, either in the external world or in the subject's mind (Piaget, 1970b, p. 77).

The major epistemologies are the apriorist (rationalist), empiricist, and genetic-epistemologist (interactionist). Kolb suggested that Piaget's interactionism is clearly rationalist in spirit. He supported this with Piaget's explanation of how mathematical formulations have consistently anticipated empirical findings.

This harmony between mathematics and physical reality cannot in positivist fashion be written off as simply the correspondence of a language with the object it designates.... Rather it is a correspondence of human operations with those operators, a harmony, then, between this particular operator -- the human being as body and mind -- and the innumerable operators in nature -- physical objects at their several levels. Here we have remarkable proof

of that preestablished harmony among windowless monads of which Liebnitz dreamt...the most beautiful example of biological adaption that we know of (Piaget, 1970b, pp. 40-41).

Kolb suggested that for both Piaget and Descartes (a rationalist) the mind is directly connected with the structure of reality. The rationalist orientation is reflected in the predominant position of Piaget's theory in reference to action and how knowledge is created. The organization and transformation of sensations through action, most specifically the internalized actions or thoughts, actually create knowledge. For Piaget, knowledge is the progressive internalization of the action transformations through which we construct reality. According to Kolb, this is decidedly a rationalist interactionism, in which sensation is secondary.

Thus, Kolb differentiated his theory of experiential learning from Piaget's theory. He explained that the experiential learning theory placed knowing by apprehension (sensation) on an equal basis with knowing by comprehension, resulting in a stronger interactionist position. He described it as actually a transactionalism, in which knowledge emerges from the dialectic relationship between the two forms of knowing: apprehension and comprehension. Kolb explained that the focus in understanding the structure of knowledge is on apprehension and comprehension, rather than the transformation

dimension, because the prehension dimension describes the current state of our knowledge, whereas the transformation dimension describes the process by which that knowledge is changed.

Kolb explained that the dialectic relationship of apprehension and comprehension is Hegelian in nature. This implies that contradictions and conflicts are borne out of both logic and emotion in a thesis and antithesis of mutually antagonistic convictions. The knowing by apprehension is here-and-now. Knowledge exists only in a continuously unfolding present movement, apparently limitless, in which events are related via synchronicity (Kolb, 1984). Kolb refers to Jung's (1960) definition of synchronicity in order to substantiate the meaning of synchronicity. In contrast, comprehension is characteristically a record of the past that seeks to define the future. The concept of linear time is perhaps its most fundamental foundation, which underlies all conceptions of causality.

Kolb presented the interplay between apprehension and comprehension in the creation of knowledge with the classical mechanics problem in physics: the fact that speed is defined by using time and time is measured by speed. Kolb stated that "the dynamic relation between apprehension and comprehension lies at the core of knowledge creation" (p. 106). To summarize the purpose of apprehension Kolb

explained that immediate apprehended experience is the ultimate source of the validity of comprehensions in both fact and value. At the same time, comprehensions act to guide our experiences and direct our attention to the aspects of apprehended experience which are considered to be relevant. He explained that the process of critical comprehension selects and reshapes apprehended experience in ways that are more powerful. The substantiation of this more powerful meaning of comprehension is illustrated by Piaget's connection between the mind and physical reality.

The result of either process cannot be entirely explained in terms of the other. These opposite processes merge toward a higher truth. How this synthesis is achieved, Kolb concluded, is somewhat mysterious; it cannot be explained by logical comprehension alone. Thus, the development of knowledge proceeds by a dynamic that is surprising, and in retrospect makes our earlier knowledge about the nature of reality seem simplistic and dogmatic.

Kolb suggested that if learning were defined not in the narrow psychological sense of behavior modification, but in the broader sense of knowledge acquisition, the problems of research on the structure of knowledge are eased. It has been observed that, with the significant exception of Piaget's initial work on genetic epistemology, very little learning research has been done. The research that has been done has focused on more external issues as

political and social attitudes and values (Bereiter & Freedman, 1962), or sex distribution and other demographic variables (Feldman, 1974), as opposed to more central issues of norms governing learning and inquiry (Kolb, 1984).

#### Experiential Learning Theory and Development as Related to Piaget

Kolb stated that the experiential learning theory of development significantly differs from the Piagetian theories of cognitive and adult development. Piaget portrays adult development as a course that is unilinear and moves toward increasing differentiation and heirarchic integration of the structures that govern behavior. According to Flavell (1963) this is how Piaget presents his theory of cognitive development. In contrast, in experiential learning theory, human development is viewed as a multilinear process (Kolb, 1984). Kolb explained that although experiential learning theory recognizes the overall linear trend in human development, from a state of globality to a state of increasing differentiation and integration, experiential theorists take issue from three perspectives with the exclusive linear view of the Piagtian theory.

The first issue involves the recognition of individual differences in the developmental process. According to

Piaget individuality is manifested only in differential progression with regard to one tenet of development; namely the progression toward internalized logic of scientific rationality. Piaget describes individuals as different insofar as they are at different stages of development. In contrast, experiential learning theory observes individuality to emerge not only in the stage of development but also throughout the course of development, specifically in the particular learning style the person develops.

A second difference arises with the transactional perspective of experiential learning that observes development as the product of personal knowing and social knowledge. Piaget held the view that personal knowing and social knowledge is entirely derived from the person:

We have seen that there exist structures that belong only to the subject, that they are built in, and that this is a step-by-step process. We must therefore conclude that there exist stages of development (Piaget, 1970B, p. 710).

Experiential learning views a person's state of development as the product of transactions between personal experience and the particular system of social knowledge interacted with. In this way, it is quite unreasonable to consider the Piagetian view of the development state as entirely a characteristic of the person (Kolb, 1984).

A third key difference between Piaget's theory and experiential learning theory concerns the paths toward development. For Piaget, all development is cognitive development (Kolb, 1984). Experiential learning theory describes four developmental dimensions: affective, perceptual, symbolic and behavioral complexities. These are interrelated in the holistic adaptive process of learning. To recognize these separate developmental paths helps to explain developmental phenomena that are anomalies to the Piagetian theories. The interaction of the affective and behavioral skills with the cognitive are not an option in Piaget's theory as is true of experiential learning theory. Piaget's developmental theory specifies how concepts gain independence from concrete experience. Yet, it does not describe the process by which concepts are revisited with personal experience. Within Piaget's conceptions assimilation takes priority over accommodation in his theory of development (Kolb, 1984). It should be noted that Piaget's reference to assimilation and accommodation differ significantly from Kolb's references to these concepts. Piaget is defining two individual phases of the learning process. When Kolb is using assimilation and accommodation in his theory he is defining two types of knowledge and two learning styles. It has also been suggested by Hickcox and Williamson (1990) that Kolb's learning cycle correlates with several aspects



Piaget's learning model, which is defined by the following terms: disequilibrium (concrete experience), attempted assimilation, accommodation (reflective observation), assimilation (abstract conceptualization), and equilibration (active experimentation).

An overall issue of difference between Piagetian and experiential learning theory relates to the practical implications of both theories within education. In 1958, at the Woods Hole conference, which initiated the nation's educational response to the Sputnik challenge, Jerome Bruner introduced Piaget's developmental theory as a framework for rationalizing and supporting the technical-scientific approach in education. With this emphasis the affective expression of art, philosophy, religion and the integrative ideals of the liberal arts were placed on the "back burner" of education. Contrary to this view, experiential learning suggests that science and technology are not enough for the fully educated person. It rejects the view that the other forms of inquiry must be subjected to science. Overall, the multilinear view of experiential learning believes that the truer path toward individual and cultural development is found in equal inquiry among affective, perceptual, symbolic and behavioral knowledge systems (Kolb, 1984).

The actual experiential learning theory of human development is described by Kolb in three stages of

maturation: acquisition, specialization, and integration. Within the acquisition stage Piaget's developmental stages are discussed. The acquisition stage takes place from birth to adolescence. This stage is characterized by the acquisition of basic learning abilities and cognitive structures (Kolb, 1984). This stage of human development is extensively described by Piaget, who defined the stage as having four major substages. The first, from birth to two years, is called the sensorimotor. He called the learning at this stage as enactive, meaning it is learned knowledge that is externalized in actions and the feeling of the environment. It is proposed that the dominant mode of adaption is enactive learning according to Piaget; or accommodative learning (apprehension transformed by extension) according to Kolb.

The second stage, two to six years, is called the preoperations stage. At this point internalized images begin to have independent meaning from the objects they represent. This describes the key aspect of ikonic learning. It is also called the representational stage. At this stage early forms of a divergent learning style, apprehension transformed by intention, are acquired, according to Kolb. The third stage, ages 7 to 11 years, marks the beginning of symbolic development, which Piaget calls the stage of concrete operations. This is when the child begins development of the logic, classification and

inductive processes. Thus, inductive learning as termed by Kolb, or an assimilative learning style through the transformation of comprehension by intention takes place. Piaget's fourth stage of development occurs in adolescence, ages 12-15 years. At this stage, symbolic meaning achieves independence from the concrete reality with the development of representational logic and the process of hypothetical deductive reasoning. These powers enable the adolescent to hypothesize implications of symbolic systems and test them out in reality. In this way hypotheticodeductive learning as defined by Kolb, or a convergent learning style through transformation of comprehensions by extension takes place, as described by Kolb.

Development in the acquisition phase is characterized by the gradual emergence of internalized structures that stimulate the child to gain a sense of self that is individually separate from the environment. This increasing movement from undifferentiated immersion in the world (infant) to differentiation of self (the definition of selfhood in adolescence, which Erikson (1959) called the identity crisis), is the essence of the acquisition phase. Piaget's stages are the basis which defines the experiential learning acquisition phase of development.

### Lifelong Learning, Integration and Piaget

Kolb explained that lifelong learning is above all a challenge for integrative development, the highest level of development within the context of experiential learning. An examination of the development of scientific knowledge is then paralleled to Piaget's dialectics within his model of learning. Piaget and others have documented the historical development of scientific knowledge. It has moved toward increasing specialization; this would be from egocentrism to reflection, and from phenomenism to constructivism. Experiential learning would describe it as movement from active to reflective, and concrete to abstract. An example of integrative development, Kolb stated, occurs when people who make their specialized abstract-reflective contributions in their career often realize they need to follow a different path. Their new set of tasks encompass more active and concrete demands. This example demonstrates the development of the specialization phase in adulthood, followed by a movement toward the integration phase during the second half of life.

Kolb's discussion on integrative development suggested one method for measuring integrative development: the Adaptive Style Inventory. Integrative development is a very difficult attribute to measure as it is an attempt to

predict behavior at a higher level of heirarchic integration. It is increasingly difficult to characterize individuals as whole persons at a specific stage of development. This problem has been recognized by developmental theorists and several approaches have been taken to deal with it. One approach taken is Piaget's concept of horizontal decalage. This represents an individual as being generally characterized by a given cognitive structure, but not necessarily able to perform all tasks within that structure (Flavell, 1963).

In concluding Kolb's discussion on integration and its relationship to Piaget a study by Kolb on the relationship between adaptive flexibility and integrated development is described. The study involved three samples of midlife adults. One group participated in a series of self-assessment workshops over a three year period (Kolb & Wolf, 1981). The key instrument administered in relation to the concept of adaptive flexibility was Loevinger's Sentence Completion Instrument, which measures ego development. This instrument was based on the works of Piaget, Kohlberg, Perry, and most extensively Erikson. The study sought to predict a relationship between adaptive flexibility and ego development. Overall, the study demonstrated that higher ego development persons tended to demonstrate higher scores for adaptive flexibility.

Summary of Dewey's, Lewin's and Piaget's Key  
Conceptualizations and Kolb's Relationship to Them

As one studies the philosophic premises and critical approaches of experiential learning theory, the works of John Dewey, Kurt Lewin, and Jean Piaget are considered the foremost intellectual foundation of experiential learning theory (Kolb, 1984). Dewey's, Lewin's and Piaget's theories each emphasize the importance of experience and/or the environment in the learning process. Dewey's model of learning is quite similar to Lewin's model, although Dewey makes more explicit the developmental nature of learning implied in Lewin's theory (Kolb, 1984).

Dewey and Lewin's models are more phenomenological and descriptive than Piaget's model. Their models are both corroborated by Piaget's structural dimensions of cognitive development. In turn, the structural parallels between Lewin's and Piaget's models, respectively, are as follows: Concrete Experience/Concrete Phenomenalism, Observation and Reflection/Internalized Reflection, Formation of Abstract Concepts/Abstract Constructionism, and Testing Implications of Concepts in New Situations/Active Egocentrism. The two models of learning by Dewey and Lewin, and Piaget's developmental model all describe conflicts between opposing ways of understanding the world, suggesting that learning results from the resolution of these conflicts (Kolb, 1984).

In observing the four central concepts of these three models it is evident that Kolb's learning cycle is a direct interpretation of the four structural dimensions of Dewey's, Lewin's, and Piaget's models. Over the course of three major careers, within the fields of Education (Dewey), Social Psychology (Lewin), and Developmental Psychology (Piaget), throughout a 50 year period, (approximately, the 1920s through the 1970s), the four conceptualizations of learning or of a cycle of learning existed.

Dewey's publications were the first to present some of the key concepts of the cycle. In his book, Interest and Effort in Education he wrote "every impulse and habit that generates a purpose having sufficient force to move a person to strive for its realization, becomes an interest" (1913, p. 90). Impulse is the first phase of Dewey's learning model. The cyclic description of the experiential learning process was initiated in Dewey's theory according to Kolb, and discussed extensively in the later works of Lewin and Piaget. Each of these theorists believed that the experiential learning process is reflected in many specialized models of the adaptive process (Kolb, 1984). It is a common theme of all three theorists that all forms of human adaption approximate scientific inquiry (Kolb, 1984). What they perceived in the scientific method was

the highest philosophical, and technological refinement of the basic processes of human adaption.

Piaget's research continued to present concepts related to the learning cycle up through the middle of the twentieth century. For example, in Piaget's (1954) book, The Construction of Reality in the Child, he presented how the child moves from the sensorimotor universe to the representational view of the universe. These are the first two developmental stages of his learning model.

As explained by David Kolb (1990), it is not his theory of experiential learning, as much as it is him giving voice to the learning theories of those before him. A comparison of themes by Dewey, Lewin, and Piaget is presented in Figure 7.

#### Summary of the Current Experiential Learning Movement

To conclude the chapter on the underlying theories of experiential learning an explanation of current trends which indicate the growth of experiential learning is presented. Four trends have continued the development of experiential learning in American higher education. One trend began in the 1970s with the establishment of open enrollment. This policy provided the poor and minorities with greater access to higher education opportunities (Kolb, 1984). For these students, field projects and work/study programs provided empowering experience. The



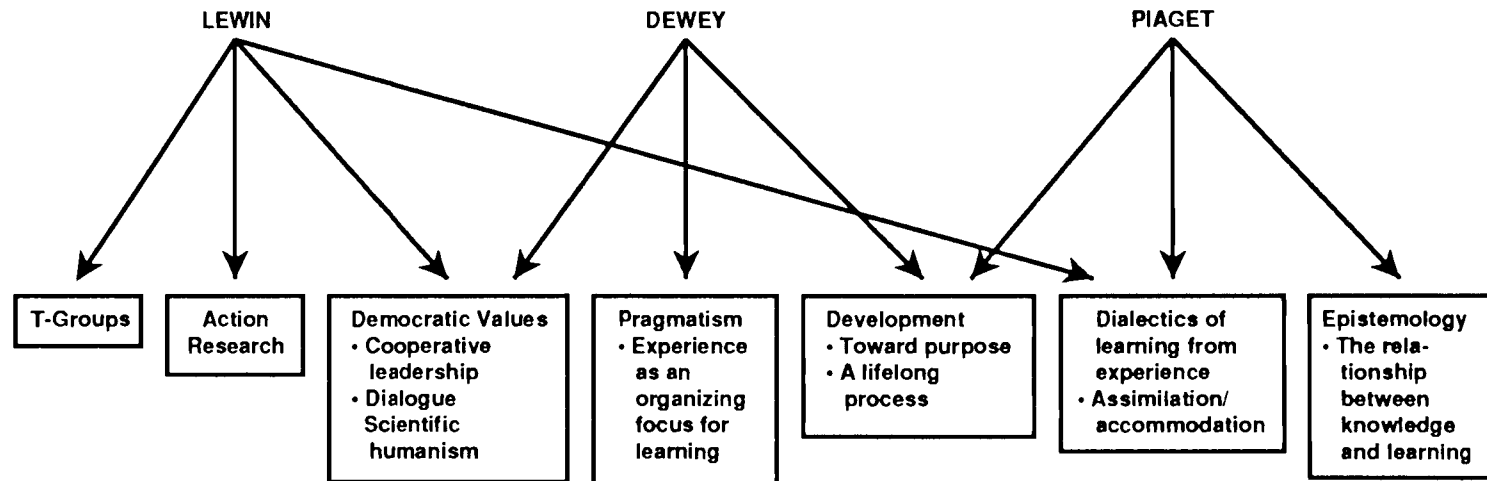


Figure 7  
Comparison of Key Themes  
of Lewin, Dewey, & Piaget

(D. A. Kolb, 1984)

students are asked to use their practical strengths while applying ideas they learn in the classroom.

Another trend has been the growth of the older student populations due to career change (Chickering & Havighurst, 1981; Hameister & Hickey, 1977; Rush, 1983; Williams, 1984). An increasing number of returning adult students are in midlife. The majority of student populations in higher education for the 1990s and beyond will be adult learners who demand relevance and application of ideas in their educational experience (Cross, 1981; Hooper, 1981; Knowles, 1950, Kolb, 1984; Korhonen & McCall, 1987; Rush, 1983; Sheckley, 1988). As discussed by Weathersby "adults learning interests are embedded in their personal histories, in their visions of who they are in the world and in what they can do and want to do" (1978, p. 19).

The third trend is the movement toward vocationalism in higher education. Demands that higher education reorient itself and become more relevant have been made by students who have felt cheated by colleges which did not meet career expectations, and employers who complain that graduates are unprepared (Kolb, 1984; Simosko, 1988). Along with this movement has come strong currents of "antiintellectualism" (Kolb, 1984). This is based on counterproductive views of learning and development (Kolb, 1984). Experiential learning is a means for responding to these demands.

A fourth trend involves the philosophy of giving academic credit for degree programs, or for certification purposes, based on prior experience-based learning. According to Willingham (1977) "granting credit for prior experience is a movement of great promise" (p. 60). According to Simosko (1988) "one could cite literally dozens of examples of why colleges and universities are moving to develop quality programs by which they can evaluate adults' prior learning" (1988, p. 5).

These prior learning experience programs have also raised great concern about the maintenance of quality by "degree mills" or degrees by correspondence. In response to this concern the Cooperative Assessment of Experiential Learning (CAEL) Project in conjunction with the Educational Testing Service was developed to implement valid methodologies to assess people's prior work and life experience (CAEL is currently called the Council for the Advancement of Experiential Learning). The emphasis on outcomes of learning and reliable assessment is critical to establishment of effective links between education and work (Churchill, 1977; Debling, 1987; Kolb, 1984; Mitchell & Johnson, 1987; Simosko, 1988). As this field has developed educators, scientists, and employers have designed competence-based methods of instruction and assessment that are meaningful to the world.

With this growing interest in experiential learning methods, the emphasis on competence-based education, and assessment and certification methods, significant changes in the structure of higher education are indicated.

Chickering (1977) stated that:

Experiential learning leads us to question assumptions and conventions underlying many of our practices. It turns us away from credit hours and calendar time toward competence, working knowledge, and information pertinent to jobs, family relationships, community responsibilities, and broad social concerns. It reminds us that higher education can do more than develop social skills and deposit information in those storage banks between the ears. It can help students cope with shifting developmental tasks imposed by the life cycle and rapid social change (pp. 86-87).

According to Kolb, there are several implications for experiential learning methods within higher education. Kolb (1984) believes the following to be the case; the current content and processes of higher education have changed; the campus is not the only location for learning; the professor does not possess the only knowledge and wisdom; education involves a network of professionals, field support and educational settings; learning will no longer be fixed to credits; educational standards will rest on demonstrated knowledge and competence; education must begin to recognize differences among students; differences in terms of verbal skills, academic preparation, learning

styles, social awareness, self-understanding and capability for independent work. Higher education will continue to perpetuate research, but will need a broad based faculty which stimulates student participation within a range of experiential settings (Kolb, 1984).

## CHAPTER III

A REVIEW OF KEY LEARNING THEORIES  
AS RELATED TO KOLB'S FORMULATION OF  
EXPERIENTIAL LEARNING THEORYIntroduction

This chapter presents some of the additional learning theories which served as a background for Kolb's formulation of experiential learning theory. The six key learning theorists and psychologists discussed are: William James, J.B. Watson, B.F. Skinner, Jerome Bruner, Albert Bandura, Paulo Freire, and Carl Jung. As these theories are discussed various comparisons are made among Kolb's, Piaget's, Dewey's and Lewin's concepts and/or theories.

William James and His Learning Theory of the Early Twentieth Century

In James' (1939) text entitled Talks To Teachers On Psychology, two chapters particularly relate to experiential learning theory. James focused on the stream of consciousness in chapter two. This was referred to by Kolb (1984) in his discussion on learning as a continuous process grounded in experience. Kolb (1984) noted how William James, in his studies on human consciousness, marveled at the fact that consciousness is continuous (p. 27).

The tenth chapter of James' book concerned the topic of "Interests." This topic related to the experiential learning concept of the importance of experience in the learning process. James originally spoke of learning as a continuous process which is grounded in prior experiences, and experiences to follow. These concepts are emphasized in Dewey's learning constructs, and described by James in his discussion on interests and learning. James summarized the chapter with these words: "All later interests are borrowed from original ones" (p. xiii).

The stream of consciousness was initially described by James (1899) as follows:

It is the fact that in each of us, when awake (and often when asleep), some kind of consciousness is always going on. There is a stream, a succession of states, or waves, or fields (or whatever you please to call them), of knowledge, of feeling, of desire, of deliberation, etc., that constantly pass and repass, and that constitute our inner life. The existence of this stream is the primal fact, the nature and origin of it form the essential problem, of our science (psychology) (p. 15).

James (1899) stated that psychologists do not know where successive fields of consciousness come from, or why they have the "precise inner constitution which they do have" (p. 16). James offered no answers as to where these fields of consciousness arise.

James then proposed some thinking which paralleled some of Dewey's thinking. He explained that the field of consciousness follows one's brain states, and its forms are determined by one's past experiences and education. The reference to the influence of past experience and education is also a major premise of Dewey's learning theory.

The key view of psychology in James' time was based on two important facts: 1) People have fields of consciousness, and 2) the concrete fields of consciousness are always complex (p. 17). These fields of consciousness contain awareness of body sensations of the environment around us, memories of past experiences, thought of the future, feelings of satisfaction, desires and aversions, other emotional conditions, along with volitions "in every variety of permutation and combination" (p. 17).

James explained that most concrete states of consciousness are simultaneously present to some degree, although the relative proportion to which they are present is continuously shifting. In most of the fields of consciousness there is a core of sensation that is emphasized. The sensations one perceives are the "centre or focus, and the thoughts and feelings of [one's] present conscious field" (p. 18). Yet, even if the center of focus is present, the mind may wander and the focus may take a marginal position in one's mind.



James referred to, but did not elaborate upon, the concepts of focal object and marginal object as described by Lloyd Morgan. The mind focus, as discussed above, refers to the focal and marginal objects of one's attention. James pointed out that these are very critical concepts.

In the continuing variations or "mutations", as James spoke of them, of one's fields of consciousness, the process by which one's consciousness dissolves into another is very gradual, and all types of inner rearrangements of mind content occur. Sometimes the focus remains, with few changes, while the margin changes rapidly. Sometimes the focus changes, while the margin remains the same. James referred to the continuing variations of one's fields of consciousness as "mutations." There are many variations, so there is no specific description of one's field of consciousness. Each field has "a sort of practical unity for its possessor" (p. 19). From this practical awareness one can class a field with other fields, similar to it by referring to it as a certain state, e.g. a state of confusion, of abstract thought, of feeling etc....

James pointed out that his conceptualization of the stream of consciousness is vague, but free from "conjecture and hypothesis" (p. 19). He referred to one influential school of psychology which sought to avoid the vagueness of the stream of consciousness by trying to make things appear

more scientifically analyzed. This school of psychology defined the fields of consciousness into a specific number of elementary mental states. He spoke of Spencer and Taine, who stated that these elementary mental states resolved themselves into psychic particles or atoms of "mind stuff" out of which the more known mental states are said to be composed. James said that Locke had introduced the previous concept in a vague form, with reference to simple "ideas" of sensation and reflection which are the foundation from which our mental architecture is created. James did not agree with Spencer, Taine and Locke: "Whether it be true or false, it is at any rate only conjectural" (p. 20). He summarized that for practical purposes of teachers, "the more unpretending conception of the stream of consciousness, with its total waves or fields incessantly changing, will amply suffice" (p. 20). James realized that the more pedantic descriptions of stream of consciousness would have little meaning or application for teachers.

The description of the four learning abilities in Kolb's learning cycle are analogous to James' (1899) description of consciousness at certain points. James specifically referred to several classes of fields of consciousness: states of emotion and sensation relate to concrete experience; state of perplexity relates to an aspect of reflective observation; state of abstract thought

refers to abstract conceptualization; and the state of volition correlates with active experimentation.

In James' discussion on interests he begins with the concept of instincts and how some situations appeal to specific instincts of students from the onset, while other instincts "fail to do so until the proper connections have been organized in the course of the person's training" (p. 91). He explained that the set of objects or situations which appeal to the instincts of students are interesting. Objects or situations which fail to appeal to the instincts are "natively uninteresting, and interest in them has first to be acquired" (p. 91).

The concept of interest has received extensive attention by pedagogical writers, according to James. James claimed that interest is a natural sequel to instincts. Some objects, as James terms them, are natively interesting and interest in other objects is artificially acquired. The teacher must know which are the natively interesting objects. Students can develop an interest in other objects artificially, through an association with some of the natively interesting objects.

James (1899) explained that "the native interests of children lie altogether in the sphere of sensation" (p. 92). This statement aligns quite clearly with Piaget's sensori-motor stage of development. James vividly described how novel sounds or visual spectacles of a

violent action nature divert from the abstract conceptions of objects. The sensory input can all act as rivals to "the teacher's powers of being interesting" (p. 92). James claimed that the child will always attend more to what a teacher does than to what a teacher says. He summarized that living things, moving things or things that have the quality of danger or a dramatic quality are natively interesting to children, to the exclusion of almost everything else. Native interest in children clearly parallels the qualities of Kolb's concrete experience learning ability. This learning ability is stimulated by the present sensory and feeling experience. According to Kolb, the sense of what is "natively interesting" is also within adults.

James said that instruction for children must be carried out objectively, experimentally and anecdotally, along with blackboard drawing and story telling. James asked if one can formulate any general principles by which the later and more artificial interests connect themselves with the early natural interests that children bring with them to school. In many ways this conceptualization speaks to Dewey's key concept of experience as related to education. He consistently emphasized that education must relate to a person's previous experienced world.

James (1899) presented one simple law that relates the acquired interests to each other:

Any object not interesting in itself may become interesting through becoming associated with an object in which an interest already exists. The two associated objects grow, as it were, together: the interesting portion sheds its quality over the whole; and thus things not interesting in their own right borrow an interest which becomes as real and as strong as that of any natively interesting thing (p. 94).

An interesting point is that borrowing does not impoverish the source; the objects taken together may be more interesting than the original object of interest by itself. This concept is one of the more effective proofs of the application of the principle of association. There is no limit to the various associations into which an interesting idea may enter. In this way one may observe how many ways interest may be derived.

James (1899) offered a principle for keeping the attention of children:

From all these facts there emerges a very simple abstract programme for the teacher to follow in keeping the attention of the child: Begin with the line of his native interests, and offer him objects that have some immediate connection with these. The kindergarten methods, the object of teaching routine, the blackboard and manual-training work, -- all recognize this feature.... Next, step by step, connect with these first objects and experiences the later objects and ideas which you wish to instill. Associate the new with the old in some natural and telling way, so that the interest, being shed along from point to point, finally suffuses the entire system of objects of thought (pp. 95-96).

This process of connecting or associating the new with the old speaks to Dewey's concept of connecting the child's past experience to that which is to be learned. Kolb emphasizes the importance of how one's past experiences influence the way in which one relates to present learning.

James stated:

the difference between an interesting and a tedious teacher consists in little more than the inventiveness by which the one is able to mediate these associations and connections, and in the dullness in discovering such transitions which the other shows. One teacher's mind will fairly coruscate with points of connection between the new lesson and the circumstances of the children's other experiences (p. 96).

In examining the literature the researcher observed that Dewey's concept of connecting the learning material with the students' experiences is parallel to James' concept of interest.

James (1899) described a key method for insuring the interest of students:

make certain that they have something in their minds to attend with, when you begin to talk. That something can consist in nothing but a previous lot of ideas already interesting in themselves, and of such a nature that the incoming novel objects which you present can dovetail into them and form with them some kind of a logically associated or systematic whole. Fortunately almost any kind of a connection is sufficient to carry the interest along (pp. 97-98).

Kolb's concepts of the concrete experience and reflective observation followed by the abstract conceptualization and active experimentation learning abilities which compose a cycle of learning, align with James' concept of relating previous common experiences to the current learning material.

James (1899) explained that acquisitions in the learning process "become in a measure portions of our personal self" (p. 98). Adult professional interests, according to James, are generally repulsive, but because of their connection to personal wealth or social responsibilities, they become the only things for which in middle life a person cares. He stated that the interests of adult life came from the "spread and consolidation" of the interests that were acquired in childhood. Such interests permeate the network of interests within one's mind. He explained: "They hang to each other by associated links, but the original source of interest in all of them is the native interest which the earliest one once possessed" (p. 99).

Interests in adult life coming from the native interests of childhood is one of James' central conclusions. This emphasis paralleled Dewey's and Kolb's emphasis on the importance of experience being related to learning. These concepts also demonstrate how James, Dewey and Kolb align with the world hypothesis of contextualism.

### Behavioral Theories of J.B. Watson and B.F. Skinner

Behaviorist theory was initiated in the early part of the twentieth century by John B. Watson and was perpetuated through the 1960s by B.F. Skinner. In the United States behaviorists occupied "center stage" in psychology between 1920 to 1960. The initial work by Watson was presented between 1914 to 1919 (Vander Zanden, 1987). Watson's theories were elaborated on by such psychologists as E.L. Thorndike (1931), E.C. Tolman (1932), E.R. Guthrie (1935), C. Hull (1943), and B.F. Skinner (1953) (Vander Zanden, 1987).

When Watson initiated his work, American psychologists were preoccupied with topics as "mind," "image," and "consciousness." Watson rejected these concepts, calling them "mystical," "mentalistic" and "subjective". Instead, he focused on a totally "objective" psychology. He explained that one should deal only with the observable activities of organisms -- their "doings and sayings." Watson insisted that psychology should study how people behave and that this could best be achieved by employing the experimental procedures of animal psychology.

Behaviorists have argued that introspection (observing one's own perceptions and feelings) is unreliable and that psychologists should not concern themselves with internal or mental events. As a result, behaviorists divide



behavior into units called responses and the environment into units called stimuli. Accordingly, behaviorism is referred to as stimulus-response psychology (Vander Zanden, 1987).

After 1910 the concept of self was driven out of psychology by the onslaught of behaviorism. The initiation of behaviorism is identified with psychologist J.B. Watson (1925). Few concepts in the social sciences influence more significant issues, yet involve more ambiguities, than the concept of self. Behaviorists claim that "consciousness" is neither a definable nor an applicable concept. It is another word for the "soul" (Vander Zanden, 1987).

Behaviorists such as Watson have insisted that people can only observe activities of human beings and that which can be directly observed. Such behaviorists attack what they term "introspective psychology" and focus on conditioning and stimulus-response phenomena. More recent behaviorists, such as B.F. Skinner (1953), continue to oppose those who believe in the concept of self, asserting that nothing is to be gained, and perhaps nothing lost, by positing a self as a factor in the study of behavior.

Watson took the radical position that since thinking, intentions, emotions and other mental events could not be seen, or studied rigorously, or scientifically, such "mentalisms," as he termed them, should not be included in an explanation of learning. The exclusion of internal

mental processes in a theory of learning diametrically opposes experiential learning theory overall, and Kolb's holistic formulation of experiential learning theory. Dewey, Piaget, and Kolb extensively propose internal processes, particularly concerning the structure of knowledge and the learning process.

A key premise of behavioral theory is that the focus on behavior change is the major outcome of learning. Experiential learning theory explains that it is the actual doing of experiences which promotes the learning process. There is little or no emphasis on behavioral learning outcomes. In other words, it is the process or experience, and not the product which is most important to experiential learning. It is the product and not the process which demonstrates and proves the learning that has or has not taken place which is most critical in behavioral theory.

All behaviorists since Watson have emphasized changes in behavior as the outcome of learning. They also have been concerned with the effects of external events on the individual's responses (Woolfolk, 1990).

### The Learning Theories of Jerome Bruner

Bruner's key theories of learning, his three concepts which describe the act of learning, are presented and compared to Kolb's description of learning. Bruner (1973) explained that learning seems to involve three almost

simultaneous processes. One process is acquisition of new information. New information runs contrary to or is a replacement for what the person has previously known implicitly or explicitly, or at the very least, is a refinement of previous known knowledge (Bruner, 1973). Kolb has incorporated the concept of acquisition within the experiential learning theory of growth and development. The first stage from birth to adolescence is called the acquisition stage. This stage is marked by the gradual emergence of internalized cognitive structures and basic learning abilities that allow the child to gain a sense of self that is separate and distinct from the surrounding environment (Kolb, 1984). This concept is similar to Bruner's concept in that it refers to the acquisition of new information, and describes an information-replacing process. Kolb's concept is much broader than Bruner's. However, it takes the view that acquisition is a long developmental period, whereas Bruner's concept considers acquisition as a process that continues throughout life.

The second process in Bruner's model is transformation. He defined it as the process of manipulating knowledge to make it fit new tasks. He explained that transformation comprises the ways people deal with information in order to go beyond it (Bruner, 1973). Kolb (1984) described transformation as a pivotal process of learning. He stated that "Learning is the

process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it" (Kolb, 1984, p. 41). He proposed that transformation is at the very heart of creating knowledge within the mind.

Bruner's (1973) third learning process is evaluation. He explained that evaluation is checking whether the way we have manipulated information is adequate for the task. He stated that "much of it takes place by judgements of plausibility without our actually being able to check rigorously whether we are correct in our efforts" (p. 422). This particular process is not discussed by Kolb.

In an essay and a book with the same title, Beyond The Information Given (1957, 1973) Bruner summarized the conditions by which it is possible for people to go beyond the information given. He proposed this as a problem involving the learning of coding systems that have applicability beyond the situation in which they are learned.

Bruner emphasized that educators focus on those conditions which maximize the transferability of learning. In line with this thinking he urged that psychologists examine more closely what is involved when people: learn generically; the motivational conditions; the kinds of practice required; and the nature of the set designed for gaining an optimally generic grasp of materials (Bruner,

1957). In reference to motivational conditions previously listed, this implies a direct concern for the learning environment, which is a central premise of both Dewey's and Kolb's learning theories.

Bruner pointed out that the rate of acquisition and rate of extinction in learning have been extensively researched for a generation, and suggested in 1957, that

in the coming generation we can concern ourselves more directly with the utility of learning: whether, one thing having been learned, other things can be solved with no further learning required. When we have achieved this leap, we will have passed from the psychology of learning to the psychology of problem solving (Bruner, 1957, p. 67).

Bruner's analysis of the future of learning research was prophetic. He recognized quite early on, prior to the computer generation in the schools, that the key to learning was not how much students can memorize, but how students work with and manipulate the information at the thinking levels of application and above (in reference to Bloom's taxonomy). Memorization and comprehension approaches are still a focus in cognitive psychology, and in the schools. Although educational psychologists are beginning to emphasize the use of problem solving, and critical thinking in the classroom.

Kolb, as Bruner, has proposed a psychology of problem solving for the classroom. Kolb's theory of the learning

cycle is analogous to a theory of problem solving. If one teaches using Kolb's learning cycle theory, the application, analysis, synthesis and evaluation levels of thinking automatically take place.

In discussing structure and representation in learning, Bruner pointed out that the structure discerned is influenced by one's purposes, expectations, and point of view, if one attends to rhetorical structures. Or if one's purpose is to study logic, one attends to deductive aspects, such as definitions and theorems. Bruner's concept of learning and the individual influences of purposes (or point of view), is reminiscent of Dewey's emphasis on the awareness of each student's background and experience. If the learning process is connected to the student's background, learning takes place.

Bruner stimulated the American education system in the 1950s to pay attention to Piaget's developmental learning principles and learning model. In the 1960s he introduced the discovery learning model to schools. This model asked educators to emphasize problem-solving methods. His theories and methods drew on the experiential theory of Dewey and developmental theory of Piaget. One example of a problem-solving curriculum that Bruner introduced was a social studies program called MACOS, an acronym for "Man a Course of Study". This curriculum was introduced throughout the United States in the 1960's and 70's. His

learning theory preceded Kolb's and is similar to Kolb's formulation of experiential learning theory. However, Bruner's theories most clearly apply to the elementary and secondary classrooms, whereas, Kolb's learning concepts apply to adult and higher education learning settings.

### The Learning Theory of Albert Bandura

Bandura distinguished between acquisition of knowledge (learning) and the observable performance based on that knowledge (behavior) (Woolfolk, 1990). Bandura suggested that one may know more than one shows. For example, one may know how to simplify fractions, but perform badly on a test because he or she is anxious, has misread test questions, or is getting sick. Learning may have occurred, but it may not be demonstrated until the situation is right. In social cognitive theory, both the internal and external factors are important. This theory clearly parallels Dewey's and Kolb's premise of the environment influencing the internal learning process. Environmental events, thinking, other personal factors, and behavior are interacting, each influencing the other in the process of learning. Bandura believed that traditional behavioral views of learning are not inaccurate, just incomplete -- they give only part of an explanation for learning. Behavioral theories overlook important aspects of the environment.

Teachers must be concerned with observable student behavior, such as the actual work done on assignments or behavior in class, as well as less observable qualities, such as abstract thinking and attitudes. Bandura's recognition of the internal process and behavioral aspects of learning clearly parallel Kolb's more holistic learning theory. Kolb's interpretation of experiential learning accounts for feelings, perceptions, thoughts, and behaviors in the process of the learning cycle.

Bandura (1977, 1986) was responsible for much of what is known about observational learning, a major aspect of social cognitive theory. In the early 1960s Bandura was already at work on his theory, showing that cognitive processes could be important in learning new behaviors. In a key study he demonstrated that children were more aggressive after watching an aggressive model, a film of an aggressive model, or a cartoon depicting violence than they were after viewing a nonaggressive model or no model at all (Bandura, 1963). These findings may indicate that both hostile behavior and moral standard are readily imitated by observers (Bower & Hilgard, 1981).

The repeated demonstration that people and animals can learn merely by observing another person or animal has offered a challenge to the behaviorist idea that cognitive factors are unnecessary in learning. Observation can be a very efficient learning process. Through modeling, one can



learn not only how to perform a behavior, but also what will happen in specific situations if one does perform it (Woolfolk, 1990).

Bandura (1986) stated that there are four important elements to be considered in observational learning. They are attention, retention, production, and motivation or reinforcement. In order to learn through observation we have to pay attention. It is noted that people who are attractive, competent, respected or admired get our attention. In teaching one has to insure students' attention to critical features by making clear presentations and highlighting key point. In demonstrating a skill it is important that students can see from the same perspective as the teacher, and to direct their attention to the right features of the skill in order to make imitation easier. The concept of imitation as one learns supports Piaget's basic concept of experiencing accommodation in the learning process. Kolb's learning model also aligns with accommodation taking place in the learning cycle.

In order to imitate the behavior of a model one has to remember the behavior. The retention process involves mentally representing the model's actions in some way, probably as verbal steps or visual images, or both. The retention process from the perspective of visual images may be likened to Piaget's representational stage in which

ikonic learning takes place. The experience of symbolistic thinking is very important at this stage. This Piagetian stage is referred to as divergent learning by Kolb. From Kolb's perspective this type of learning processes symbolistically, and occurs throughout adult life.

Bandura explained that retention can be improved by mental rehearsal or imaging oneself imitating the behavior. It may also improve with actual practice. In the retention phase of observational learning, practice helps one remember the sequence of steps.

Although one may know how a behavior looks and remembers the steps, one still may not perform it smoothly. The production phase may involve a great deal of practice, feedback, and coaching about subtle points. This is needed before one can produce the behavior of the model. In the production phase, practice makes the behavior smoother.

Motivation or reinforcement in social cognitive theory distinguishes between acquisition and performance. One may acquire a new skill or behavior through observation, but one may not perform that behavior until there is some incentive to do so. Reinforcement can play several roles in observational learning. If a student anticipates being reinforced for imitating the actions of a model, a student may be more motivated to pay attention, remember, and reproduce the behaviors. In addition, reinforcement is important in maintaining learning. Even if modeling causes

a person to try a new behavior, one is unlikely to persist if one receives little reinforcement (Barton, 1981; Ollendick, Dailey & Shapiro, 1983).

Studies have been conducted to demonstrate the effects of observational learning. One arena of study has been in the teaching of new behaviors. It is explained that teachers serve as models for the acquisition of a tremendous range of new behaviors. Bandura (1986) stated that learning new behaviors through observation of someone else may well be more efficient than learning the behavior through direct reinforcement. For teachers this fact presents endless opportunities. By observing others a student may not only learn about what they do, but also learn about aspects of the situation itself. In one study, Bandura observed children who watched a doll being pounded with a mallet. They not only imitated the pounding, but also started using the mallet for many other purposes. Kolb explained that the developmental stage of acquisition extends from birth to adolescence and marks the acquisition of basic learning abilities and cognitive structures. The acquisition of new behaviors Bandura studied was predominantly in relation to children. This concept of observational learning may relate most often to children and adolescence according to Kolb's developmental theory.

Modeling is another key aspect of Bandura's observational learning theory. Modeling has been used in

psychomotor skills for years. Modeling can be used deliberately in the classroom to teach mental skills and broaden the students' horizons. For example, modeling can be applied to teach new ways of thinking. Modeling when applied deliberately can be an effective means of teaching new behavior (Bandura, 1986; Schunk, 1987). Research indicates that modeling can be most effective when all the elements of observational learning are taken into account, particularly reinforcement and practice. Modeling can reinforce reinforcement -- it can make praise more effective. Zimmerman and Pike (1972) found that modeling plus praise was much more effective than praise alone in helping second grade students learn to ask questions in a small group.

Bandura studied the concept of self-management. A key step in self-management is self-reinforcement. There is some disagreement, however, as to whether this concept is actually necessary. Some psychologists believe that setting goals and monitoring progress alone are sufficient, and that self-reinforcement adds nothing (Hayes, 1985). Other researchers believe that rewarding oneself for a job well done, rather than simply setting goals and keeping track of progress, can lead to higher levels of performance (Bandura, 1986).

Social learning theories of motivation are integrations of behavioral and cognitive approaches. To

some extent, these concepts are characteristic of experiential learning theory. Experiential learning theory incorporates both the cognitive and behavioral aspects of learning. For example, Kolb explained that abstract conceptualization (cognitive approach), and active experimentation (behavioral approach) are equally important learning abilities.

Bandura suggested several sources of motivation: one source consists of thoughts and projections about possible outcomes of behavior. One imagines future consequences based upon past experiences, the consequences of those experiences, and one's observations of others. The reference to past experiences and its effect on motivation parallels, to some degree, the effect of experience in learning referred to by Dewey and accounted for in Kolb's theory.

The projections related to motivation are affected by one's sense of self-efficacy. This refers to one's beliefs about one's personal competence in a given area. According to Bandura, another source of motivation is the active setting of goals. The goals one sets become one's standards for evaluating performance. One's sense of self-efficacy acts here, influencing the goals one will attempt to reach. As one works toward goals, one imagines the possible positive outcomes of succeeding and the negative outcomes of failing. One tends to persist in

efforts until one meets the standard set. Upon reaching our goals, one may be satisfied for a short time, but then tend to raise the standards and set new goals. The key factors that affect such motivation behaviors are arousal, goals, needs and beliefs (Woolfolk, 1990).

Overall, Bandura's social learning theory emphasized the importance of setting and working toward goals (Bandura, 1977, 1986). A second major contribution was that of observational learning. Bandura (1977) and Mischel (1973) stressed that observational learning plays a key role in human adaption. The concept of human adaption occurring with the learning process very clearly aligns with the learning theories of Dewey, Lewin, Piaget and Kolb. Bandura's processes of observational learning clearly parallel Kolb's learning model.

#### Paulo Freire and His Theory of Education for the Brazilian Transition

In his book, Education For Critical Consciousness, Freire (1973) described the Brazilian transition which sought to develop a democracy within the government and country. The reform was not limited to technical questions or "pure" economic policy or structural reform, but also involved the passage from one mentality to another. Freire explained this change from one mentality to another mentality as: "the support of basic reforms as a foundation

for development, and development as a foundation for democracy itself" (p. 32).

In the chapter entitled "Education versus Massification", Freire discusses the special contribution of education to the birth of a new society. Education, he explained, can offer the skills of a critical education, which help to form critical attitudes from the previous naive consciousness from which people have emerged. Only through education can the process of facilitating people from naivety to consciousness occur. According to Freire, this process increases people's ability to perceive the challenges of their time, and prepare them to resist the emotional power of transition.

He further described how education in Brazil during this national transition allowed people to discuss courageously the problems within their context and then intervene in that context. This sense of context in Freire's explanations directly relates to a key quality of Dewey's experiential learning theory, as well as Kolb's formulation of experiential learning theory. Dewey refers to understanding the experience students bring to the learning setting and the importance of their experiential context to which the teacher is teaching. Freire also aligns with the contextualist world hypothesis concepts, with which Dewey and Kolb's learning theories both align.

Freire described the process of the Brazilian transition via education in a manner that closely parallels the learning models and concepts of Piaget, Dewey and Lewin. The following statement reflects this:

By predisposing men to reevaluate constantly, to analyze 'findings,' to adopt scientific methods and processes, and to perceive themselves in dialectic relationship with their social reality, that education could help men to assume an increasingly critical attitude toward the world and so to transform it (p. 34).

The reference to "analyze findings" is one aspect of Kolb's abstract conceptualization. The reference to "adopt scientific methods" clearly parallels Dewey's, Piaget's and Lewin's premise that the scientific method is a model for the human adaption process. Freire referred to "process" and "perceive," which are concepts at the heart of Kolb's learning cycle and were originally derived from Dewey's, Lewin's and Piaget's models of learning.

The above concepts are followed by the idea that people should begin "to perceive themselves in dialectic relationship with their social reality" (p. 34). Awareness of the dialectic in the learning and change process is in direct alignment with Dewey's, Lewin's and Kolb's theories of learning. In order to begin to learn something, one must personally resolve a conflict between two polar opposite concepts. Freire explained that when this dialectic relationship within their social reality is



perceived, people will develop an increasingly critical view of the world and, in turn, transform it. Kolb (1984) addressed the concept of transform in his definition of knowledge:

Knowledge results from the combination of grasping experience and transforming it (p. 41).

Kolb explained that learning is a process in which knowledge is created through the transformation of experience. Thus, Freire and Kolb both addressed the issue of transformation in relation to experience.

Freire further discussed how the highly technical, industrial "mass production" organization of society results in man's "massification." Requiring people to act mechanically, and excessively requiring the specialization of work tasks, results in dehumanization and encourages no critical attitudes, making people passive, fearful, and naive. The tendency toward a mechanistic, specialized society is recognized by Kolb in his views toward present day adult development. Kolb explained that such specializations in institutions decontextualizes people's lives, treating all people as generic equal beings. In this way no one is recognized for their individuality. Kolb and Freire express their negative views toward societal specialization with differing emphases. Freire focuses on the loss of critical capacity with specialization, whereas Kolb explains it as a loss of

individuality. Yet, their conclusion toward resolving the problem is quite similar. Both conclude that the answer does not lie in the rejection of the technical society, but rather the humanization of all people.

Freire stated that in seeking to redirect their educational practice toward the goal of an authentic democracy, people could neither ignore their patriarchal cultural traditions nor the new conditions of the societal transition. These conditions are favorable to the development of a democratic mentality. He observed this based on the idea that in periods of accelerated change there is often greater flexibility in people's understanding, which may predispose them toward more "plastic" democratic forms of life.

Freire's reference to a flexible, and more plastic democracy has some connection to the adaption process or learning process referred to by Dewey, Lewin, and Piaget. All three theorists viewed learning as an adaption process, and in turn they all referred to the scientific method as the best model of adaption. Freire referred as well to adopting scientific methods in order to help people assume more critical attitudes toward the world. The transforming process first starts with each person beginning to learn. He explained that the attitude of rebellion was a most promising aspect of political life. He considered an attitude of rebellion a form of action. He also recognized

that the new activism had to progress from "naive rebellion" to critical intervention. The above statements parallel, to some degree, the four learning abilities of Kolb's learning cycle. Naive rebellion represents concrete experience; movement to critical intervention would involve reflective observation, abstract conceptualization and active experimentation.

Freire's thinking corresponds with Dewey's and Kolb's learning theories. He stated "I was convinced that the Brazilian people could learn social and political responsibility only by experiencing that responsibility" (p. 36). Freire explained that the people would be assisted to learn democracy through the practice of democracy. Freire's awareness of the experiential nature of learning is demonstrated in the following statement: "For that knowledge, above all others, can only be assimilated experientially" (p. 36). According to Kolb, the implications of experiential learning and democratic values were clearly voiced by Dewey's and Lewin's theories.

Freire recognized that the traditional educational establishment in his country did not encourage experiential learning; it stifled it. The following statement discusses his awareness of the traditional assimilative learning mode in the schools, and its disconnection from experience and life: "Our traditional curriculum, disconnected from life, centered on words emptied of the reality they are

meant to represent, lacking in concrete activity, could never develop a critical consciousness" (p. 37).

The concept of critical consciousness relates to an experiential learning process, and is quite similar to Kolb's experiential learning theory, specifically the learning cycle. Kolb's learning cycle is actually a process of problem solving. Freire asked that people learn about democracy experientially, to develop a critical attitude and, in turn, transform the world. This thinking is quite similar to the four phases of the learning cycle: concrete experience (experiencing democracy), reflective observation and abstract conceptualization (critical attitude), and active experimentation (transform world).

Freire discussed how the less people actually experience democracy, the more people tend to perceive their reality naively and represent it abstractly. The less people are critical of their reality, the more people treat problems at a superficial level. It appears that Freire strongly believed in the role of experience which stimulates people to move toward a more critical view of reality.

Freire described democracy and democratic education as based upon a faith in people and on the belief that they not only can, but should discuss the problems of their country, of the world, of their work and of democracy as well. He concluded that:

Education is an act of love and thus an act of courage. It cannot fear the analysis of reality or, under pain of revealing itself as a farce, avoid creative discussion (p. 38).

The process of analysis of reality and of conflict is addressed by Kolb in his description of the learning cycle. As one moves through the cycle, a person automatically must resolve conflicts which create tension and disagreement, in order to solve problems. The learning cycle is a way of developing a critical consciousness. Freire demonstrated through his philosophy of education during the Brazilian transition that he was actually practicing the learning cycle, which actually reflected the thinking of Dewey's, Lewin's, Piaget's and Kolb's learning models.

Freire discussed how the existing Brazilian education could not prepare people for integration into the process of democratization. The Brazilian education contradicted the democratization process and the emergence of people into public life. Freire explained that they had to appeal to education as a cultural action by which means the Brazilian people could learn. This type of education would develop new attitudes and habits of participation and intervention, which would replace the old ways of passivity. In other words, the new Brazilian education quite clearly aligned with Dewey's and Lewin's belief in democracy as an important theme in education.

Freire then discussed the importance of the "humanization of the Brazilian people" (p. 39). He stated: It was essential to harmonize a truly humanist position with technology by an education which would not leave technicians naive and uncritical in dealing with problems other than those of their own specialty (p. 39).

The humanistic perspective, clearly, is an aspect of the experiential learning theory of Dewey, Lewin and Kolb. The underlying concept of Kolb's theory of learning focuses on the development of the individual and that of learning as an holistic process. These concepts substantiate that Kolb's theory is grounded within a humanistic tradition. Freire's concept of each person needing to develop a critical consciousness as the basis for a democracy parallels Kolb's premise of the development of the individual throughout life through the experiential learning process.

#### Carl Jung and His Psychology of Individuation

Jung's (1938) book Psychological Types or the Psychology of Individuation is prefaced by the translator (H.G. Baynes), who said that the definition and psychology of individuality "is the alpha and omega of Jung's system" (p. xviii). This discussion on Jung's psychological theory in this study presents Jung's book with reference to the forward, introduction and definition of terms. These

portions of his book clearly present Jung's intentions and emphases on individuality. An understanding of these concepts is critical, as they are a theoretical framework upon which Kolb developed his theory of learning style.

Jung explained that his book is the result of almost twenty years of experience as a psychiatrist. It was developed from the vast number of impressions and experiences he processed in his psychiatry practice. He stated that the book was a product of his personal dealings with all types of people from all social levels. He recognized that because the book is based on personal experience, it was influenced by his own "psychological particularity (p. 7)."

He stated that he chose not to burden the reader with casuistry. He recognized that it was important to associate his ideas, which were derived from experience with historical and previously existing knowledge, and provided historical background (chapters one through five) in order to bring the narrow experience of the medical (psychiatric) specialist into the more general realm of society. Jung's book sought to allow the educated individual to make use of the experiences of psychiatry. The focus in Jung's book on the importance and meaning of experience is a key premise of learning in Dewey's and Kolb's theories.

Jung was convinced that the psychological points of view presented in his book were of wide significance and application, and better applied in connection to society than left in the form of "specialized scientific hypothesis" (p. 7). Jung explained that he confined his ideas to those of a few workers in the field. He referred to a great collection of correlated materials and views which exceeded what could be covered in the book. He also referred to an inventory which had implications for a fundamental contribution to the key issue of psychological types, which was omitted from his book. He explained that his earlier and lengthy exchange of ideas with a colleague, Dr. H. Schmid, of Basle, Switzerland, concerning the question of types, was an important stage of preparation for the book.

Jung (1938) began the introduction with the following: "In my practical medical work with nervous patients I have long been struck by the fact that among the many individual differences in human psychology there exist also typical distinctions: two types especially became clear to me which I have termed the Introversion and the Extraversion Types" (p. 9).

Jung explained that in reflecting on human history, one may see how the destiny of one individual is conditioned more by the objects of his/her interest (extraversion), while another individual is conditioned



moreso by his/her own inner self (introversion). Since a person orients toward one type more than the other, one is naturally oriented to understand everything in the sense of one's own type.

Jung explained how it may be difficult to determine one's type, particularly if oneself is in question. There tends to be a subjective clouding of judgement in relation to one's own personality. Jung found that with every pronounced type there existed a tendency towards compensation for the onesidedness of one's type. This onesidedness is biologically expedient as it acts to maintain psychic equilibrium.

Jung described the existence of secondary characters, or types, which may be so hard to define that they are denied and people may only believe in the existence of individual differences.

Jung recognized that the "psychological reaction of a human being is such a complicated matter, that my descriptive ability would indeed hardly suffice to give an absolutely correct picture of it" (p. 10).

Jung limited and qualified the degree to which a psychiatrist may determine the personality type of an individual. He believed that humans tend to reflect a "relative predominance" (p. 10) of either extraversion or introversion, which determines one's type. It was clear to

him that every person possesses both mechanisms, as he terms them.

Jung's individuation principles were "abstracted from an abundance of observed facts" (p. 10). His tendency as a researcher to consider qualitative observations as facts is reminiscent of Piaget's methodology. Piaget observed children within a diversity of situations, in the process of originating his concepts of cognitive development. (It appears that Jung and Piaget both practiced and researched in the field of psychology, using similar research methodologies: qualitative observation. Jung and Piaget completed advanced degrees in the biological sciences. Thus, both had similar academic backgrounds. Piaget was originally a naturalist, and Jung was a medical doctor.)

Jung stated that his presentation of the psychological type is based on "a deductive presentation of empirically gained understanding" (p. 11). This statement leads us to believe that Jung gathered his data with a scientific methodology, which may have been the case. Yet, he stated that the findings were based on an "abundance of observed facts" (p. 10) which indicates he used observation and reflection. He said that his insights would act to clarify a dilemma in analytic psychology in reference to extraversion and introversion standing as a fact. The following statement summarizes his views: For it explains how the existence of two distinct types is actually a fact

that has long been known: a fact that in one form or another has dawned upon the observer of human nature or shed light upon the brooding reflection of the thinker (p. 11).

One may note how Jung may have developed the fact of extraversion and introversion: by observation of human nature and reflection. These both represent qualitative research methods.

Jung described the mechanisms of extraversion and introversion. He referred to a diversity of formulations about the two mechanisms. He stated: "Notwithstanding the diversity of the formulations, the common basis or fundamental idea shines constantly through; namely, in the one case an outward movement of interest toward the object, and in the other a movement of interest away from the object, towards the subject and his own psychological processes" (p. 11).

In summarizing his discussion on introversion and extraversion, he explained that the introverted view sets the self and the subjective psychological process above the objective process. On the other hand, the extraverted view sets the subjective below the objective, and the objective process receives the predominant value and the subjective process always has secondary importance. He described these mechanisms as opposing attitudes, using the analogy of the functions of the heart:

These opposite attitudes are merely opposite mechanisms -- a diastolic going out and seizing of the object, and a systolic concentration and release of energy from the object seized. Every human being possesses both mechanisms as an expression of his natural life-rhythm -- A rhythmical alternation of both forms of psychic activity may correspond with the normal course of life (pp. 12-13).

Jung explained that the complicated conditions under which people live, and the individual psychic dispositions all possess, often do not allow an undisturbed flow of psychic activity. He found that outer circumstances and inner disposition frequently favor one mechanism and restrict or hinder the other. In this way, if the condition becomes chronic, a type results. He described his type concept as an habitual attitude, in which one mechanism predominates.

Jung found that with the substantiation of the two psychological types of individuals (introverted and extraverted), the grouping produced a superficial and an inclusive basis of general discrimination. This resulted in great differences between individuals, even though they belonged to the same group. He concluded that in order to determine the differences between individuals belonging to the same group, one must make additional discriminations. These discriminations were defined as basic psychological functions which exist in the individual, and emerge as basic preferences, namely, thinking, feeling, sensation,

and intuition. Jung viewed these functions as polar opposites: thinking versus feeling, sensation versus intuition. He stated that as "one of these functions habitually prevails, a corresponding type results" (p. 14). He found that each of the types can be introverted or extraverted.

Jung's psychological theory of types corresponds with Dewey's, Piaget's and Kolb's theories of learning with respect to two concepts: the influence of outer circumstances and inner disposition on the predominance of extraversion/introversion, and on the predominance of one function. Dewey emphasized the influence of experience (outer circumstances) as well as background (inner disposition) on learning. Piaget recognized the influence of environment as well as genetic background on a child's cognitive development. Kolb considered environment and background in his developmental theory.

A second aspect in Jung's psychology which relates to Piaget's, Lewin's, and Kolb's theories of learning is the preference for dialectical opposite concepts or attitudes. The habitual predominance or preference for one attitude over another creates a type according to Jung. In the process of learning, according to Piaget, Lewin, and Kolb, one is continuously resolving choices between polar opposites as one perceives and processes information. The continual preference for two of the four learning abilities

(polar opposites) creates one's learning style, according to Kolb.

At the conclusion of his book, Jung offered definitions of his psychological conceptions: individuality and individuation. Jung defined individuality as the "peculiarity and singularity of the individual in every psychological respect" (p. 561). All that is individual is not collective. Individuality cannot be described as belonging to the psychological elements, but rather to a unique grouping and combination of psychological elements.

Jung's definition of individuation is perhaps one of his most important contributions to psychology. Individuation was a central and foremost concept of Jungian psychoanalysis. In general he described it as the process of forming and specializing the individual nature. More specifically, he stated that it is the development of the psychological individual as a differentiated being from the general, collective psychology. Thus, it is a process of differentiation, having as its goal the development of the individual personality.

The emphasis on individuation as a process offers a parallel to Kolb's focus on the learning cycle and development; the process of experiencing the learning cycle as a learner throughout life, and of moving through three developmental stages toward integrative development. It is not the product but the process which is of importance in both Jung's and Kolb's theories of psychology and learning.

## CHAPTER IV

AN OVERVIEW OF NORTH AMERICAN AND AUSTRALIAN  
LEARNING STYLE LITERATUREIntroduction

The major inventories and theories are presented in this chapter. The inventories and theories reviewed emerged during the 1960s through 1980s. The inventories are discussed in reference to Curry's learning style topology developed in the mid-1980s.

Research on learning or cognitive styles evolved from the psychological research on individual differences (Curry, 1987). Individual difference research was widespread in psychology during the late 1960s and early 1970s. During this time period a number of learning style concepts were proposed for consideration and application.

There is a distinct difference between North American research and European and Australian research on learning style. The North American researchers have developed learning style concepts from their backgrounds in psychology and cognitive psychology, and emphasized psychometric considerations from the onset. European and Australian researchers developed concepts based on the European approach to learning style research. This approach began with detailed observations of learning behaviors of small numbers of learners (Curry, 1987).

Examples of the two approaches are: North American--Friedman and Stritter (1976), Kolb (1976), and Yando and Kagan (1970); European and Australian--Newble (1986), Curry (1983), and Biggs (1979).

Differences in these research approaches continue to make it difficult to resolve issues, such as an acceptable definition of learning style inventory validity. Since the mid 1980s, North American researchers have written about behaviors used by learners in learning situations. Three examples are: Levin (1986), "Four Cognitive Principles of Learning-Strategy Instruction"; Thomas and Rohwer (1986), "Academic studying: The Role of Learning Strategies"; and Boyatzis and Kolb (1989), "From Learning Styles to Learning Strategies: The Executive Skills Profile". These researchers have focused on behaviors which are thought of as strategies (by North American researchers), and are relatively easy to change. In contrast, the European/Australian researchers consider such learning behaviors directly analogous to deeper "style" concepts (Curry, 1987).

Most of the literature on learning styles has focused on improving the immediate and longterm results of teaching and learning episodes. The following papers exhibit this emphasis: Andrews (1981) "Teaching Format and Student Style: Their Interactive Effects on Learning"; Biggs (1979) "Individual Differences in Study Process and the Quality of



Learning Outcomes"; Papalia (1978) "Assessing Students' Learning Styles and Teaching for Individual Differences".

Another focus of learning style research has been in the area of professional education. Investigators have applied learning style concepts to a number of issues of specific importance in their professional area. For example, medical school admissions, training programs, scholarly achievement, willingness to practice in small communities, choice of specialty and professional competence, have all been researched by correlational studies in reference to one or several of the learning style conceptualizations (Curry, 1987). The investigators' rationale for such studies was that the quality of the learning style used by students is likely to determine the quality of what is learned and this can act as an outcome to compare various curricular approaches (Coles, 1985; Newble & Clarke, 1986).

The majority of this research has continued in the face of significant difficulties in regard to the adequacy of learning style conceptualizations. A key difficulty is the confusion of definitions surrounding learning style concepts, and the resulting wide variation in scale or scope of behavior claimed to be predicted by various models. For example, some conceptualizations claim only to predict an individual's choice between a lecture-style and a small group-style course (Friedman & Stritter, 1976);

others attempt to predict a habitual response overall learning acts in which a student might engage (Yando & Kagan, 1970). Curry (1987) pointed out that the evidence, gathered to support the various conceptualizations, varies radically in terms of psychometric standards for reliability and validity. Curry reviewed the major learning style theories and inventories in North America, Europe and Australia, in order to critically present the reliability and validity of the various learning style instruments. Her review was a key reference for this overview of the North American and Australian learning style literature. She conducted a survey of 21 learning style conceptualizations and instruments over a five-year period. She found, based on psychometric evidence, and written documentation, that it was possible to reorganize thematically the 21 learning style instruments into a three-layer system.

Curry's system has three "layers" like an onion (Figure 8). The first layer (or core) presents learning behavior as controlled at a fundamental level by the central personality dimension. The middle layer centers around a theme of information processing dimensions. The outer layer, influenced by the interaction with the environment, is based on the theme of instructional preferences. The outermost layer of instructional performance is the most observable. The three-layer

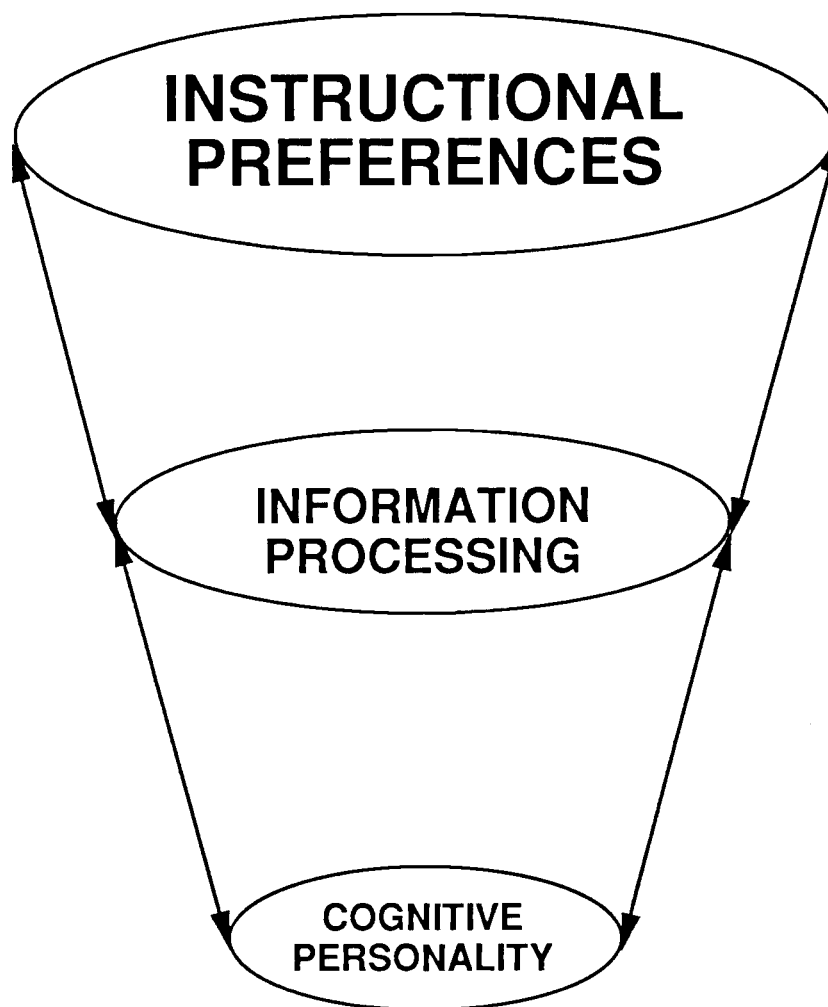


Figure 8

Marshall's Learning Style  
Model of Curry's Topology

connection between the innermost personality layer and the outermost instructional preference layer, she claimed, is analogous to the trait and state concepts of personality theory.

Shipman and Shipman (1985) reviewed a wide variety of learning style conceptualizations and variation in regard to psychometric considerations. Their review presented an updated version of the Messick (1976) listing of learning style/ cognitive style dimensions. They concluded that,

there is a considerable variety among the processes indexed by the various cognitive styles, ... that styles have been defined at different levels of discourse and as operating at different levels of generality and that there was enough educational utility in both the long and short terms to pursue learning/cognitive style research and applications (Shipman & Shipman, 1985).

A study by Marshall (1987) corroborated the validity of Curry's learning style topology. Marshall conducted a study to examine the construct validity of Curry's learning styles "onion" model, with a focus on the information processing level (toponymy), and then determined whether or not the model translated into the instructional preference toponymy. He concluded:

This study does provide evidence that the topology has promise as a tool in learning style research and application. As a starting point, the topology can be used for classifying learning style models and instruments

into a meaningful structure. It can provide a framework for the re-examination of much of the earlier research and for conducting future research. (pp. 426-427).

The following three sections focus on each layer of the topology. Eighteen of the 21 learning style inventories and their conceptualizations are reviewed according to the layer they are classified within (Table 1). This discussion focuses on the North American and Australian learning style conceptualizations. Sixteen North American learning style inventories fall within all three layers. Two Australian learning style inventories fit within the information processing layer.

#### Learning Style as Instructional Preference

The outermost layer of Curry's topology, which is the most observable, is entitled Instructional Preference. Eight of the learning style research groups concerned themselves with the instructional preference or the individual's choice of environment in which to learn. Since this layer interacts most directly with learning environments, learner expectations, teacher expectations and other external features, it is expected that instructional preference is the least stable across time, and the most easily influenced level of measurement in the learning arena (Curry, 1987).

Table 1. North American and Australian Learning Style Inventories

Author and Name of Inventory	Level of Curry's Topology	Key Concepts	Overall Validity and Reliability Ratings
Canfield. Learning Styles Inventory 1976	Instructional Preference	Rank order 120 items to investigate: Conditions of learning, context of learning, mode of learning and expectations for learning.	Poor reliability Poor validity
Dunn, Dunn and Preice. Learning Style Inventory 1975, 1984.	Instruction Preference	100 self-report true false items to investigate: Environmental elements, emotional elements, physical elements, sociological elements and psychological elements.	Good reliability Good validity
Friedman and Stritter. Instructional Preference Questionnaire. 1976	Instructional Preference	40 self-report Likert-scale items to investigate student preference for: Pacing, influence over learning, media active role in learning and feedback in learning.	Fair reliability Fair validity
Goldberg. Oregon Instructional Preference Inventory. 1963	Instructional Preference	82 items completed in a 2 alternative forced choice format to indicate "those characteristics of college students which predispose them towards learning more effectively."	Fair reliability Poor validity
Grasha and Riechman. Student learning Style Inventory. 1974	Instructional Preference	90 items-likert-scale, which describe the learner along 3 bipolar scale dimensions: Independent-dependent, avoidant-participant, and collaborative-competitive.	Fair reliability Fair validity
Hill. Cognitive Style Interest Inventory. 1976	Instructional Preference	216 items, Likert scale. To measure 27 scales in 3 areas: Symbols and their meaning, cultural determinants, and modalities of inference.	No reliability evidence No validity evidence
Renzulli and Smith. Learning Styles Inventory. 1978	Instructional Preference	65 Items, Likert scale. 9 scales which measure: Student preferences for projects, drills and recitation, peer teaching, discussion, teaching games, independent study, programmed instruction, lecture and simulation.	Poor reliability Fair validity

Table 1. (continued)

Author and Name of Inventory	Level of Curry's Topology	Key Concepts	Overall Validity and Reliability Ratings
Rezler and Rezmovic. Learning Preference Inventory. 1974	Instructional Preference	15 items, rank order 6 choices of 3 bipolar concepts: Abstract vs concretes, individual vs inter-personal, and student structure vs teacher structure.	Good reliability Fair validity
Biggs. Study Process Questionnaire. 1986 (Australian)	Information Processing	42 Likert scale self report items, asking about motive-strategy dimensions which are: Surface, deep, achieving and deep achieving.	Good reliability Fair validity
Entwistle and Ramsden. Approaches to studying. 1983 (Australian)	Information Processing	64 self-report Likert scale items, 4 scales representing: Meaning orientation, reproducing orientation, achieving orientation, and holistic orientation.	Good reliability Good validity
Hunt. Paragraph Completion Method. 1971	Information Processing	6 open-ended sentences to be completed by students, and to be rated on conceptual complexity, interpersonal, maturity, and self-other understanding.	Fair reliability Fair validity
Kolb. Learning Style Inventory. 1971, 1981, 1985	Information Processing	12 sentence stems rank order completers measuring 4 scales representing bipolar concepts: Concrete experience, abstract conceptualization, reflective observation and active experimentation.	Strong reliability Fair validity
Schroeder. Paragraph Completion Test. 1967	Information Processing	Completion of 5 open-ended sentence stems about the following issues: Disagreements, doubt, rules, criticism, and confusion.	Good reliability Fair validity
Reinert. Edmonds Learning Style Identification Exercise. 1976	Information Processing	50 words read aloud individually to respondent who reacts with a forced choice among 4 alternatives: Visualization, written, listen, activity.	Poor reliability No validity evidence

Table 1. (continued)

Author and Name of Inventory	Level of Curry's Topology	Key Concepts	Overall Validity and Reliability Ratings
Schmeck, Ribich and Ramanaiah. Inventory of Learning Processes. 1977	Information Processing	62 items responded to with true/false format, measuring four scales: Synthesis-analysis, study methods, fact retention, and elaborative processing.	Strong reliability Strong validity
Myers-Briggs. Myers-Briggs type Indicator. 1962	Cognitive Personality	143 forced-choice items, each with 4 alternatives. Each choice is oriented toward 1 of 4 bipolar concepts: Extraversion vs introversion, sensing vs intuition, thinking vs feeling, and judging vs perceiving.	Good reliability Strong validity
Kagan. Matching Familiar Figures Test. 1964	Cognitive Personality	12 visual items to match to a sample. Each item is timed for accuracy of the match. Score places respondent on 1 bipolar scale which measures conceptual tempo: Reflective vs compulsive.	Fair reliability Fair validity
Witkin. Embedded Figures Test. 1969	Cognitive Personality	18 pictorial items; identification of non-meaningful geometric target shapes hidden within non-meaningful geometric shapes. Scores place respondent on 1 bipolar scale: Field dependence vs field independence.	Strong reliability Good validity



The Canfield and Lafferty Learning Styles Inventory (1972) was designed with 120 self-report rank ordered items to investigate 20 scales grouped into four general areas: conditions of learning, content of learning, mode of learning and expectations for learning. The purpose of this inventory was to "identify learner preferences for instruction" (Canfield, 1980). The overall psychometric ratings of the inventory by Curry were the following: poor reliability evidence, and poor validity evidence.

Several versions of the Dunn, Dunn and Price Learning Style Inventory (1977) were defined and rated, as well as a presentation of the overall conception of the inventory. It is composed of 100 self-report true/false items, in order to investigate 24 scales grouped into five categories thought likely to affect learning: environmental elements, emotional elements, physical elements, sociological elements, and psychological elements. The authors proposed that "this instrument analyzes the conditions under which students in grades three through 12 prefer to learn" (Dunn, 1983, p. 496). It was explained that analogous instruments have been developed for use with adults (Dunn & Dunn, 1986) and for grades one and two (Perrin, 1982). The Dunn, Dunn and Price inventory and its theory were placed in the instructional preference layer because the majority of the theory (17 of the 20 scales) describes features of the situations in which learning occurs. The three scales

titled Psychological Elements describe a kind of information processing typically exhibited. These scales fit well into the second layer of Curry's Onion topology. The Dunn, Dunn and Price inventories were psychometrically rated overall as follows: good reliability evidence, and good validity evidence.

The Friedman and Stritter Instructional Preference questionnaire (1976) contains 40 self-report items with Likert-type six point scales used to describe student preferences for pacing, influence over learning, media, active role in learning, and feedback in learning. The authors created this questionnaire in an "attempt to assess student preferences according to empirically defined instructional characteristics..." (Friedman & Stritter, 1976, p. 85). This questionnaire was psychometrically rated as fair in relation to reliability, and fair in terms of validity.

The Goldberg Oregon Instructional Preference Inventory (1963) consists of 82 items to be completed by an individual in a two alternative forced choice format. The items are not organized into scales and range across a wide variety of issues considered important to instructional preference by the author. This instrument was developed to indicate "those characteristics of college students which predispose them towards learning more effectively from one, rather than some other particular instructional format"

(Goldberg, 1972, p. 153). The inventory was psychometrically rated fair in terms of reliability and poor as related to validity.

The Grasha and Riechman Student Learning Style Scales (1974) is a series of self-report, Likert-type five point scale items which describe the learner along three bipolar scale dimensions (independent-dependent, avoidant-participant, and collaborative-competitive). The purpose of this instrument was "to develop an instrument that was based on the type of learning styles students demonstrate in the classroom", which they felt was the appropriate approach "if teachers are to innovate and take student learning needs into consideration" (Riechmann & Grasha, 1974, p. 213). The scales center on how students interact with the teacher, other students, and the learning task, and were rated fair in regard to reliability, as well as fair, in terms of validity.

Hill's (1976) Cognitive Style Interest Inventory is composed of 216 items, each of which involves a 3-point Likert-type scale to be completed by the student. The items are arranged to measure 27 different scales in three areas: symbols and their meanings, cultural determinants, and modalities of inference. The instrument was developed to provide an overall picture of a learner's "mode of behavior in deriving meaning" (Whitley, 1982, p. 25). According to Curry, the majority of scales describe media

preferences and other features of the learning environment. Curry gave the inventory no psychometric rating for reliability or validity.

The Renzulli and Smith (1978) Learning Styles Inventory is composed of 65 items, with 5-point Likert-type scales which the students self report. The items are categorized into nine scales: projects, drills and recitation, peer teaching, discussion, teaching games, independent study, programmed instruction, lecture, and simulation. The author's purpose was to provide teachers with information about "how pleased" students feel when participating in the types of learning environments described by the nine scales. This information was "designed to guide teachers in planning learning experiences that take into account the learning style preferences of students within their classrooms" (Smith & Renzulli, 1983). The psychometric ratings for this Inventory were poor for reliability and fair in relation to validity.

The Rezler and Rezmovic (1974) Learning Preference Inventory (LPI) is composed of 15 items, of which the student is asked to rank order six choices. The choices are descriptive of three bipolar concepts: abstract versus concrete, individual versus interpersonal, and student structure versus teacher structure. The key purpose of the LPI was "to identify preferred modes of learning" with

preference determined by the "choice of one learning situation or condition over another" (Rezler & Rezmovic, 1981 p. 28). The psychometric ratings were good in regard to reliability and fair in terms of validity.

### Learning Styles as Information Processing

Information processing is a set of processes that function at the intersection between fundamental personality levels, individual differences, and environmentally based learning format choices. This is the second or middle layer of the learning style onion topology. Concepts at this level describe the individual's cognitive approach to assimilating information and in that respect these concepts can be related to the classic cognitive information processing model (Gage & Berliner, 1979).

The Biggs (1978) Study Process Questionnaire represents one of the key Australian learning style theories and inventories. It is composed of 42 Likert-type 5 point scale self report items inquiring about motive-strategy dimensions. These dimensions are as follows: surface (instructional versus reproducing), deep (intrinsic versus meaning), and achieving (achievement versus organizing). This instrument was designed to measure these three concepts which the author believes "offers a parsimonious and theoretically coherent model for

conceptualizing the more important ways in which students may feel about, and behave towards their study" (Biggs, 1979, p. 384). This learning style conceptualization, according to Curry, fits less effectively within the onion model than do others. Biggs focused both on the learner's motives for approaching learning in a particular way, and the strategies used to accomplishing that motive. The first emphasis appears to be on instructional preference, and the second emphasis is based on information processing. If the onion model had an intermediary space between the two layers, this would be the place for the Biggs conceptualization and inventory. The psychometric ratings were good for reliability and fair for validity.

The Approaches to Studying Inventory was developed by N.J. Entwistle and Paul Ramsden (1970). This is another learning style theory and inventory which represents the Australian approach to learning style research. The inventory was designed to operationalize concepts developed by Marton (1976) and Pask (1976) based on holistic and serialist learning. Their intent was to define approaches to learning and styles of learning in ways which are directly related to the experience of students. To do this the inventory involved 64 self-report, 5-point Likert scale items. The four scales of the inventory represented the following scores: meaning orientation, reproducing

orientation, achieving orientation, and holistic orientation.

The Entwistle and Ramsden conceptualization, like Biggs, has the elements of both instructional preference and information processing. The Approaches to Studying Inventory was developed to incorporate some of Biggs' questions. Ramsden (1983) has developed the most complete documentation on the Approaches to Studying Inventory to date. He suggests that its best use is for informing teachers about their students' study patterns so that "they will be in a better position to organize their teaching to ensure that students learn effectively" (Ramsden, 1983). Entwistle has compared their Inventory with the Inventory of Learning Processes developed by Schmeck (Schmeck, Ribich, & Ramanaiah, 1977). Schmeck's inventory is the most highly rated instrument described in Curry's model. The psychometric ratings for the Entwistle and Ramsden inventory were good for both reliability and validity.

The Hunt Paragraph Completion Method (1971) encompasses the completion of six open-ended sentences by the students, which are scored by trained raters for their level of "conceptual complexity, interpersonal maturity and self-other understanding" (Miller, 1981, p. 33). The sentence stems deal with responses to: rules, criticism, parents, being disagreed with, uncertainty, and being told.

The instrument received a fair rating for both reliability and for validity.

A similar conceptualization was developed by Schroeder (1967). Schroeder's Paragraph Completion Test (1967) required the completion of 5 open-ended sentence stems, which covered the following issues: disagreements, doubt, rules, criticism and confusion. Both Hunt and Schroeder developed their tests as indicators of "the integrative component of cognitive complexity," which they define as the ability to think in multiple conceptual terms (Curry, 1987, p. 12). Their orientation was towards the structure of thought. The "This I Believe" test developed in 1961 by O.J. Harvey, in cooperation with Hunt and Schroeder, focused on the levels of influenceability of thought, defined by Schroeder in 1967 as the "developmental potential" (Schroeder, 1967). Schroeder's inventory was rated good in terms of reliability, and fair in regard to validity.

The Kolb (1985) Learning Style Inventory contains 12 sentence stems each having four sentence completers to be rank ordered. Responses are organized into bipolar concepts: concrete experience versus abstract conceptualization, and reflective observation versus active experimentation. Kolb's Learning Style Inventory was psychometrically rated as strong in regard to reliability and fair in terms of validity.



Curry (1987) reported that there are four variations of Kolb's model in use. Two derivatives have been developed for business applications: McKenney and Keen (1974) and Honey and Mumford (1982). McKenney and Keen presented a model, without acknowledging Kolb, based on two bipolar concepts (information gathering and information evaluation). The instrument was tested in relation to MBA students by 12 standard reference tests for cognitive factors developed by the Educational Testing Service (1974). Honey and Mumford did credit Kolb for stimulating their model, in which managers were tested to identify four style types (activist, reflector, theorist and pragmatist). Honey and Mumford describe the style types in terms which are quite parallel to Kolb's terms. A third variation of Kolb's model is by Marshall and Merritt (1985) who have designed an alternative measure for the Kolb procedure. A fourth inventory, by Gregorc and Ward (1977) is a Kolb-like bipolar scale (abstract/concrete, and sequential/random) derived from observations and interviews with teachers and learners. The inventory was published without reference to Kolb. The Kolb LSI is the only inventory to have stimulated the development of four other learning style inventories.

The Edmonds Learning Style Identification Exercise (ELSIE) was designed in 1976 by Harry Reinert (1976). The Exercise is based on 50 words read aloud individually to

the respondent, who is asked to describe his or her reaction to the words according to a forced choice from four alternatives: visualization, written (spelling), listen (sound), and activity (feeling). These four alternatives describe the four types of learning methods into which the words are grouped. The objective of this exercise for Reinert was

to provide practical help for the classroom teacher interested in providing more effective counseling for his students. The basic pedagogical principle proposed here is that the student['s] initial contact with new material [should be] by means of his most efficient learning style (Reinert, 1976, p. 160).

The overall psychometric ratings for the ELSIE were poor for reliability and no evidence for validity.

The Schmeck, Ribich and Ramanaiah Inventory of Learning Processes (ILP) (1977) was created by extrapolating ideas from Craik and Lockhart into the area of everyday study methods. The inventory is composed of 62 written items in a true-false format which are responded to by the student. These items are organized into four scales: synthesis-analysis, study methods, fact retention, and elaborative processing. This inventory was designed to assess "the behavioral and conceptual processes which students engage in while attempting to learn new material" (Ribich & Schmeck, 1979, p. 515). The psychometric ratings

for this instrument were strong for both reliability and validity.

Curry found that Schmeck collaborated with Entwistle and Ramsden to produce an instrument combining their approaches in 1984. From the Inventory of Approaches to Studying (Entwistle & Ramsden), and Inventory of Learning Processes (Schmeck, Ribich & Ramanaiah) they used 75 items to compose the combined scales of Entwistle and Ramsden and of the Schmeck instrument. The strong correlation which resulted supported the thematic relationship between these two instruments (Curry, 1987). The collaborated inventory was not psychometrically rated within Curry's study.

#### Learning Style as Cognitive Personality

The third and central layer of the thematic learning style onion topology is cognitive personality style. This concept is defined as an individual's approach to adapting and assimilating information. This adaption does not interact directly with the environment. Rather, these are underlying and relatively permanent personality constructs. These constructs form part of the construct description of personality.

One of the earliest indicators of personality type developed was the Myers-Briggs Type Indicator (MBTI), which was designed in 1962 (Myers, 1962). This inventory was theoretically based on Jung's theory of psychological

types. It contains 143 forced-choice items, each with four alternatives. Each choice is oriented towards one of four bipolar concepts: extraversion versus introversion, sensing versus intuition, thinking versus feeling, and judging versus perceiving. This instrument was designed to measure the constructs in Jung's theory of psychological type; although the last two polarities (judging and perceiving) were proposed by Myers and Briggs. The pattern of results generated by the four bipolar concepts are interpreted in terms of Jungian type theory. This, in turn, is used to predict attitudes and behavior. The overall psychometric ratings were good for reliability and strong for validity.

The work of Jerome Kagan (1964) resulted in the development of the Matching Familiar Figures Test. This test is based on 12 visual items each involving meaningful line drawings and requiring a match to an available target. Each item is timed for accuracy of the match. The scoring places each respondent on a bipolar scale purporting to measure conceptual tempo or the tendency to venture answers with a cursory or careful approach (Curry, 1987). Kagan's labels for this style difference are impulsivity and reflectivity, respectively. The underlying concept of the test was to demonstrate the degree to which people tend to reflect on the validity of hypothesized solutions for problems that contain response uncertainty. The

psychometric ratings were fair for both reliability and validity.

The Witkin (1969) Embedded Figures Test was developed in 1969. It is composed of 18 pictorial items, each involved identification of non-meaningful geometric target shapes hidden within larger non-meaningful geometric shapes. The items are scored for time and accuracy. The scores place respondents on a bipolar scale which measure the degree of field dependence/independence. The measure was designed to reveal a respondent's "general tendency to function at a more differentiated or less differentiated" level (Witkin, 1971).

Another form of the Embedded Figures Test was also developed to be administered in groups. The Group Embedded Figures Test was made available in 1971. More current work by Shade (1984) supports the proposal that Witkin's tests are measuring individual variation in perceptual preference patterns rather than behavioral tendencies. The psychometric ratings overall for Witkin's tests were strong for reliability and good for validity.

#### Summary and Conclusions on Learning Style Concepts and Instruments

According to Curry (1987) learning style researchers "have not yet unequivocally established the reality, utility, reliability or validity of their concepts" (p.

16). On one hand, learning styles may not exist other than as unsubstantial artifacts of the interaction between people and the learning environment. On the other hand, learning styles may be real, and stable enough to be useful to educational planners, specifically those who are concerned about individualized educational programs.

Based on Currey's literature review there were no clear conclusions, due to the variation in results among the 21 instruments. Her emphasis was on the psychometric qualifications of the instruments. Kolb proposed that if one understands learning style as a state as opposed to a trait, due to the interdependence of the learning modes, then one realizes the very low expectancy of any individual in a given sample to be a pure learning style over time. These factors reduce the reliability of the LSI (Geller, 1979). In this way the issue of learning style inventory reliability results become less relevant.

Curry (1987) suggested that more research should be conducted to improve the learning style inventory psychometrics. She stated that people responsible for educational program design and delivery may find the benefit in experimental application of these learning style instruments in an effort to individualize education. This may be done by assuming responsibility to help clients learn about their own learning style, and then to understand the implications for their style in both

teaching and learning settings. This type of understanding will help educators plan or select educational experiences more appropriately, and utilize their habitual styles more effectively. They should seek to match the primary mode of educational delivery to the best learning style information available, and, in turn, apply the information most appropriately to the intended audience (Curry, 1987).

Educators and planners should consider offering a cross section of courses in order that critical course material is offered in a diversity of teaching approaches (methods). "The point is to offer planned variation in teaching approaches that will reinforce or reinterpret course content from didactic, discussion, or practice perspectives" (Curry, 1987, p. 16).

Given the rudimentary and varying psychometric support for the majority of these learning style concepts, Curry recommended (1) not to choose randomly among the 21 inventories, due to the poor general quality of available instruments, it would be unwise to utilize any one instrument as the one true indicator of learning style, (2) that educators administer at least three inventories, each representing the three layers of her topology. Curry made these recommendations in light of there being no unitary concept of learning style.

From the educational philosophy which values context and that people must be viewed as individuals with unique

experiential backgrounds, it is impossible to describe one singular construct for learning style. This philosophy is grounded in Dewey's (1938) educational constructs, and Kolb's views, specifically in reference to their perspectives on experience, education and individuality. In summary, there needs to be many learning style constructs in order to define learning style because humans are unique, although patterns may be observed among the diversity.

With the psychometric and individuality perspectives in mind one recommendation may be suggested. Using only one measure assumes that one inventory is more correct than others. At this time that assumption cannot be made. It may be assumed that with human individuality, multiple descriptions of learning style are necessary. Curry, (1987) recommended "that when making descriptions of individuals, to triangulate upon the concepts of interest by utilizing at least three measures with reasonable psychometric standards at each level of learning style, according to the model" (PP- 17-18). If an investigator wants to use a learning style construct, s/he is well advised to carefully consider the most appropriate level of learning style for application.

Curry concluded that the heuristic value of the onion topology seemed reasonably established, particularly in reference to Marshall's (1987) findings. Learning style



concepts appear to be groupable based on two key organizing principles: (1) similarities in the type of behavior measured and predicted, and (2) similarities in the duration of the effect measured (test-retest reliability) (Curry, 1987, p. 19).

In summary, the Australian learning style instruments either approach learning style as a deeper or a broader, holistic concept, compared to the majority of North American learning style conceptualizations. The North American learning style conceptualizations tend to propose learning style as a more variable, behavioral or instructional preference concept.

## CHAPTER V

THE EFFECT OF KOLB'S FORMULATION OF  
EXPERIENTIAL LEARNING THEORY AND THE LEARNING STYLE  
INVENTORY IN HIGHER EDUCATIONIntroduction

Kolb's greatest contribution to learning theory, as observed by Murrell and Claxton (1987), has been the illumination of the role of learning in individual development. According to Bennis, Kolb has provided "the missing link between the abstract generalization and the concrete instance, between the affective and the cognitive domains" (Kolb, 1984, p.ix).

This chapter presents studies conducted between 1971 and 1990 in higher and adult education which have critiqued, tested, and argued in support or against Kolb's formulation of experiential learning theory and/or the LSI.

The studies reviewed in this research all focused on application or the relationship of the theory and/or LSI to higher or adult education settings: community colleges, colleges, universities and adult education undergraduate and graduate programs and departments, and continuing education.

The Social Sciences Citation Index between 1971 and 1989, listed 679 citations credited to Kolb, which results in an average of 36 citations per year. This research

discusses 81 studies and articles which are representative of the aforementioned educational settings. The 81 studies fell into the following four categories: (1) LSI administered to various special population studies; (2) LSI validity and reliability studies; (3) cross-professional qualitative and quantitative studies on learning styles and Kolb's formulation of experiential learning theory; (4) learning style reviews and topologies of which Kolb's theory and LSI are one component; and the following five academic fields: 1) accounting and business education, 2) the helping professions (career education, counselor education, social work education), 3) medical professions (medical education, nursing education, pharmacy education), 4) postsecondary education, and 5) teacher education.

The following four sections of this chapter present the major studies which resulted in significant findings or that demonstrated the effectiveness or ineffectiveness of Kolb's formulation of experiential learning theory and/or the LSI. Categories one, two, three and four above represent the types of studies which investigated the effect of Kolb's contributions in higher and adult education, and determine the types of studies within each academic area discussed in this chapter.

Researchers have studied the LSI and/or Kolb's formulation of experiential learning theory in the following academic fields: accounting education, business

education, career education, computer education, counselor education; cross-cultural research and education, developmental education, educational psychology, engineering education, English as a second language education, home economics education, hotel management education, instructional media education, mathematics education, medical education, nursing education, pharmacy education, physical education, postsecondary education, psychology, religious education, social work education, speech and communication education, and teacher education.

The studies in each of the following four parts of this chapter are divided into a five academic areas with respect to the types of articles that have been published in each field. These key studies were summarized according to the findings and conclusions. Within each part the studies were discussed with regard to four qualifications: (1) author, date, and title, (2) purpose of the study, (3) the key approach(es) of the study/article, (theory discussion and/or critique, practical use of theory or LSI, revision of theory or LSI, testing theory or LSI), and (4) supportive or nonsupportive of the Kolb formulation of experiential learning theory and/or LSI. Tables 2, 3, 4, 5, and 6 list the articles of the four parts in their respective academic areas, and descriptive data in reference to overall study trends (table 6).

Table 2. Part 1 - LSI Administered to Special Populations

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
<b>Accounting and Business Education</b>					
Biberman & Buchanan	1986	Business Ed.	<sup>d</sup> 4) test the application of the LSI	<sup>c</sup> 1	"Learning Style and Study Skills Differences Across Business and Other Academic Majors"
Baker, Simen & Bazeli	1987	Accounting Ed.	<sup>a</sup> 1) discussion of the experiential learning theory & LSI <sup>b</sup> 2) use of the LSI and experiential theory	<sup>c</sup> 1	"Selecting Instructional Design for Introductory Accounting Based on the Experiential Learning Model"
Collins & Milliron	1987	Accounting Ed.	<sup>a</sup> 1) discussion of learning style theory <sup>b</sup> 2) use of the LSI	<sup>c</sup> 1	"A Measure of Professional Accountants' Learning Style"
Coulter, Coulter, Widing & Schultz	1990	Business Ed.	<sup>a</sup> 1) theory discussion <sup>d</sup> 4) test learning style theory	<sup>c</sup> 1	"Primary Learning Styles and Preferred Teaching Techniques in Marketing Ed.: An Explanatory Study"
Brown & Burke (Canadian)	1987	<sup>b</sup> Accounting Ed.		<sup>c</sup> 1	"Accounting Education: A Learning Style Study of Professional - Technical and Future Adaption Issues"
<b>Helping Professions</b>					
Kurzich, Friesen & Van Soest	1986	Social work	<sup>a</sup> 1) discussion of learning style theory <sup>b</sup> 2) use of LSI	<sup>c</sup> 1	"Assessment of Student & Faculty Learning Styles: Research & Application"

<sup>a</sup> Discussion

<sup>b</sup> Use

<sup>c</sup> Revision

<sup>d</sup> Testing theory/LSI

<sup>e</sup> Support (I)

<sup>f</sup> Non-Support (II)

<sup>g</sup> Partial support and non-support (I & II)

<sup>h</sup> Not reviewed in text, but referred to

Table 2. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
<b>Medical Education</b>					
Whitney & Caplan	1978	Medical Ed.	<sup>a</sup> 1) learning style discussion theory <sup>b</sup> 2) use of the LSI	<sup>a</sup> 1	"Learning Styles & Instructional Preferences of Family Practice Physicians"
Baker, Wallace, Cooke Alpert & Ackerly	1986	Anesthesiology Ed.	<sup>a</sup> 1) discussing of learning style theory <sup>b</sup> 2) use of LSI	<sup>a</sup> 1	"Success in Residency as a Function of Learning Style"
Baker, Wallace & Cooke	1987	Anesthesiology Ed.	<sup>b</sup> 2) use of LSI	<sup>a</sup> 1	"Learning Style Distribution: A Consistent Relationship Between Faculty & Residents"
Baker, Cooke, Conroy, Bromley, Hotton, Alpert	1988	Anesthesiology Ed.	<sup>a</sup> 1) discussion of learning style theory <sup>b</sup> 2) use of LSI	<sup>a</sup> 1	"Beyond Career Choice: The Role of Learning Style Analysis in Residency Training"
Wunderlich & Gjerde	1978	Medical Ed.	<sup>a</sup> 1) discussion of learning style theory <sup>d</sup> 4) testing LSI	<sup>f</sup> II	"Another Look at Learning Style Inventory & Medical Career Choice"
<b>Nursing Education</b>					
Lassan	1984	Nursing Ed.	<sup>a</sup> 1) discussion learning style theory <sup>b</sup> 2) use of LSI	<sup>a</sup> 1	"Learning Style Differences: Registered Nurse Students vs. Generic Student Nurses at the Baccalaureate Level"
Laschinger	1989	<sup>b</sup> Nursing Ed.	<sup>a</sup> 1) discussion learning style theory <sup>b</sup> 2) use of LSI	<sup>a</sup> 1	"Review of Experiential Learning Theory Research in the Nursing Profession"
Merritt	1983	Nursing Ed.	<sup>a</sup> 1) discussing of learning style theory <sup>c</sup> 3) revision of LSI <sup>d</sup> 4) test learning style (LSI)	<sup>f</sup> II	"Learning style Preferences of Baccalaureate Nursing Students"

Table 2. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
<b>Pharmacy Education</b>					
Garvey, Bootman & McGhan	1984	Pham. Ed.	*1) discussion of the theory and LSI b2) use of the LSI	*I	"An Assessment of Learning Styles among Pharmacy Students"
<b>Postsecondary Education</b>					
Strange	1978	Postsec. Ed.	*1) discussion of learning style theory b2) use of LSI	*I	"Intellectual Development, Motive for Education & Learning Styles during the College Years: A Comparison of Adult of Traditional-Age College Students"
Dorsey & Pierson	1984	Postsec. Ed.	*1) discussion of learning style theory b2) use of the LSI	*I	"A Descriptive Study of Adult Learning Styles in a Nontraditional Education Program"
Groetsch	1986	Postsec. Ed.	*1) discussion of learning style theory b2) use of LSI	*I	"Student Preferences for Particular Instructional Strategies in a Master of Arts Program & Their Relationship to Kolb's Learning Style Inventory"
<b>Teacher Education</b>					
Dunn, M.B.	1982	Teacher Ed.	*1) discussion of learning style theory b2) use of LSI d4) testing of LSI	II	"Preferred Learning Styles of Teachers as Determined by Kolb's LSI"
Van Cleaf & Schkade	1987	Teacher Ed.	*1) discussion of learning style theory b2) use of LSI	*I	"Student Teacher Learning Styles: Another Dimension of Reform"

Table 3. Part 2 - LSI Validity and Reliability Studies

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
<b>Accounting &amp; Business Education</b>					
Freedman & Stumpf	1978	Business Ed. (management)	<sup>a</sup> 1) discussion of learning style theory <sup>d</sup> 4) testing the LSI	<sup>f</sup> II	"What Can One Learn from the Learning Style Inventory"
Freedman & Stumpf	1980	Business Ed.	<sup>a</sup> 1) discussion of the learning style theory and the LSI	<sup>f</sup> II	"Learning Style Theory: Less than Meets the Eye"
Stumpf & Freedman	1981	Business Ed.	<sup>a</sup> 1) discussion of learning style theory and LSI	<sup>f</sup> II	"The Learning Style Inventory: Still Less than Meets the Eye"
Kolb	1981	Business Ed.	<sup>a</sup> 1) discussion of experiential learning theory and LSI	<sup>e</sup> I	"Experiential Learning Theory and the Learning Style Inventory: A Reply to Freedman & Stumpf"
Lamb & Certo	1978	Business Ed.	<sup>a</sup> 1) discussion of life style theory and LSI <sup>c</sup> 3) revision of LSI <sup>d</sup> 4) testing the LSI	<sup>f</sup> II	"The Learning Styles Inventory (LSI) & Instrument Bias"
Sims, Veres, Watson & Buckner	1986	Business Ed.	<sup>a</sup> 1) discussion of life style theory and LSI <sup>d</sup> 4) testing the LSI	<sup>g</sup> I & II	"The Reliability & Classification Stability of the Learning Style Inventory"
Certo & Lamb	1980	Business Ed.	<sup>a</sup> 1) discussion of learning style theory and experiential life theory <sup>c</sup> 3) revision of LSI <sup>d</sup> 4) testing of LSI	<sup>f</sup> II	"An Investigation of Bias within the Learning Styles Inventory through Factor Analysis"
Beutell & Kressel	1984	<sup>h</sup> Business Ed.	<sup>a</sup> 1) discussion of the LSI <sup>d</sup> 4) testing of the LSI	<sup>f</sup> II	"An Investigation of Kolb's Learning Styles Inventory: Social Desirability and Normative Scoring"

<sup>a</sup> Discussion

<sup>b</sup> Use

<sup>c</sup> Revision

<sup>d</sup> Testing theory/LSI

<sup>e</sup> Support (I)

<sup>f</sup> Non-Support (II)

<sup>g</sup> Partial support and non-support (I & II)

<sup>h</sup> not reviewed in text but referred to



Table 3. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
<b>Helping Professions</b>					
Fox	1984	Continuing Med. Ed. for Health Prof.	*1) discussion of LSI (learning style inventory) d4) testing of the LSI	<sup>f</sup> II	"Learning Styles & Instructional Preferences in Continuing Education for Health Professionals: A Validity Study of the LSI"
Highhouse & Doverspike	1987	Career Education	*1) discussion of learning style theory d4) testing of LSI	<sup>f</sup> II	"The Validity of the Learning Style Inventory 1985 as a Predictor of Cognitive Style and Occupational Preference"
Atkinson	1988	<sup>b</sup> Sociology	*1) discussion of the LSI d4) testing of the LSI	<sup>f</sup> II	"Reliability of the Learning Style Inventory - 1985"
<b>Medical Professions</b>					
Geller	1979	Medical Ed.	*1) discussion of the LSI d4) testing the LSI	<sup>f</sup> II	"Reliability of the Learning Style Inventory"
West	1982	Medical Ed.	*1) discussion of the LSI d4) testing the LSI	<sup>f</sup> II	"A Construct Validity Study of Kolb's Learning Style Types in Medical Education"
Merritt & Marshall	1984	Nursing Ed.	*1) discussion of the learning style theory	<sup>a</sup> I & II	"Reliability & Construct Validity of Ipsative & Normative Forms of the Learning Style Inventory"
Marshall & Merritt	1985	Nursing Ed.	*3) revision of the LSI d4) testing the LSI	<sup>f</sup> II	"Reliability & Construct Validity of Alternate Forms of the Learning Style Inventory"

Table 4. Part 3 - Cross-Professional Qualitative and Quantitative Studies of Learning Styles and Kolb's Formulation of Experiential Learning Theory

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
<b>Accounting &amp; Business Education</b>					
Kolb	1976	Business Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use of the theory	<sup>c</sup> I	"Management and the Learning Process"
Wolfe & Byrne	1976	Business Ed.	<sup>a</sup> 1) theory discussion <sup>d</sup> 4) testing learning styles theory	<sup>e</sup> I & II	"A Comparison of Perceived Learning in Three Pedagogically Different Sections of a Required Business Policy Course"
Certo	1977	Business Ed.	<sup>d</sup> 4) testing theory	<sup>c</sup> I	"Stages of the Kolb-Rebin-McIntyre Experiential Learning Model and Perceived Trainee Learning: A Preliminary Investigation"
Sims & Sauser	1985	Business Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use	<sup>c</sup> I	"Guiding Principles for the Development of Competency - Based Business Curricula"
Gray, Quick & Laird	1979	Business Ed.	<sup>a</sup> 1) theory discussion	<sup>c</sup> I	"A Contingency Model of the Management Learning Environment"
Randolph & Posner	1979	Business Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) practical use	<sup>c</sup> I	"Designing Meaningful Learning Situations in Management: A Contingency, Decision-Tree Approach"
Brenenstuhl & Catalanello	1979	Business Ed.	<sup>d</sup> 4) testing theory & LSI	<sup>c</sup> I	"Can Learning Styles be Used as Curriculum Aids"

<sup>a</sup> Discussion

<sup>b</sup> Use

<sup>c</sup> Revision

<sup>d</sup> Testing theory/LSI

<sup>e</sup> Support (I)

<sup>f</sup> Non-Support (II)

<sup>g</sup> Partial support and non-support (I & II)

<sup>h</sup> Not reviewed in text, but referred to

Table 4. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
Hunsaker	1981	Business Ed.	<sup>a</sup> 1) theory discussion	<sup>a</sup> I & II	"The Experiential Learning Model and the learning Style Inventory: An Assessment of Current Findings"
Carricato, D.L.	1982	Business Ed.	<sup>b</sup> 2) use <sup>d</sup> 4) testing theory	<sup>c</sup> I	"The Implementation and Evaluation of a Practical Management Development Course Based on Experiential Learning"
Noel & Sims	1984	Business Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use	<sup>c</sup> I	"An Experiential learning Model for Continuing Education"
Pollack	1984	Business Ed.	<sup>d</sup> 4) testing the LSI & learning style theory	<sup>c</sup> II	"The Relationship Between Matching University Students' Learning Styles & Their Teacher's learning Style and Business School Course Achievement"
Brenenstuhl & Catalanello	1976	<sup>b</sup> Business Ed.	<sup>a</sup> 1) theory discussion and description	<sup>c</sup> I	"An Analysis of the Impact upon the Learning Effectiveness of Traditional Instruction Simulation Gaming & Experiential Learning Teaching Methodology: An Experimental Design"
<b>Helping Professions</b>					
Pelsma	1982	Career Ed.	<sup>d</sup> 4) testing learning style theory & LSI	<sup>c</sup> I	"Effects of Learning Style on Satisfaction with A System of Interactive Guidance & Instruction (SIGI)"
Sugarman	1985	Counselor Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use	<sup>c</sup> I	"Kolb's Model of Experiential Learning: Touchstone for Trainers, Students, Counselors & Clients"
Abbey, Hunt & Weiser	1985	Counselor Ed.	<sup>a</sup> 1) theory discussion <sup>c</sup> 3) revision	<sup>a</sup> I & II	"Variations on a Theme by Kolb: A New Perspective for Understanding counseling & Supervision"

Table 4. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
Pelsma & Borgers	1986	Counseling Psychology Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use	<sup>a</sup> I	"Experience - Based Ethics: A Developmental Model of Learning Ethical Reasoning"
<b>Medical Professions</b>					
Sadler, Plovnick & Snope	1978	Medical Ed.	<sup>d</sup> 4) testing LSI <sup>b</sup> 2) use	<sup>a</sup> I	"Learning Styles and Teaching Implications"
Christensen, Lee & Bugg	1979	Nursing Ed.	<sup>d</sup> 4) testing learning style theory	<sup>a</sup> I & II	"Professional Development of Nurse Practitioners: As a Function of Need Motivation, Learning Style, and Locus of Control"
<b>Postsecondary Education</b>					
Weathersby	1977	Adult & Higher Ed.	<sup>a</sup> 1) theory discussion <sup>c</sup> 3) revision	<sup>a</sup> I	"A Developmental Perspective on Adults' Formal Uses of Education"
Fry & Kolb	1979	Adult & Higher Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) practical use	<sup>a</sup> I	"Experiential Learning Theory & Learning Experiences in Liberal Arts Education"
Kolb	1981	Higher Ed.	<sup>a</sup> 1) theory discussion	<sup>a</sup> I	"Learning Styles and Disciplinary Differences"
Gypen	1981	Adult Ed.	<sup>b</sup> 2) practical use <sup>d</sup> 4) testing theory	<sup>a</sup> I	"Learning-Style Adaption in Professional Careers: The Case of Engineers and Social Workers"
Claxton, Adams and Williams	1982	Higher Ed.	<sup>a</sup> 1) theory discussion	<sup>a</sup> I	"Using Information on Student Learning Styles to Improve Educational Practices"
Claxton & Murrell	1987	<sup>b</sup> Adult & Higher Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use	<sup>a</sup> I	<u>Learning Styles: Implications for Improving Educational Practices</u>

Table 4. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
Mark & Menson	1982	Adult & Higher Ed.	*1) theory discussion b2) use c3) revision	*I	"Using David Kolb's Experiential Learning Theory in Portfolio Development Courses"
Dixon	1982	Adult Ed.	*1) theory discussion b2) use	*I	"Incorporating Learning Style into Training Design"
Rush	1983	Adult Ed.	*1) theory discussion d4) testing of theory	*I & II	"Comparative Study of Learning Styles & Related Factors between Traditional & Non-traditional Students at the University of Akron"
McCall	1983	Adult Ed.	*1) theory discussion d4) testing of learning style theory	*I & II	"Effects of Learning Style & Learning Environment on Achievement by Levels of Learning"
Mentkowski & Strait	1983	Higher Ed.	*1) theory discussion b2) use	*I	"A Longitudinal Study of Student Change in Cognitive Development and Generic Abilities in an Outcome - Centered Liberal Arts Curriculum"
Koch	1984	Adult & Higher Ed.	*1) theory discussion b2) testing theory	*I	"Assessment of Dominant Learning Styles and Preference for Teaching Methods in Adult Students Attending a Small Liberal Arts College"
Williams	1984	Adult Ed.	*1) theory discussion b2) practical use	*I	"Designing Learning Activities for Adults: A Practical Approach"
deHainer	1985	Postsec. - English as a Second Language	*1) theory discussion b2) use of learning style theory	*I	"Learning Styles: A New Approach to Teaching ESL"
Lieberman	1986	Higher Ed.	*1) theory discussion d4) testing of learning style theory	*I & II	"The Effect of Congruence between Learning/Teaching Styles on Student Retention at Broward Community College"

Table 4. (Continued)

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
Baxter-Magolda	1987	Higher Ed.	*1) theory discussion & critique d4) testing LSI & theory	*I & II	"Gender Differences in Cognitive Development"
Korhonen & McCall	1987	Postsecondary Ed.	*1) theory discussion d4) testing the learning style theory	*I & II	"The Interaction of Learning Style and learning Environment on Adult Achievement"
Vondrell & Sweeney	1989	Postsecondary Ed.	*1) theory discussion (learning style theory only) d4) testing the learning style theory	*I	"Independent Study: Using Learning Style Assessment to Predict Student Success"
<b>Teacher Education</b>					
Banks	1977	Teacher Ed.	*1) theory discussion d4) testing theory	*I	"An Examination of the Relationships among the Teachers' Learning Style, Principal's Learning Style, and the Degree of Teacher's Satisfaction with the Principal's Job Performance"
Phi Delta Kappa - Newsletter	1980	Teacher Ed.	*1) theory discussion	*I	"On Mixing and Matching of Teaching and Learning Style"
Kotar	1980	Teacher Ed.	*1) theory discussion and critique d4) testing of theory & LSI	*I & II	"An Investigation of a Learning Style Inventory with Selected Educational Groups"
Fitzgibbon	1987	Teacher Ed.	*1) theory discussion b2) use of theory & LSI	*I	"Kolb's Experiential Learning Model as a Model for Supervision of Classroom Teaching for Student Teachers"

Table 5. Part 4 - Learning Style Reviews and Topologies

Investigators	Date	Field of Study	Key Approaches	Support	Title of Study
Dunn & DeBello	1981	Teacher Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use of LSI & learning style theory	<sup>c</sup> I	"Learning Style Researchers Define Differences Differently"
Ferrell	1983	Teacher Ed.	<sup>d</sup> 4) testing the learning style theory and LSI	<sup>e</sup> I & II	"A Factor Analytic Comparison of Four Learning Styles Instruments"
Tenore	1984	Education (Ed. Psychology)	<sup>a</sup> 1) theory discussion <sup>d</sup> 4) testing learning style theory and LSI	<sup>f</sup> II	"An Exploratory Study of the Interrelationships Among Variables which Impinge on Cognitive/Learning Styles"
Sewall	1986	Education		<sup>f</sup> II	"The Measurement of Learning Style: A Critique of Four Assessment Tools"
Marshall	1987	Postsecondary Ed.	<sup>a</sup> 1) theory discussion <sup>d</sup> 4) testing the learning style theory	<sup>c</sup> I	"Examination of a Learning Style Topology"
Davidman & Chiarelott	1987	Teacher Ed.	<sup>a</sup> 1) theory discussion <sup>b</sup> 2) use of theory and LSI	<sup>c</sup> I	"Analyzing Diverse Learning Style Conceptions and Approaches: A Synthesis of Learning Style Informal Education"
Bonham	1988	Postsecondary Ed.	<sup>a</sup> 1) theory and LSI discussion and critique	<sup>f</sup> II	"Learning Style Instruments: Let Buyer Beware"
Karrer	1988	Education	<sup>a</sup> 1) theory and LSI discussion of critique <sup>b</sup> 2) use of the LSI	<sup>c</sup> I	"Comparison of Learning Style Inventories (LSI)"
Rule & Grippin	1988	Postsecondary Ed.	<sup>a</sup> 1) theory and LSI discussion of critique <sup>b</sup> 2) use of the LSI	<sup>f</sup> II	"A Critical Comparison of Learning Style Instruments Frequently used with Adult Learners"

<sup>a</sup> Discussion

<sup>b</sup> Use

<sup>c</sup> Revision

<sup>d</sup> Testing theory/LSI

<sup>e</sup> Support (I)

<sup>f</sup> Non-Support (II)

<sup>g</sup> Partial support and non-support (I & II)

Table 6. Study Trends

Part #	Total Studies in Part	Studies that Support	Studies that do not Support	Studies that do and do not Support
1	18	15	3	-
2	14	2	10	2
3	40	29	1	10
4	9	4	4	1
<b>Totals</b>	<b>81</b>	<b>50</b>	<b>18</b>	<b>13</b>
<b>Percentages</b>		<b>61.7%</b>	<b>22.2%</b>	<b>16.1%</b>

## Part # 1

Academic Area	Total Studies in Part	Studies that Support	Studies that do not Support	Studies that do and do not Support
Accounting & Business Education	4	4	0	0
Helping Professions	1	1	0	0
Medical Education	8	6	2	0
Post Secondary Education	3	3	0	0
Teacher Education	2	1	1	0
<b>Totals</b>	<b>18</b>	<b>15</b>	<b>3</b>	<b>0</b>
<b>Percentages</b>		<b>83.3%</b>	<b>16.7%</b>	<b>0%</b>



**Part # 2**

<b>Academic Area</b>	<b>Total Studies in Part</b>	<b>Studies that Support</b>	<b>Studies that do not Support</b>	<b>Studies that do and do not Support</b>
Accounting & Business	8	1	6	1
Helping Professions	2	0	2	0
Medical Education	4	1	2	1
<b>Totals</b>	<b>14</b>	<b>2</b>	<b>10</b>	<b>2</b>
<b>Percentages</b>		<b>14.3%</b>	<b>71.4%</b>	<b>14.3%</b>

**Part # 3**

<b>Academic Area</b>	<b>Total Studies in Part</b>	<b>Studies that Support</b>	<b>Studies that do not Support</b>	<b>Studies that do and do not Support</b>
Accounting & Business	12	9	1	2
Helping Professions	4	3	0	1
Medical Education	2	1	0	1
Post Secondary Education	18	13	0	5
Teacher Education	4	3	0	1
<b>Totals</b>	<b>40</b>	<b>29</b>	<b>1</b>	<b>10</b>
<b>Percentages</b>		<b>72.5%</b>	<b>2.5%</b>	<b>25.0%</b>

**Part # 4**

<b>Academic Area</b>	<b>Total Studies in Part</b>	<b>Studies that Support</b>	<b>Studies that do not Support</b>	<b>Studies that do and do not Support</b>
Post Secondary Education	3	1	2	0
Teacher Education	3	2	0	1
Education	3	1	2	0
<b>Totals</b>	<b>9</b>	<b>4</b>	<b>4</b>	<b>1</b>
<b>Percentages</b>		<b>44.4%</b>	<b>44.4%</b>	<b>11.1%</b>

## Part 1 - The LSI Administered to Special Populations

The majority of the studies reviewed, which were based in higher education or professional education, involved the Kolb Learning Style Inventory. Kolb's formulation of experiential learning theory, from which the LSI was derived, was initially proposed in a working paper entitled "Individual Learning Styles and the Learning Process" in 1971. Kolb's initial desire to present a formulation of experiential learning theory grew out of his first disconcerting experience as a college professor at M.I.T. in 1965. He explained:

I started teaching MBA students by standing up and lecturing about motivation and psychological ideas. It was very didactic and, they really didn't want to know about motivation. They wanted to know about how to run companies. So it was, I guess in that sense, my own ineffectiveness as a teacher that stimulated me to say is there another way to look at learning and to make these classes somewhat more valuable in the eyes of the students.

And in another context at the time, in the Peace Corps [training] we had begun working on the experiential learning model as it evolved in the laboratory T-group methodology, which of course goes back to Lewin (Kolb, 1990).

The previous quotation offers a description of Kolb's originating experiences which stimulated his formulation of experiential learning theory and the LSI. Kolb initially drew from Lewin's theory of learning for his formulation of

experiential learning theory. By 1971 the LSI was published. The following quote by Kolb offers a description of his cross-professional interest in experiential learning theory and the LSI:

That [this] model of learning and development seems to be a framework that people can use in different professions to conceptualize issues of learning and development within their profession. And what I've been interested in is kind of cross-profession comparisons. So, because you have a kind of consistent model or framework, you can begin to comparatively look at issues like, engineering, for example, tends to increase people in the convergent quadrant and nursing tends to increase people in the accommodative quadrant. (Kolb, 1990)

The studies presented in part one are listed by academic area in Table 2.

#### Accounting and Business Education

The four studies, (Biberman & Buchanan, 1986; Baker, Simon & Bazeli, 1987; Collins & Milliron, 1987; and Coulter, Coulter, Widing & Schultz, 1990), demonstrated support and/or significant findings which substantiated the Kolb LSI or formulation of experiential learning theory. The studies are presented chronologically, with a focus on findings and conclusions. Some cross-study comparisons are made among the four studies.

Biberman and Buchanan's (1986) study "Learning Style and Study Skill Differences Across Business and Other Academic Majors" used Kolb's LSI as the major test instrument. The key purpose of the study was to determine how three variables, two LSI scales and the LASSI scale, discriminated among four business majors. The approach used in the study was to test the application of the LSI. The study was supportive of the LSI overall. The three scales, (two LSI scales and the LASSI), were analyzed with a discriminant analysis. The standard deviations of the LSI scores indicated a great degree of variation for students of each major, with economics, finance and marketing showing the least variation in LSI scores. Observing the univariate Wilk's Lambda and F ratios significant differences at the .01 level occurred between the means of the majors on the two composite LSI scores (AC-CE and AE-RO).

The key conclusion was that the two composite scores of the LSI were the most responsible for discriminating between the majors. Their findings further demonstrated that business majors tend to have learning styles of all four types (divergers, assimilators, convergers and accommodators). Whereas Kolb's studies, (10 years previously), showed that business majors were predominantly the accommodator learning style. Biberman and Buchanan (1986) felt that their results suggested that business

majors came from much more diverse backgrounds as compared to their counterparts of ten years ago. Their comparison of "then and now" results also suggested that generalizing about learning style types of various college majors may not always be appropriate, considering the variation in sample size and historical time period.

The first accounting education study discussed is by Baker, Simon and Bazeli (1987). This study presented the experiential learning model and discussed it in relation to teaching modes available to accounting educators. The LSI (1985) was used to determine (1) the learning preferences for a group of 207 introductory accounting students, and (2) to profile an accounting class for their learning styles in order to predict the amount of discomfort students were having in class during specific stages of the experiential learning/teaching cycle. The approaches used were discussion of the experiential learning theory and LSI and use of the LSI.

This study found that the learning style data resulted in a diversity of learning styles with a predominance of two styles; convergers (31%) and assimilators (44%). The second major finding was the large number of introductory students who had significantly unbalanced learning styles.

The authors strongly advocated that the use of Kolb's experiential learning model provides a framework for an

integrated approach to instruction, which moves students through the four stages of the learning cycle.

Another accounting education study by Collins and Milliron (1987), focused on professional accountants' learning styles. The study emphasized the professional setting as opposed to higher education.

The learning style measures were obtained from practicing accountants in large and small CPA firms, and from one large company. The key approaches were to discuss the learning style theory and to consider the use of the LSI as related to the accounting profession. The investigators found that accountants are characterized by a dominant learning style, converger, that does not vary significantly across career paths or specialty areas. They also found that this style is more prevalent among accountants within management as opposed to staff positions. This dominant learning style corroborated the same findings of college business majors in Brown and Burke's (1987) Canadian study, and Baker, Simon and Bazeli's (1987) study.

The investigators concluded that learning styles and related issues are of special relevance to educators. The key question was if learning style homogeneity within accounting should be promoted through counseling or screening students, or whether it is better to encourage diversity. Based on Kolb's developmental theory, diversity

would be the recommendation. The investigators clearly acknowledged and supported the awareness and application of learning styles and Kolb's formulation of experiential learning theory.

Coulter, Coulter, Widing and Schultz (1990) conducted a study in marketing education whose central purpose was to determine if marketing students, representing a crosssection of Kolb's four learning styles, would reflect group preferences for alternative teaching techniques. Their approaches were to discuss theory and test the learning style theory. The study was supportive. Overall, this study was described as exploratory in nature, and investigated if student preferences for particular types of teaching experiences are related to their primary learning styles and related learning skills.

The sample totalled 37 subjects, whose learning styles spread relatively evenly among the four learning styles: seven accommodators, nine divergers, 12 assimilators, and nine convergers. This even distribution of the four learning styles is parallel to Biberman and Buchanan's (1986) findings: business majors tend to have learning styles of all four types.

Using the ANOVA data analysis to examine the differences in preferred teaching methods across the four primary learning styles, five of the six teaching methods - lectures, cases, outside class projects, in-class projects,

guest speakers - were found to be significantly related among the four learning style groups. Only the preference for field trips did not significantly differ across the learning style groups.

Overall, the investigators concluded that students may not be receiving enough diversity in teaching techniques which, in turn, would allow students to enjoy and fully use all of their learning skills. The authors suggested that by using a greater variety of teaching techniques, students would be stimulated to use learning skills not considered to be their primary strengths. In this way students would be better prepared for the work place. These concluding statements are clearly congruent with the meaning of Kolb's learning cycle.

Coulter, Coulter, Widing and Schultz's (1990) study substantiated Kolb's formulation of experiential learning theory, and further observed that it was reasonably clear that experiential tools are under utilized in marketing education. They strongly recommended the use of experiential learning techniques, and established a tentative link between certain learning styles and teaching method preferences in marketing.

Baker, Simon and Bazeli (1987), as well as Collins and Milliron (1987), acknowledged that learning awareness by educators would make accounting education more effective, but did not make any connections to specific teaching



methodologies. It was further observed by Coulter, Coulter, Widing and Schultz that it was reasonably clear that experiential tools were under utilized in marketing education. They strongly recommended the use of experiential learning techniques, and established a tentative link between certain learning styles and teaching method preferences in marketing education.

### Helping Professions

Social Work Education- The second academic area investigated with regard to LSI studies was the helping professions. The only study to represent this area and support the LSI was a descriptive study by Kurzich, Friesen and Van Soest (1986). This study reported the learning styles of students, faculty and field instructors in three schools of social work.

The three key questions raised by the investigators were:

- (1) What are the predominant learning styles of social work students and faculty?
- (2) Are characteristics such as age, experience, and choice of concentration related to particular learning styles?
- and (3) How can information about the learning styles of students and teachers be used to inform the educational process? (p. 23)

The key approaches of this study were the discussion of learning style theory and the use of the LSI. The faculty as a group, which represented all three colleges,

were predominantly of the converger learning style. In contrast, it was shown that the majority of graduate students and field instructors were divergers. The undergraduate students were most predominantly accommodators.

With regard to the question of learning style differences associated with sociodemographic characteristics of age, gender or major concentration (graduate students), the chi square analysis revealed no differences on the LSI by gender. In the analysis by age, (students older and younger than 28), it was found that the majority of students in each group were accommodators. The older students were more likely to be divergers, with the younger students more equally divided among the three other learning styles. A noticeable difference related to the analysis by gender was that only 3% of the men were convergers as compared to 12% of the women. When examining the specialization in the masters program, it was found in both specializations, (administration or direct services), that older students were more likely to be divergers and the younger students were almost equally divided among the learning styles.

The predominant learning style of faculty who teach planning, administration and policy was assimilator. Only 6% of the faculty in the direct services instruction area had the assimilator learning style. The majority (65%) of

faculty in this area were convergers. Faculty who were either accommodators or divergers reported that they were involved in outside practice or consultation.

The investigators concluded that the lack awareness of individual learning styles by teachers may result in communication problems and learning blocks in the classroom. The authors stated that:

an awareness of learning styles and a recognition of each style as having its strengths and weaknesses can result in increased acceptance and openness to learning from the styles of others (Kurzich, Friesen & Van Soest, 1986, pp. 28-29).

They further explained that when learning styles are recognized and understood, differences between younger and older students could enhance the learning process of both groups rather than become a source of misunderstanding. Overall, the authors recommended the LSI as a useful tool for students and faculty. The study also supported the general meaning of the experiential learning theory.

### Medical Professions

Medical Education - Of the five studies discussed in the medical professions category four of the studies (Whitney & Caplan, 1978; Baker, Wallace, Cooke, Alpert & Ackerly, 1986; Baker, Wallace & Cooke, 1987; Baker, Cooke, Conroy, Bromley, Hollon & Alpert, 1988) supported the LSI and demonstrated significant findings. These four studies

are initially discussed chronologically, followed by the one study that does not support the LSI by Wunderlich and Gjerde (1978). All of these studies scrutinized the use of the LSI in relation to various medical education specialty areas (predominantly family practice medicine and anesthesiology). Wunderlich and Gjerde discussed the LSI in relation to all medical specialties.

Whitney and Caplan (1978) recognized that more information was needed about physicians as adult learners. Based on this premise the study was designed with data gathered in reference to learning styles and instructional preferences from two groups of physicians; (1) those who attended, and (2) those who did not attend multi-disciplinary university sponsored refresher courses. Some of the key questions of the study were: Do family practice physicians who choose to attend a refresher course differ in learning styles from those who do not attend? Do family practice physicians who are characterized by a particular learning style prefer different characteristic learning styles? Is the age of the physician related to one's instructional preference?

The approaches used in this study were discussion of learning style theory and use of the LSI. In regard to the first question the results demonstrated that the active types who prefer concrete settings were predominantly

attendees; and the preference for abstract settings was greater among those who did not attend.

In regard to the second question, the investigators found that there was not one relatively uniform learning style for the entire sample. They found a relatively equal distribution of the learning styles for the sample population. Their study concluded that learning style and career choice are not associated.

This study concluded with a strong recommendation that descriptive information needed to be collected about learner characteristics that can be used to individualize instruction. The investigators acknowledged the usefulness of the LSI and supported the overall concept of experiential learning theory.

Baker, Wallace, Cooke, Alpert and Ackerly (1986) looked at the relationship between success in the residency of anesthesiologists and learning style in order to evaluate the LSI as a predictor of resident performance. The approaches used were discussion of the learning style theory and use of the LSI.

This 1986 study was supportive of Kolb's LSI and his theory. The investigators found that the predominant learning style was accommodator. They reported that the distribution of learning style types was the same as in the pilot study five years previous. They recognized that their anesthesiology department clearly selected and trained

residents of the accommodator style preferentially and had done so for the past ten years. The study concluded that Kolb's LSI and experiential learning model were known to be helpful in areas of counseling and curriculum design. They further explained that learning style compatibility between a resident and a training program acts as important predictor of resident performance and determining factor in successful residency completion.

Baker, Wallace and Cooke (1987) conducted a study 1) to determine whether other anesthesiology training programs also exhibit characteristic learning style distributions, and 2) to discover if participants in a recent workshop of the Society for Education in Anesthesia were representative of teaching faculty in four known residency programs. The approach used was use of the LSI.

The LSI was administered to the students, (residents), and faculty in the four medical schools. In addition, the LSI was administered to 20% of the medical educators attending the 1987 spring meeting of the SEA. The sample as a whole indicated a majority of accommodators and convergers (36% and 38% respectively), with a minority of divergers and assimilators (both 13%).

The authors concluded that there was a remarkable parallel tendency between the faculty and resident learning style distributions. This suggested that the LSI was sensitive to multiple cognitive and non-cognitive factors

influencing the selection and training of anesthesiologists. The authors suggested that the dominant learning types within a program probably arise from specific work/study experiences of the specific programs. These investigators recognized the usefulness of the LSI for encouraging better communication, yet the study did not acknowledge the importance of the trainees being equally challenged by the other learning styles throughout a program in order to encourage more adaptive development of the learners, which is a central tenet of Kolb's theory.

A third study within the anesthesiology education field by Baker, Cooke, Conroy, Bromley, Hollon and Alpert (1988) reviewed the LSI, the use of Kolb's formulation of experiential learning theory in anesthesiology residency training, and reviewed the 1986 and 1987 studies, which applied the LSI in relation to anesthesiology residency programs. This study used two approaches; discussion of learning style theory and use of the LSI.

The authors supported the use of the LSI. The following five conclusions were suggested in regard to the LSI studies of anesthesiology residents and teachers: (1) every training program has a characteristic distribution of learning styles among the teachers; (2) through some combined effect of the resident selection process and socialization during residency training, the learning style distribution of the residents tends to resemble closely

that of the teachers; (3) a characteristic parallel learning style distribution tends to continue through time, probably as a function of the stability of the teachers at each institution; (4) this somewhat makes unnecessary the use of the LSI as a tool for selecting anesthesiology residents since teacher-resident uniformity seems to be achieved automatically by an undefined mechanism; however (5) it would seem useful to know the characteristic learning style distribution within a particular institution, because residents with one of the other nondominant learning styles will almost certainly experience more stress during training.

The authors further explained that a most impressive characteristic of the LSI is implied in much of the literature, yet in a negative manner. This is the fact that Kolb's experiential learning model does not define a static or trait categorization of learning styles, but rather describes a dynamic flow of behavior from one mental set to another depending upon the demands of the situation. This explanation parallels the state versus trait measurement issue which is referred to by Curry (1987) in her overview of the learning style inventories.

The authors acknowledged that the Kolb experiential learning model provided a means to relate these roles to training experience, and can then be used as a basis for residency curriculum design.



Wunderlich and Gjerde's (1978) study, which is entitled: "Another Look At Learning Style Inventory and Medical Career Choice" did not support the LSI. The investigators explained that it was suggested in the literature at that time, particularly by Plovnick, that learning style, as measured by the LSI, can be associated with choice of a particular medical field and that individuals with certain learning styles in making career choices are influenced more than other students by particular learning experiences. Wunderlich and Gjerde designed a replication study of Plovnick's, and administered the LSI to 200 practicing physicians and medical students. The approaches used in this study were discussion of learning style theory and testing the LSI.

In describing the key objectives of their study they stated that "Fundamental to the understanding of this issue is a knowledge of how medical career decisions are made" (Wunderlich & Gjerde, 1978, p.45). The two central research questions posed were:

- (1) Is there an association between an individual's learning style and that person's choice of a given medical field?
- (2) What influences inside and outside of medical school are considered most important by individuals with certain learning styles in making the choice to enter a particular medical field? (p. 45).

Wunderlich and Gjerde's study resulted in some learning style patterns quite similar to the anesthesiologist learning style studies ( Baker, Wallace, Cooke, Alpert & Ackerly, 1986; Baker, Wallace & Cooke, 1987) and the pharmacy education study (Garvey, Bootman & McGhan, 1984). The investigators found that the highest learning style percentage (46%) favored convergers, with the second highest percentage (25%) being the accommodator learning style. It was also found that no significant association between learning style and career group was apparent from the results. The investigators did note that the most significant result was that convergers were the most numerous learning style for both the practicing physician group and student group. They agreed that this association agreed with Kolb's description of individual preferring the converger learning style; one's strength lies in the practical application of ideas.

Wunderlich and Gjerde claimed that the failure of the LSI to discriminate between the medical career groups may be due to several factors. One aspect may be that practicing physicians and medical students are a homogeneous group of highly educated people, all working in an active rather than a technical field. A second reason for the failure may be that the LSI items in each column may not be appropriately grouped for the M.D. population. They noted that the word grouping of the LSI was developed

in studies on managers and management graduate students. A third criticism was that perhaps the two primary dimensions, (perceiving and processing), of learning style are independent and totally unrelated. Overall, the investigators concluded that the results of their study did not support Plovnick's claim that the LSI is useful in discriminating between medical career specialties. It was recommended that the LSI not be used to provide career guidance to medical students.

The four studies which supported the LSI were Whitney & Caplan, 1978; Baker, Wallace, Cooke, Alpert & Ackerly 1986; Baker, Wallace & Cooke, 1987; and Baker, Cooke, Conroy, Bromley, Hollon & Alpert, 1988. These studies recommended the use of the LSI within specialties of medical education (i.e. family practice, and anesthesiology), as opposed to a crossection of specialties. They recommended the LSI as useful for counseling and support during residency training, as well as recommending Kolb's formulation of experiential learning theory as an effective means for curriculum design. These studies did not refer to the LSI as a method for career guidance.

Wunderlich and Gjerde (1978) explained that the LSI did not discriminate among medical specialties. Although, the LSI indicated that a majority of physicians and students were of the accommodator and converger learning

styles. In this way the instrument worked as it does in most studies. It indicated a majority learning style with smaller percentages of the other two or three learning styles. A second conclusion reached by Wunderlich and Gjerde was that the two major dimensions of the LSI were totally unrelated. This indicates their misunderstanding of the theory the LSI is based on. Kolb explains that the perceiving and process dimensions are based on dialectically opposite learning abilities. This implies that as one perceives and processes information one is continually required to choose between these opposite abilities. As one develops, a learner preference for two of the abilities translates into a learning style. Yet, one's learning style may change due to the demands of one's learning environment over time. Thus, learning style is considered by Kolb to be relatively stable, yet is not to be considered a trait. Wunderlich and Gjerde have interpreted the LSI to be an instrument which should indicate stable traits as related to a career specialty. Thus, it may be concluded that their recommendation of not to use the LSI for indicating medical career specialties is based on a misperception of the use of the LSI.

Nursing Education - According to Laschinger (1989) experiential learning theory has been tested in several studies in the nursing population. The most consistent finding in these studies is the predominant trend of

concrete learning styles, (accommodators and divergers), in samples of nurses and nursing students (Christensen, Lee, & Bugg, 1979; Hodges, 1988; Huch, 1981; Johanson, 1987; Laschinger, 1986; Laschinger & Boss, 1983; Laschinger & Boss, 1989; Marcinek, 1983). It was stated by Laschinger that these findings are supportive of Kolb's contention that members of human services professions have concrete, people-oriented learning styles and differ from Kolb's (1976) earlier finding that nurses were predominantly convergers.

Kolb's formulation of experiential learning theory has been tested extensively in the nursing population. Researchers have studied relationships between learning style and learning preferences, decision making skills, educational background, nursing roles, nursing specialty, factors influencing career choices, and diagnostic abilities (Laschinger, 1989). Laschinger further explained that the usefulness of the theory in describing learning orientations and environmental learning demands in nursing situations has received moderate support and further research is suggested. Overall, Laschinger (1989) supported Kolb's learning cycle theory stating that it "appears to be a valid and useful model for instructional design in nursing education" (p. 19).

Lassen's (1984) study, entitled: "Learning Style Differences: Registered Nurse Students vs. Generic Student

Nurses At the Baccalaureate Level", examined and compared learning style differences as measured by the Learning Style Inventory (1981 version), between registered nurse students and generic student nurses enrolled in a baccalaureate nursing program. The approaches used were discussion of learning style theory and use of the LSI.

The findings indicated that the groups were similar in learning styles throughout the four year program. Although registered nursing students and generic student nurses more closely resembled each other as they progressed from junior to senior levels. As seniors, both groups tended to become more able to learn by a variety of methods rather than by assuming a permanent learning style. The investigator concluded that results of the data analysis support similarity rather than diversity of course design as an acceptable base upon which curriculum design for both types of nursing students could be developed.

This study generally supported the notion of learning styles derived from Kolb's experiential learning theory. It revealed that the most significant difference in learning style occurred between senior R.N. and generic students. The generic students tended to prefer the accommodative learning style and the R.N. students preferred the diverger learning style.

The second nursing education study by Merritt (1983) is entitled: "Learning Style Preferences of Baccalaureate

Nursing Students". The purpose of the study was to determine the relationships of age, professional nursing employment, and learning style preferences of students and R.N. students using the Canfield and Kolb learning style models. The study approaches were to discuss learning style theory, revision of the LSI, and test the LSI.

Kolb's Learning Style Inventory and theory were not supported by this study. It was found that there were significant differences between basic and R.N. students in relation to the conditions and modes of learning as defined by the Canfield model. Yet, these differences, according to Merritt, did not involve those differences that have been inferred by adult learning theory. The study findings for both groups of learners did not support the propositions that age or length of career accounted for differences in the ways adults prefer to learn. A key conclusion of the study was that with the significant differences between the two groups faculty need to consider development of different learning environments for the younger-aged and the older experienced students. In this way the investigator did recognize that learning preferences between the two groups existed. Although, a particular learning style model was not supported.

Overall, both nursing studies (Lassen, 1984; Merritt, 1983), recognized the varying learning style preferences between the younger versus the older R.N. nursing student

groups. The studies differed in that Lassen recommended similar teaching methods for all students, whereas Merritt recognized the need for different teaching and learning environments for the younger and older nursing students. Although, Merritt did not support Kolb's theory, Merritt's recommendation for varied learning environments parallels a premise of Kolb's learning cycle theory.

Pharmacy Education - This one study by Garvey, Bootman and McGhan (1984) represents the area of pharmacy education. The study is entitled: "An Assessment of Learning Styles Among Pharmacy Students". The purpose of this study was, in part, to understand the learning preferences of pharmacy students in order to better investigate the impact of curriculum changes on the ability of students to learn. This study also considered the Kolb experiential learning theory as a means of designing instruction in order to specialize learning for each individual, instead of viewing the learning process as an application of all four learning modes, which asks the learner to be more adaptive. The study used two approaches; discussion of the theory and LSI, and use of the LSI. The study was supportive of the Kolb theory and LSI.

The findings were that the majority of the 445 pharmacy students scored in the converger quadrant (in reference to the four quadrant scoring grid of the LSI),



50.8%. The authors confirmed that this was consistent with studies using the LSI that indicated that professions tended to have the most notable concentrations of particular learning styles (Garvey, Bootman & McGhan, 1984). In terms of other significant findings it was reported that reflective observation varied significantly by year in the program. Generally, beginning students were more reflective than advanced students. This trend was substantiated by a reference to Kolb (1976), who explained that there is a pattern for students to become less reflective up through the masters level. Another key area of significant findings was in regard to learning style and gender. It was found that there was a significantly greater number of males who scored in converger quadrant. The females composed a greater percentage of those in the other three learning style quadrants. They also reported that with the analysis of variance the F ratios were significant between the genders for concrete experience, abstract conceptualization, and abstract. Basically, the study found that women tended to score higher on concrete experience, and men tended to score higher on abstract conceptualization and the abstract dimension.

In conclusion the authors recognized the significance of experiential learning theory, as they explained that the theory and its application has been widely accepted across many disciplines. They also critiqued Kolb's formulation

of experiential learning theory stating that there were two primary weaknesses: (1) there is no general mechanism for focusing student awareness in the learning context, and (2) insufficient attention is given to the students' ability to abstract from experience. In this way a student is often left to his/her own resources in completing a given learning cycle. They recognized that the study has made evident a predominant learning style of pharmacy students, converger. Significant correlations indicated that students who possess the converger orientation are likely to be more successful academically than students who have another learning style preference. Thus, they concluded that some students would benefit from assistance in developing their ability to abstract concepts from the learning experience.

The investigators did not recommend the LSI as a screening instrument for pharmacy school admissions. They did recommend that it would be a useful instrument for counseling student as related to career planning. This is a similar recommendation to that of the Baker, Cooke, Conroy, Bromley, Hollon and Alpert (1988) anesthesiology residency study. Overall, the Garvey, Bootman and McGhan study supported the LSI and Kolb's learning model as a useful perspective for viewing the processes of learning and individual development. They also stated that the LSI was not useful for investigating the relationship between

learning styles and the amount of learning that occurs in a situation. They suggested that further study of such an instrument would need to account for influences as culture and personality.

Of the eight studies in medical education, six supported the LSI and/or Kolb's formulation of experiential learning theory and these six studies represented anesthesiology, family practice medicine, nursing and pharmacy education. The most current study, by Baker, Cooke, Conroy, Bromley, Hollon and Alpert (1988) acknowledged the limitations of the LSI, (not to be used as a screening instrument into a medical program), but as a means for counseling and support throughout a program. The use of the Kolb learning cycle for curriculum planning was recognized in the latter studies; Merritt (who was nonsupportive of the LSI, 1983) and Garvey, Bootman & McGhan (1984).

The two studies which did not support the LSI, Wunderlich and Gjerde (1978) and Merritt (1983) were most critical of the LSI's predictive and reliability properties. Wunderlich and Gjerde duplicated Plovnick's study in order to demonstrate the inability of the LSI to predict medical specialty according to one's learning style. In this way they did show how the LSI is not effective for career guidance in medicine. This recommendation was challenged and modified with findings of

the anesthesiology studies. Merritt's study found no significant differences between generic and R.N. nursing students based on the LSI. Merritt found that the age and length of career experience did not account for differences in the ways adults prefer to learn. Although the author did acknowledge that learning preferences and age differences among students do exist.

Postsecondary Education - Many studies have been conducted in postsecondary education in regard to learning style. The studies reviewed were conducted between 1978 and 1986.

Strange (1978) conducted a study entitled: "Intellectual Development, Motive For Education, and Learning Styles During the College Years: A Comparison of Adult and Traditional-Age College Students." The purpose of this study was to explore intellectual development, motives for pursuing education, and learning styles among adult and traditional-age college students. The approaches used were discussion of the learning style theory and use of the LSI.

Overall, the study supported the learning style theory. One significant finding in regard to the LSI was described as follows: "Males emphasized abstract conceptualization over reflective observation to a significantly greater degree than females" (Dissertation Abstracts, No. 7902948). One major conclusion was that no

significant differences were found between high and low reflective judgement scorers on either the importance they assigned to motives for pursuing education, or the learning style distributions observed within each group. Generally, this study did recognize a significant learning style difference between men and women, but did not find an overall pattern of learning styles between the two student groups.

The second supportive postsecondary study by Dorsey and Pierson (1984) is entitled: "A Descriptive Study of Adult Learning Styles In a Nontraditional Education Program." The purpose of the study was to report the use of Kolb's LSI in investigating the effectiveness of an inventory to guide counselors and faculty in dealing with the adult learner. Five hundred and thirteen students at one university participated in the study by taking the LSI. The approaches used were discussion of the learning style theory and use of the LSI.

The study was supportive of the LSI. The Learning Style Inventory results were discussed in terms of the four learning abilities. The predominant learning ability for males was abstract conceptualization, and for the females it was active experimentation. In terms of age it was found that from 18 to 33 years the tendency toward abstract conceptualization increased; from 34 to 49 years the tendency toward concreteness increased; and from 60 to 65

abstractness increased again. The active experimentation/reflective observation learning abilities indicated that from 18 to 49 years respondents initially preferred a more active process, and then moved toward a more reflective process in later life.

Overall, it was concluded that age and prior work experience influence learning style type. Thus, faculty who teach adults should take these factors into consideration. The investigators also concluded that age and age difference becomes an increasingly important index for student learning styles. The data indicated that the accommodator learning style tends to become predominant at about age 33. The investigators also emphasized that the trend toward accommodator learning style, the age, and prior learning experience all affect learning style more than gender or ethnicity, according to their sample. The investigators strongly supported the relevance of the LSI, in terms of designing better curriculum and programs for the growing adult student population.

The third study representing the postsecondary education area is by Groetsch (1986) which is entitled: "Student Preferences For Particular Instructional Strategies In a Master of Arts Program and Their Relationship To Kolb's Learning Style Inventory". This study also supported the LSI and underlying experiential learning theory.

The study initially involved the administration of an instructional preference survey to 523 graduate students. The approaches involved discussion of learning style theory and use of the LSI.

The study was supportive of Kolb's learning style theory. The survey indicated that the Master of Arts students had some clear preferences for specific instructional strategies. It also was found that their preferences were influenced by factors of age and gender.

The key conclusions drawn from the instructional preference portion of the study were as follows: (1) females preferred guest speakers, internships and seminars more than males; (2) males showed stronger preferences for case studies and oral reports; (3) there was little difference between the genders in their preferences for lectures and class discussion. Both genders had a low preference for written papers and reports; (4) younger students had a low preference for case studies and a clear preference for lectures. The younger students also related more positively than older students to audiovisual instruction and guest speakers; (5) older students had a strong preference for class discussion than that of younger students, and older students also had stronger preferences for oral reports and for individually written papers and reports.

The second portion of the study involved the identification of specific instructional strategies which could be related to the learning modes (learning abilities) of Kolb's LSI. The investigators concluded that there were particular instructional strategies that were identified with the four learning abilities. The following summary statements of key significant findings are in regard to academic major and learning ability scores at the 80th percentile: (1) Management students scored high in all four learning modes (abilities), which may indicate the balanced learning style typical of management students. (2) Business administration students also had a balanced learning style, with learning mode scores statistically significant in concrete experience, reflective observation, and abstract conceptualization. (3) Computer data management students had a balanced learning style with statistically significant scores in reflective observation, abstract conceptualization, and active experimentation. (4) Health service management students had high scores at the 80th percentile in concrete experience, and reflective observation. (5) Counseling services students had a high score in concrete experience, finance students scored high in abstract conceptualization, and marketing and procurement students scored at the 80th percentile in active experimentation (Groetsch, 1986).



The following summarizes the interrelationships found according to major, most favored (highest ratings) instructional preference(s), and learning modes at the 80th percentile, respectively: (1) business administration, lecture, class discussion, case study, CE, RO, and AC; (2) computer data management, lecture, class discussion, RO, AC, and AE; (3) counseling services, internship, CE; (4) finance, lecture, class discussion, AC; (5) health services management, lecture, class discussion, case study, guest presenter, CE, and RO; (6) legal services, lecture, AC; (7) management, lecture, class discussion, CE, -RO, AC, and AE; (8) marketing, class discussion, guest presenter, AE; (9) procurement and materials management, lecture, class discussion, AE. The previous nine summaries of academic majors demonstrated their relationships to preferred instructional strategies and to significant learning modes.

The investigator presented strong conclusions with regard to the LSI as related to gender, and instructional preference. The investigator stated that females constituted a statistically significant majority of students at the 80th percentile in concrete experience and reflective observation. Males constituted a majority in abstract conceptualization and active experimentation. Students at the 80th percentile for abstract conceptualization and active experimentation gave case studies a significant rating. Students high in concrete

experience and reflective observation gave guest presenters a similar strong ranking. Students high in active experimentation were the only students not to give lectures a significant rating. Students high in reflective observation were the only students to give audiovisual instruction a significant preference. Class discussion was preferred by students in all four learning modes. Overall, this study offered some very constructive findings for college teachers seeking to use the LSI and directly related it to curriculum planning and teaching.

Dorsey and Pierson (1984), and Groetsch, (1986) were very supportive LSI with regard to their findings. A pattern was observed in Groetsch's (1986) and Strange's (1978) studies. Strange found that males preferred abstract conceptualization over reflective observation to a significantly greater degree than females. This was similar to a finding in Groetsch's study in which males composed a statistically significant majority of students in abstract conceptualization and active experimentation, whereas females composed the majority in concrete experience and reflective observation. These gender related findings confirm Kolb's overall observations; it is typically found across the samples the LSI has been administered to, that males prefer abstract conceptualization and females prefer concrete experience (Kolb, 1990, interview).

Overall, the postsecondary education field tends to be very supportive of Kolb's LSI and formulation of experiential learning theory. Kolb's research and theory is based in higher education, and as a result acts as a complimentary theory to adult learning theory.

Teacher Education - Two studies are representative of this area, one which is supportive (Van Cleaf & Schkade, 1987) and one which is not supportive (Dunn, 1982).

The study by Van Cleaf and Schkade (1987) evaluated the learning styles of student teachers from four specialty areas: (1) secondary liberal arts majors, (2) secondary math/science majors, (3) secondary fine arts majors, and (4) elementary student teachers with majors in liberal arts. The approaches used were discussion of the learning style theory and use of the LSI. The study supported the learning style theory.

Van Cleaf and Schkade's study resulted in no significant differences with regard to between group comparisons of the mean LSI scores for the student teachers. There was a definite learning style preference pattern among the 82 "successful" student teachers. It was found that the scores of the secondary liberal art student teacher group and the secondary math/science student teacher group fell within the accommodator quadrant. It was also found that the scores of the secondary fine arts student teachers and elementary liberal arts student

teachers fell within the diverger quadrant. It was also found that a representative balance was not found in the assimilator and converger quadrants. Thus, two very key learning style preferences among student teachers at the secondary and elementary levels were the major results of this study.

The major recommendations involved suggestions as to future studies on teacher learning style. The authors stated that more extensive data could be collected with regard to teacher learning style in order to develop a comprehensive description of successful educators in various instructional areas. They also suggested that characteristics of successful teachers who may not fall within the "typical" categories should also be studied.

The nonsupportive study by Dunn (1982) is entitled: "Preferred Learning Styles As Determined by Kolb's Learning Style Inventory". The study focused on a comparison of the learning style preferences of educators and business professionals. This study was not conducted within a higher education setting, yet has implications relevant to higher education (i.e. teacher education). The researcher sought to construct a Learning Style Profile for educators if a difference between the two groups was determined. The investigator also sought to determine if there was a difference in learning style preferences of elementary teachers and principals, and secondary teachers and

principals. The approaches used were discussion of learning style theory and testing of the LSI.

It was found that there was a significant difference in preferred learning style of educators and business professionals. Thus, an educator Learning Style Profile was developed. It was then found that there was no significant difference in learning style preference between elementary principals and teachers, and between secondary principals and teachers.

Dunn's study as well as the previous medical education study by Wunderlich and Gjerde (1978) demonstrated how the LSI can differentiate learning style preferences between major professional groups, yet may not be sensitive enough to differentiate learning styles among subspecialties of a major professional group. Although, the previous study by Van Cleaf and Schkade (1987) differentiated and determined learning style patterns among four student teacher specialties. This may suggest that the LSI, along with many other learning style instruments, tend to reflect relatively stable learning styles which are subject to change over time, as opposed to determining stable traits throughout the life span. In this way, it may not be appropriate that researchers use the LSI to characterize learning behaviors of an entire profession. Yet, it may be found to be quite useful as an instrument to encourage self knowledge and development of individuals within various

professions. This view was shared by Baker, Cooke, Conroy, Bromley, Hollon, and Alpert (1988), in medical education and by Van Cleaf and Schkade, (1987) in teacher education.

In summary of this first section of the chapter some trends may be noted. Of the six academic areas presented, two of the areas were most critical of the LSI; medical education and teacher education. Wunderlich and Gjerde (1978), one of two nonsupportive studies in medical education, and Dunn (1982), the one nonsupportive study in teacher education, both proposed that the LSI could not discriminate learning style differences of subspecialties of a major professional area. In this way it was suggested that the LSI not be used to provide career guidance for students.

The following professional areas did find the LSI useful: accounting and business education, (Biberman & Buchanan 1986; Baker, Simon & Bazeli, 1987; Collins & Milliron, 1987; Coulter, Coulter & Schultz, 1990), anesthesiology education, (Baker, Wallace, Cooke, Alpert & Ackerly, 1986; Baker, Wallace & Cooke, 1987; Baker, Cooke, Conroy, Bromley, Hollon & Alpert, 1988), family practice medical education, (Whitney & Caplan, 1978), nursing education, (Lassen, 1984), pharmacy education, (Garvey, Bootman & McGhan, 1984), postsecondary education, (Strange, 1978; Dorsey & Pierson, 1984; Groetsch, 1986), social work education (Kurzich, Friesen & Van Soest, 1986), and teacher

education (Van Cleaf & Schkade, 1987). Overall, it may be observed that all these studies found the LSI and/or the Kolb formulation of experiential learning theory acceptable and useful. Their conclusions focused on applications of the LSI which encourage individual development, teaching methods or curriculum development, as opposed to seeking to generalize about large professional groups or subgroups of a population. These conclusions demonstrate the relevant and nonrelevant uses of the LSI.

## Part 2 - LSI Validity and Reliability Studies

The topic of the LSI as a valid and reliable instrument has been debated intermittently throughout the past 12 years. The studies in part two were published between 1978 and 1988. In 1978 one of the first articles by Freedman and Stumpf was published which challenged the validity and reliability of the LSI. Between 1978 and 1981 these investigators and Kolb carried on a debate centered on the psychometrics of the LSI. The following quotation by Kolb during a 1990 interview explains the background and issues of the LSI's underlying purpose, construction and psychometrics:

Well, partially I think that some of the people who are criticizing the psychometrics of the LSI basically don't understand what I'm doing. And I don't know if you've seen the debate with Freedman and Stumpf...And that has to do with the notion that test-retest

reliability is the appropriate measure. And to me that's only an appropriate reliability measure if you assume that the style is a trait or is meant to be fixed. But this is a learning model where the ideas change. So I consider the internal reliability to be the more important question. That is, are all of these scales internally consistent with one another and different from the other scales in a meaningful way. And I gather when Curry says the reliability of the LSI is high, she must be agreeing with me in that. But that's one debate that's going on.

And then the other one has to do with a holistic view versus a univariate view...I use a ranking process there which means that there is what's known as ipsitivity in the scale. As a high scorer one automatically introduces the lower score on another...When [you] use a rating form like [a] Likert seven point scale or whatever, what you tend to best predict is preference, not behaviors or choices. Whereas if you use a ranking scale, they tend to better predict actual behavioral choices. And it makes sense because, when you're doing seven point scales on something, I can give a seven to everything and there's no cost to me for it. So I can equally prefer all of [the] alternatives.

But in an action situation you can't do that. You have to do one or the other...So the ranking process more approximates the choice process by being holistic in the sense that everything is related to everything else and if you do one thing that decreases the probability, you'll do something else.

So that's basically what the review shows. And in my notion, I argued that these modes are sort of dialectically in opposition and that it's in the sort of conflict among these modes that



learning occurs. So the ranking ...I'm committed to the ranking process because that is like the process one goes through in any learning situation. You're choosing to be abstract or to be reflective or whatever.

So, those are the two criticisms, the reliability and the holism, that I have felt about the instrument. And, the third one, I guess, is that it's a self-report instrument, that it's limited by my own self-image and how accurate I am in my own self-image (Kolb, 1990 interview, pp. 6-9).

Kolb felt that the reliability and holism are the most criticized aspects of the LSI. The following academic areas present some of these criticisms: accounting and business education, continuing medical education, career education, medical education, and nursing education. The studies are discussed chronologically and according to academic area. The studies discussed in part two are listed in Table 3.

Accounting and Business- The first three articles are by Freedman and Stumpf (1978, 1980 & 1981), all of which do not support the validity and reliability of the LSI. This is followed by a review article by Kolb (1981) which substantiates the LSI and responds to Freedman and Stumpf. These articles are followed by one study, (Lamb & Certo, 1978), which does not support the LSI, and one study that partially supports the LSI (Sims, Veres, Watson & Buckner, 1986).

The three articles by Freedman and Stumpf presented the arguments opposing the reliability of the LSI. The first article (1978) is entitled: "What Can One Learn From the Learning Style Inventory?". The central purpose of the paper was to analyze the measurement properties of the LSI and to examine the implications of the results for both the use of the LSI and the larger issue of experiential learning instruments. The LSI was administered to a sample of 1,692 graduate business students. The approaches used were discussion of the learning style theory and testing the LSI.

The results were centered around the reliability estimates. The investigators reported that the reliabilities were comparable for both samples. The abstract conceptualization scale was found to be the most reliable, ( $r_{kk}=.70$ ), with the concrete experience found to be the least reliable ( $r_{kk}=.40$ ). The median reliability coefficient of the four scales for both samples was .54. The AC-CE and AE-RO inventory scores resulted in more moderate reliability for both samples with the median reliability coefficient being .71.

The test-retest reliability estimates were reported as fairly low (median coefficient = .50). The investigators noted that the test-retest results were actually larger than those reported by Kolb (1971). The median reliability coefficient of the six scales for both reliability methods

and the three samples was .58. Thus, the investigators suggested that the LSI was rather volatile, which they believed was unlike the theoretical constructs being investigated. They further explained that the alpha coefficients indicated only moderate consistency within three of the scales. In this way, they concluded that the low reliabilities limit the ability of the instrument to explicate learning styles.

Freedman and Stumpf further explained that the factor analysis and factor congruence between samples provided moderate support for a theory of two bipolar learning style dimensions. The correlations between these scales also supported the theory. A key point made was that the previous results suggested that Kolb's model of learning is a four stage problem-solving model which merits consideration. They continued by stating that:

the model may be useful in the context of cognitive learning to explain learning as a problem-solving process independent of the merits of the LSI as a measurement device (p. 280).

They then discussed the construct validity of the LSI. They explained their construct validation procedure by comparing their 1972 NYU results with a similar sample of Kolb's in 1971. They found their results comparable to Kolb's. Thus, many results were significant at the .01 level. Although a question was raised with regard to variance. It was found that less than 5% of between group

variance (of undergraduate groups) was accounted for by knowledge of learning style. Based on these findings they concluded that there was limited support for the construct validity of the instrument.

Freedman and Stumpf proposed three major conclusions: (1) The LSI is a worthwhile idea which has some theoretic value, but has been operationalized too soon; (2) The instrument is rather unreliable, and this unreliability places limits on instrument validity; (3) The amount of unexplained variance is large enough to produce misleading results. For this reason they concluded that what the instrument does measure is blocked by an inordinate amount of error variance.

The second article by Freedman and Stumpf (1980) is entitled: "Learning Style Theory: Less Than Meets the Eye." The article was a review of LSI issues, and refers to their original research as discussed in the 1978 article. The approach used in this article was discussion of the learning style theory and LSI.

The authors explained and argued that the researchers who have developed applications of Kolb's learning style theory have not taken a close look at the validity of the theory. They observed that researchers have moved from speculative formulation of the theory to applications without adequate evaluation and validation. Freedman and

Stumpf proposed that the Kolb learning style theory may not offer enough evidence of validity and reliability.

In 1980 Freedman and Stumpf claimed that empirical evidence supporting learning style theory and the LSI had come from one piece of unpublished research (Kolb, 1971). They further explained that Kolb evaluated construct validity by analyzing a number of variables that were hypothesized to covary with learning style. He found a number of significant differences in the hypothesized direction. Yet, Freedman and Stumpf argued that Kolb's data indicated that many of these significant differences were weak. The investigators also compared their LSI results, (means of two independent samples), and also found weak results (1978). It was stated that less than 5% of the between-group variance could be accounted for by learning style.

The test-retest reliability for their two samples (three week period) was low, which suggested that the LSI is quite volatile. The factor analysis they performed on the LSI also offered weak support for the learning style theory. They found that the two bipolar dimensions accounted for only 20.6% of the item variance. They did explain that much of the variance may be a function of the ipsative scoring system used with the LSI. They further stated that if the LSI variance is simply a function of the

scoring system, then the theory has yet to receive empirical support.

Freedman and Stumpf concluded that the learning style theory has supporting empirical evidence from an unreliable instrument, which is designed such that the instrument's results spuriously support the theory. From this perspective of empirical evidence they concluded that the instrument is invalid and that little evidence supported Kolb's theory of learning styles. The authors concluded that the use of the learning style theory as a basis for making normative judgements about educational practices should be suspended until the theory is modified, or new methods of measuring learning styles are developed.

The third article by Stumpf and Freedman (1981), also a review article, is entitled: "The Learning Style Inventory: Still Less Than Meets the Eye." The approach was a discussion of the learning style theory and LSI. The article acts as a rebuttal to Kolb's (1981) article which was a response to Freedman and Stumpf's articles of 1978 and 1980. The authors stated: "The utility of Kolb's learning style theory should be evaluated in light of the available empirical evidence" (p. 297). They continue with a discussion in response to Kolb's (1981) rebuttal. They stated that the following two points of clarification are necessary:

- (1) We have empirically addressed Kolb's Learning Style Inventory (LSI) and the theory which it is based. Hence we have examined only a small component of experiential learning theory, not all experiential learning theories, as Kolb (1981) implies.
- (2) Little empirical research on the LSI has been published in academic journals or other publications that require a rigorous independent review (Stumpf & Freedman, 1981, p.297).

The authors further discussed the articles that have been published, and the fact these papers have been negative with regard to the LSI. Examples of some of these empirical studies on the validity and reliability of the LSI were by the following investigators: Lamb & Certo, 1978; Certo & Lamb, 1980; Freedman & Stumpf, 1978; and Wunderlich & Gjerde, 1978. It should be noted that all of these studies were published before the second revision of the LSI. Stumpf and Freedman argue that one published study that Kolb (1981) cites as supportive of the LSI measurement properties, (Geller, 1979), concluded that the correlations observed were unsatisfactory for the LSI's use in reliably differentiating among individuals.

Stumpf and Freedman stated that Kolb provided 12 other references in his rebuttal article, which were unpublished, qualitative or a chapter from a book in press. Thus, the authors asserted that there was little available empirical evidence that supported the LSI or its underlying theory.

Stumpf and Freedman then presented Kolb's view of their central argument: "that experiential learning theory is invalid because the LSI is unreliable and improperly structured" (Kolb, 1981, p.290). Stumpf and Freedman felt that Kolb misinterpreted their critiques. They explained that they support the concept that the LSI is of questionable utility, because the inferences one makes from one's LSI scores have not been shown to be valid or reliable. They pointed out that the "Clinical use of instruments such as the LSI demands a high degree of measurement precision" (p. 297).

The authors then discussed how Kolb stated that the four constructs measured by the LSI are "variable", and thus, should not exhibit high test-retest reliability estimates. Kolb argued that the constructs indicate dominant learning abilities which compose preferred styles that individuals "tend to emphasize" (Kolb, Rubin & McIntyre, 1979. p. 39). Stumpf and Freedman then argued with Kolb's previous statement, claiming that "Traits that are dominant, preferred, and tend to be emphasized should be stable over a few weeks given comparable learning environments" (Stumpf & Freedman, 1981, p. 297). They continued to argue that if learning is mainly a function of the situation, then a learning style instrument is not needed. They posed the question, given the assumption that both situation and style play a part in learning, "How are



we to weight situational and individual factors when test-retest reliability in similar situations over short time periods is so low?" (Stumpf & Freedman, 1981, p. 298).

Kolb explained that responses to the LSI are determined by variable situational factors as well as stable personal disposition (Kolb, 1981). In response to this statement Stumpf and Freedman questioned what the variable situational factors are. They questioned if these factors represent measurement error or meaningful variance. They concluded that more generalizable studies need to be made to address the above question.

Stumpf and Freedman continued to scrutinize the LSI with a discussion of the internal consistency and the construct validity. They assessed the internal consistency estimates for the scale as modest, averaging .69 for Kolb's data, and .59 for their data. In reviewing the construct validity of the LSI they discussed the factor analysis and interscale correlations of Freedman and Stumpf's study and group comparisons as reported by Kolb. Observing the data, it demonstrated some support for Kolb's learning style theory, but they concluded that the support was weak and limited.

The authors concluded their criticisms with the following statement:

We began research on the LSI in 1976 in hopes of finding support for it. We subsequently published two articles

relating to the LSI in hopes of: (1) suspending normative use of the LSI until it and its underlying theory receive sufficient empirical support to warrant its clinical use, and (2) stimulating further research and theory building in the area of learning styles (Stumpf & Freedman, 1981, p. 298).

David Kolb (1981B) published an article in response to Freedman and Stumpf's (1978, 1980) first two articles entitled: "Experiential Learning Theory and the Learning Style Inventory: A Reply to Freedman and Stumpf." The approach taken was a discussion of experiential learning theory and the LSI. Kolb addressed Freedman and Stumpf's 1980 article in particular. He explained that his review article was to serve three key purposes:

(1) to correct certain inaccuracies in their report; (2) to respond to their conclusion that the theory of experiential learning has little empirical support, and (3) to clarify the dialectical nature of experiential learning theory and the attendant implications for reliability studies and the structuring of the Learning Style Inventory (LSI) (p. 289).

Kolb further explained that his response to Freedman and Stumpf would show that they had improperly assessed the validity of experiential learning theory by basing their judgement on an analysis of the internal characteristics of the LSI, with only a superficial review of research on the theory. Kolb noted that their conclusions about the learning style theory were not supported by independent research, and that normative use of the LSI be suspended,

was only based on casual scholarship and faulty reasoning. Kolb further claimed that Freedman and Stumpf's criticism of the reliability and structure of the LSI represented the misapplication of statistical assumptions of stability and independence to a theory based on variability and interdependence.

In the explanation of empirical support for experiential learning theory Kolb related that the most serious misinterpretation of fact by Freedman and Stumpf was their assertion that "empirical evidence supporting learning style theory and the LSI has come from a single piece of unpublished research" (Kolb, 1981B, p. 289). Kolb further explained that the Learning Style Inventory: Technical Manual (Kolb, 1976) is an overview of the theory offering some internal property description and validity studies of the LSI. The 1979 updated technical manual actually listed 60 articles and dissertations, reporting research on experiential learning and the LSI. Additional studies have been compiled for the next manual edition (1985). Kirby (1979) conducted an independent comparison of the LSI with other learning style tests, with access to the previous material. Kirby concluded that the LSI is clearly cited in the literature, with a "fair amount" of existing supportive literature.

A central argument of Freedman and Stumpf was that experiential learning theory is invalid because the LSI is

unreliable and improperly structured in a forced-choice format that biases results in favor of the theory. Kolb refutes this argument with a discussion of the scientific method upon which their point is made. He explained that the scientific method fails to distinguish between a theory and the operational measures of its variables. Thus, experiential learning theory cannot be proven invalid with only an analysis of the internal characteristics of the LSI, nor can it be proven valid by such an analysis.

Kolb continued to explain that Freedman and Stumpf concentrated on the internal characteristics of the LSI, and in turn drew conclusions on the utility of the instrument, but did not do so in terms of the validity of the theory upon which the instrument is based. The instrument's construct validity, along with other operational measures of the theory variables would have to be considered. Kolb suggested that a reading of the literature (Kirby, 1979, etc.) offers substantial empirical support for the theory of experiential learning using different operational definitions of the constructs in addition to the LSI. Empirical support is also evident in replication studies by independent researchers (Carlsson, Keane & Martin, 1976; Clarke, Oshiro, Wong & Yeung, 1977; Fry, 1978; Gish, 1979, 1980; Griggs, 1979; Gypen, 1980; Kolb, 1981; Manring, 1979; Plovnick, 1975; Sims, 1980; Wolfe & Kolb, 1979).

Following an extensive review of the LSI reliability, (test-retest and split-half), as well as the LSI format and the reasoning its based on, Kolb related that the evaluation of experiential learning theory requires a more "evenhanded" review of the theoretical and empirical literature. Freedman and Stumpf's evaluation of the LSI is an analysis of the instrument from the popular perspective of psychological testing. The highest priorities of this perspective is that any test instrument must meet statistical criteria of independence and stability. Kolb stated that this perspective is inappropriately applied in cases as the theory of experiential learning, in which the theory is specifically based on assumptions of interdependence and variability. Thus, no operational measure of a theory can be used to test a theory which is not consistent with the premises of the theory. One key misinterpretation by Freedman and Stumpf, which resulted due to an inconsistent way of judging the theory, was the view that traits are being measured by the LSI, whereas states are actually being measured.

Kolb recommended that better operational measures for the constructs of experiential learning theory is an important future research agenda. He further recommended the development of behavioral as well as self-report measures of the learning style modes, assessment of the developmental dimensions of experiential learning, and the

assessment of situational variability in response to environmental demands.

The study by Lamb and Certo (1978) entitled "The Learning Style Inventory (LSI) and Instrument Bias" described the 1971 version of the LSI. They explained that a previous study by Freedman and Stumpf (1978), drew the conclusion that although data gathered and analyzed using the LSI resulted in findings which were consistent with Kolb's bi-polar experiential learning construct, it was uncertain if this result was attributable to LSI instrument bias. Thus, the purpose of Lamb and Certo's study was to investigate the relationships between the LSI's ability to generate two bi-polar learning dimensions through instrument bias. They explained that such a bias can artificially support the validity of empirical test instruments. The approaches used were discussion of learning style theory and the LSI, revision of the LSI, and testing the LSI.

According to the two dimensional bi-polar experiential learning theory items which measure the four learning abilities, the AC construct items should correlate negatively with items measuring the CE construct on the LSI. Twenty-eight of the 36 LSI item pairs did correlate negatively; 17 of the pairs were significant at the .05 level.

The original LSI was further scrutinized with the observation that the five largest negatively correlated values are formed from pairs appearing in the same row of the LSI. The results from their modified LSI were quite different. This inventory resulted in only positive correlations, 32 of which were significant at the .05 level indicating that these items did not reflect a bi-polar AC-CE construct. Thus, the modified LSI did not appear to offer any substantial support for the two bi-polar learning dimensions.

The investigators concluded that the appearance of two bi-polar learning dimensions based upon the original LSI is largely due to instrument bias. They also pointed out that there were errors in the modified LSI which was based on Likert scale use (Kerlinger, 1973). Overall, they concluded that the obvious lack of supportive correlations as related to the modified LSI renders the validity of the original LSI highly suspect. Based upon this study's results, significant instrument bias within the LSI seemed highly likely. It should also be noted that Kolb offered his reasoning for a forced-choice ranking format as opposed to a Likert scale format, as it more closely related to "real life" choice making.

A concluding study which represents the accounting and business area as a partially supportive study of the reliability and stability of the LSI is by Sims, Veres,

Watson and Buckner (1986). The study was entitled "The Reliability and Classification Stability of the Learning Style Inventory." The two purposes of the study were outlined as follows: (1) An effort to confirm the existing studies citing poor measurement characteristics of the LSI, i.e. internal consistency and test-retest reliability. (2) To examine the LSI II (most recently revised 1985 version) for its measurement properties in light of the previously mentioned research (Freedman & Stumpf, 1978 & 1980). The study used two approaches; discussion of the learning style theory and LSI, and testing of the LSI.

In summary, the results of their study demonstrated that the reliability coefficients were not high for the LSI I or LSI II. One of their key conclusions, based on the reliability results, was that the LSI was unstable across time. Their results agreed with Freedman and Stumpf's study. Although the investigators recognized that the instability may be related to their undergraduate sample. They pointed out that often college students are defining their learning style during their college experience.

The investigators recommended that Kolb's revisions to the LSI II have resulted in an improved learning style inventory. However, they believed that the adjectival, non-behavioral inventory statement approach may be the key reason for the spuriously inflated internal consistency measures, and the lack of reasonable test-retest



reliability. Although this study did not strongly support the LSI they recognized its improvement with the 1985 revision.

Overall, the accounting and business education studies offered a great deal of criticism with regard to the LSI validity and reliability. The studies primarily scrutinized with regard to the LSI reliability, particularly through the use of test-retest reliability. If one looks at the underlying purposes of the LSI it is clear that the test-retest reliability method is inappropriate for the LSI. Kolb (1981) explained that with the variable nature of learning style, (i.e. situational variables due to environmental demands), then the more appropriate reliability measure is split-half reliability. This was not discussed by Freedman and Stumpf, Lamb and Certo or Sims, Veres, Watson and Buckner. The format of the LSI was also critiqued by the above researchers. It appeared that they (Freedman & Stumpf, and Lamb & Certo) criticized the LSI format without understanding the underlying theory of experiential learning, as proposed by Kolb in his 1981 article.

The Helping Professions - One study by Fox (1984) is within the continuing medical education area. The second study by Highhouse and Doverspike (1987) is classified within the area of career education. Both studies

investigated the validity of the LSI, and were nonsupportive.

Fox's (1984) validity study entitled "Learning Styles and Instructional Preferences in Continuing Education for Health Professionals: A Validity Study of the LSI", evaluated the construct validity of the Learning Styles Inventory. The learning styles of participants in a continuing professional education program were correlated with both the evaluative statements participants made about the design of the program and their attitudes toward lecture and small group sections of the program. The approaches used were discussion of the learning style theory and testing the LSI.

No significant relationships between learning style of the participants and either score of evaluative statements or preferences for lecture or small group methods were found.

The discussion of the findings and conclusions were pessimistic with regard to the attributes of each learning style, and learning style applications with regard to instructional or educational activities. In the first hypothesis the investigator proposed that responses of participants to evaluative statements directly derived from Kolb's descriptors of learning styles would differ according to participants' learning styles as determined by the LSI. The study findings did not support this

hypothesis. Fox found that evaluative statement scores did not differ as a function of learning styles. Since the evaluative items were based on LSI descriptions, the investigator seriously questioned the construct validity of the LSI. This author may also be questioned as to how valid his evaluative statements index was. Typically, a standard instrument is used for comparison to the instrument being scrutinized for construct validity. This was not the case of this investigator's comparative instrument.

The second hypothesis was that individuals with different learning styles would react differently to didactic lecture and small group discussion methods. This hypothesis was not supported by the findings. No relationships between learning styles and reactions to different methods of instruction were evident.

According to Fox the results reflected problems with the LSI in one of three possible areas: (1) either the LSI is not an adequate indicator of learning styles, (2) the descriptors Kolb used to characterize the four quadrants of the learning styles model inaccurately reflect the actual attributes of each learning style, or (3) learning style is not the basis for either preferences for or evaluation of educational activities. It should be noted that Fox was viewing the LSI as an instructional preference inventory, which was actually inaccurate. According to Curry (1987)

Kolb's LSI is an information process based inventory, which simply involves the learner to self-report their own learning preferences. This is different from instructional preferences.

Fox concluded that the key problem of the LSI is that it is not an adequate indicator of learning styles. He also concluded that one must question the LSI as a guide to educational design decisions. In one sense Fox's study further validated Curry's learning style topology which classified Kolb's LSI as an information processing model as opposed to an instructional preference model.

The Highhouse and Doverspike (1987) study is entitled: "Validity of the Learning Style Inventory 1985 as a Predictor of Cognitive Style and Occupational Preference." The purpose of was to investigate the relationship between measures of learning style and occupational preference and learning modes as measured by the most current version of the LSI (1985). The overall purpose of the study was to investigate the construct validity of the revised LSI. The approaches used were discussion of the learning style theory and testing the LSI.

The major findings were correlations between the LSI and GEFT (Group Embedded Figures Test), a measure of learning style perceptual preference: field dependence or field independence. The authors found that none of the LSI scores predicted field independence or field dependence.

There were correlations between the LSI and VPI (a measure of vocational preference) scales.

Overall, the key conclusion stated that because the LSI did not significantly correlate with field independence or dependence, it may suggest that the LSI measures preferences more than it measures learning styles. They further explained that the GEFT may measure cognitive ability rather than cognitive style. The authors did not define the terms preference and ability, which made their conclusion somewhat unclear. The authors also concluded that due to the ambiguities in Kolb's theory about the relationships to career, as well as the complexities of relating the LSI variables to career preferences, it was difficult to arrive at specific conclusions with regard to college student occupational preferences.

The authors referred to a lack of knowledge in order to calculate the LSI scores. Using their own procedure this may have skewed the results. At the conclusion of the article the authors explained that they may have selected instruments which were not appropriate for comparison (the LSI and GEFT). This is an important acknowledgement. As a result the investigators did not draw conclusions about the construct validity of the LSI. They also did not draw conclusions about the LSI and career preference. Thus, the study demonstrated the authors' lack of understanding of the LSI.

In summary, these two validity studies represent some of the misunderstandings investigators have had in relation to the LSI. These helping profession studies have demonstrated what instruments the LSI is not correlated to, and further verified Curry's information processing classification of the LSI. The Atkinson study (1988), classified within this section, is the most recent reliability study published to date.

Medical Professions - The medical professional area is represented by four studies from medical and nursing education: Geller, 1979; West, 1982; Merritt & Marshall, 1984; and Marshall & Merritt, 1985. The Geller and West studies tested for either validity or reliability of the LSI. Merritt and Marshall's two studies tested for both validity and reliability. These four studies support, partially support, or do not support the LSI.

Medical Education - Geller's (1979) study entitled "Reliability of the Learning Style Inventory", measured the test-retest reliability of the LSI. The study examined the 1971 version of the LSI. A 31 day interval was used for the test-retest interval, with a test sample of 50 U.S. students enrolled in foreign medical schools. The approaches used were discussion of the LSI and testing the LSI.

The investigator reported that the test-retest reliability coefficients, while clearly significant

( $p < .005$ ), were relatively low. All the coefficients fell within the same range reported by Wunderlich and Gjerde (1978), and those reported in the LSI manual. The interval between administrations was shorter than that of any previous investigations. Thus, it might be assumed that this study's coefficients might be a bit higher, but they were not. The investigator also found that the split-half reliability coefficients were not very different from the test-retest coefficients.

The theoretically maximum reliability scores suggested that the instrument can provide fairly reliable estimates of the functions it is intended to measure (concrete experience, reflective observation, abstract conceptualization, active experimentation, and two combination scores, AC-CE, AE-RO). The investigator also concluded that the test-retest reliability estimates were satisfactory. Although it was suggested that the LSI might be used to distinguish between means of two relatively small groups with a narrow range of difference.

The investigator raised Kolb's point that split-half and test-retest reliability determinations are most appropriate for estimating measurement error in independent psychological traits. The LSI assesses basic learning modes that are interdependent and variable. Thus, reliability coefficients of less than one are highly predictable according to Geller.

In conclusion, the investigator explained that, despite these suggestions, the LSI is a potentially valuable instrument and that the problems or questions to which it can be applied are important.

The second medical education study by West (1982) entitled: "A Construct Validity Study of Kolb's Learning Style Types in Medical Education", was a discussion of the LSI and tested the LSI.

According to West, within a ten year period - 1972-1982 - medical educators had given much consideration to the learning style construct. He referred to Kolb's LSI as the most extensively used instrument for gathering information about individual learning styles. He explained that Kolb's LSI has been used to determine one's individual learning style with one's subsequent choice of a specific medical career type. West claimed that these studies have given contradictory findings.

The LSI has also been used to categorize faculty and medical residents into learning style types (Baker, Wallace, Cooke, Alpert & Ackerly, 1986; Baker, Wallace & Cooke, 1987) which can be used to match learning styles to instructional methodology (Whitney & Caplan, 1978; Groetsch, 1986; Baker, Cooke, Conroy, Bromley, Hollon & Alpert, 1988). The LSI has been used as well to obtain information about continuing medical education markets and



audiences (Wunderlich & Gjerde, 1978; Whitney & Caplan, 1978; Fox, 1984).

West emphasized that medical educators have continued widespread use of the LSI despite the fact that Wunderlich and Gjerde (1978) have expressed cautions about the validity of the instrument, particularly when applied to the medical profession. The major issue West's study sought to address was the construct validity of the LSI or "whether Kolb's LSI measures what it purports to measure within the field of medical education" (West, 1982, p. 794).

West hypothesized that if Kolb's Learning Style Inventory has construct validity, then personality traits identified by Kolb as being characteristics of each learning style should be related to the personality factors identified through a factor analysis of the three personality inventories. The three comparative inventories used were the Myers-Briggs Type Indicator, the Survey of Interpersonal Values, and the Omnibus Personality Inventory. Another key purpose of West's study was to expand the work of Wunderlich and Gjerde in determining whether the learning style types identified as "opposite" actually have different personality traits suggested in Kolb's model of learning styles. Curry's topology did not classify the LSI within the cognitive personality category, in which the Myers-Briggs Type Indicator was classified.

Thus, this study indicated an inappropriate comparison for validity purposes.

The one significant difference found was that convergers had significantly higher scores on the social adaptability dimension than did the divergers at the .05 level. This difference was actually in the opposite direction than was expected.

The major conclusion suggested in this study was that the learning style categories may not be effective descriptors to understand the individual learning styles within the medical education context. West further concluded that while heuristically appealing, Kolb's learning styles may not be accurately representing the personality types underlying the LSI. West studied the construct validity of the LSI based on a trait definition of learning style, whereas Kolb described the learning style concept as interdependent learning abilities, which in turn describes a state versus a trait concept.

Nursing Education - A reliability and validity study of an alternate form of the LSI was conducted by Marshall and Merritt in 1985, entitled: "Reliability and Construct Validity of Alternate Forms of the Learning Style Inventory." This study was the follow-up to a previous study by Merritt and Marshall (1984), which compared Kolb's original instrument and an alternative form, (LSI-N), of the LSI were compared. This alternative normative

inventory, which used a Likert-type normative response format, was cross-validated. In the 1985 study a second alternate version (LSI-SD) of the LSI was developed by using the same word list that comprised the original ipsative form of the LSI. This new form provided more structure for responding, with each word contrasted with a word that represented a theoretically opposite learning style.

In the 1984 study the structure of the original form of the LSI was confirmed, with moderate to low scale reliabilities. The normative form, (LSI-N), had reliabilities equal to or higher than those of the original LSI.

The LSI-N was cross validated in the second study (1985) with a sample of 343 nursing students. The LSI-SD was administered to 181 of the same nursing students who responded to the LSI-N. For all four learning ability scales the estimates of reliability for the LSI-SD were higher than those of the LSI-N. The mean scale reliability for the LSI-SD was 0.771 compared to that of 0.624 for the LSI-N. Overall, the analysis resulted in moderately high scale reliabilities, with the LSI-SD structure consistent with the Kolb learning style model. They also explained that the scale intercorrelations of the LSI-N and LSI-SD were moderate. The investigators concluded that valid normative alternative forms of the LSI can be developed,

and that the structure of the semantic differential format improved scale internal consistency as compared to that of a Likert-type normative format. This 1985 study demonstrated that a semantic differential format is more reliable than a Likert-type questionnaire format.

The alternative LSI-SD was not discussed in comparison to the original Kolb LSI or 1985 revised LSI. It is interesting to note that the investigators found their second format, which was more closely oriented to the original ipsative LSI format, to be more reliable. Although Marshall and Merritt still used a five-point scale within their LSI-SD format.

### Summary

Freedman and Stumpf presented the following key issues primarily in reference to the LSI's reliability: 1) The utility of Kolb's learning style theory should be evaluated in reference to available empirical evidence; 2) They empirically addressed Kolb's Learning Style Inventory and theory. Thus, they examined only one part of experiential learning theory; 3) Little empirical research on the LSI has been published in academic journals or other publications that require rigorous review; 4) How can situational and individual factors be weighed when the test-retest reliability in similar situations over short periods is so low? 5) The internal consistency estimates

for the scale were modest; 6) The interscale correlations were large, but have been shown to be mostly random effects; 7) The instrument variance and between group variance accounted for by the two bipolar factors were small; 8) The key purposes of the three articles were to (a) suspend normative use of the LSI until its underlying theory receives sufficient empirical support to warrant clinical use, (b) stimulate further research and (c) develop learning style theory.

Kolb's responses to Freedman and Stumpf's criticisms of the LSI were as follows: 1) Freedman and Stumpf's criticisms centered around two central issues. They claimed that experiential learning theory was inadequate based on a lack of empirical evidence, and poor reliability and validity evaluations of the LSI. Kolb explained that the cancellation of a theory cannot be based on the judgement of one instrument representing the theory. He stated that several constructs must be tested with regard to validity studies before such a judgement of the entire theory is made. Freedman and Stumpf only demonstrated superficial understanding of the theory. 2) Kolb further pointed out that their psychometric arguments were based on the premise that the LSI is testing for traits, whereas the instrument is clearly testing interdependent (bipolar) constructs which result in variable responses influenced by the situation over time (a state). Based on this state

premise of the LSI it is not consistent that the LSI is tested for validity and reliability based on the popular psychological trait premise which does not relate to the instrument. He suggested that other methods of measuring the validity and reliability of an instrument measuring for state must be developed.

Four (Fox, 1984; Highhouse & Doverspike, 1987; Lamb & Certo, 1978; West, 1982) of the other seven studies discussed were nonsupportive validity studies. It was observed that much of the nonsupport was due to the same reasoning used by Freedman and Stumpf, namely, having misconceptions about the meaning and use of the LSI. The investigators tended to view the LSI as an instrument which measured traits, as opposed to the measurement of states. Thus, these validity results were not clearly understood or explained.

It should be noted that Curry's (1987) classification placed Kolb's LSI within the information processing category, whereas the GEFT and MBTI used as validity measures by Highhouse and Doverspike (1987) and West (1982), were placed in the cognitive personality category. Thus, the conclusion that the three inventories (GEFT, MBTI and LSI), are not related is accurate. According to Curry these three inventories have very different functions.

The Lamb and Certo (1978) study presented the issue of instrument bias, due to the LSI's structure. The Sims,

Veres, Watson and Buckner (1986) study questioned the stability of the LSI across time. They recommended adjectival, non-behavioral statements for a better inventory format. This was the one business education article, aside from Kolb's, which supported the ongoing development of the LSI. The business education studies tended to focus on the reliability. Lamb and Certo presented the main validity study with a factor analysis.

The helping professions and medical professional studies were generally nonsupportive of the LSI; both the original and revised versions. These studies also tested for validity with inappropriate comparative instruments. This was demonstrated by Fox (1984), Highhouse and Doverspike (1987, and West (1982). The one supportive study was by Geller (1979). The researcher accepted the test-retest reliability coefficients. Although, he further suggested that the LSI length be increased with some restructuring in order to improve the validity and reliability. Overall, the supportive studies (Geller, 1979; Merritt & Marshall, 1984; Sims, Veres, Watson & Buckner, 1986) tended to be more understanding of experiential learning theory. These investigators tended to perceive the value of receiving LSI information in order to relate it to the instructional setting.

Part 3 - Cross-Professional Qualitative and Quantitative  
Studies on Learning Styles and Kolb's Formulation of  
Experiential Learning Theory

The focus of these studies is the underlying meaning of Kolb's formulation of experiential learning theory and its applications. Kolb expressed some of his special research interests and applications of the LSI and this formulation of experiential learning theory, during a 1990 interview. The following statements explain the interest and research that has evolved from this theory:

Kolb: Well, one of the really gratifying things about this work to me has been... the connection with adult learning, and adult transition and adult development and so on. I mean... there's a kind of validity that I don't think we talk about scientifically, but it just makes sense for a lot of people, and they use it and so on. And so [you see] the use of it [LSI] in the adult development, learning and development area. And the other is the use of it [LSI] cross-professionally.

Investigator: Cross-professionally? What is it you mean by that?

Kolb: That the model of learning and development seems to be a framework that people can use in different professions to conceptualize issues of learning and development within their profession. And part of what I've been interested in is kind of cross-profession comparisons. So, because you have a kind of consistent model or framework you can begin to comparatively look at issues like, engineering, for example, tends to increase people in the convergent quadrant and nursing tends to increase people more in the accommodative. To go back to the instrument... in some ways I have felt there's a lot of misconceptions of what the instrument measures and people have very



simple trait-like notions about this. That I'm either one or the other, and if I'm that way I'll always be that way... But, the complicated statement I think that's in the theory, is that in any setting you'll find people who have these different styles. And [for example] I think, generally, you can find that in a sample of engineers the largest percentage of them will be convergers. So you do see some statistically significant patterns, but... in any sample you'll find all the style types.

And success in a particular field doesn't necessarily mean that your style is matched with that field... going back to the theory of learning which is, any one style is just part of the process, and the learning really involves being strong in all the styles. I think also the idea of learning is something that a lot of people don't have many ideas about. That... to introduce a model of learning to people and say you tend to focus, on this step and not on this step, really opens their eyes to stuff they've never really thought about (Kolb, 1990, pp. 11-14).

Kolb's particular interests in the LSI and its applications and interpretations cross-professionally have demonstrated an affirmation of the LSI and theory. This was described as he explained the kind of "sense" the LSI and theory have made to people, which has gone beyond the scientific definition of validity. The concluding statement he made with regard to the administration of the LSI and the awareness of learning it brings to people, reflects the adult developmental focus which Kolb brings to the learning style literature.

The studies presented in this section encompass the five major academic areas: business and accounting education, the helping professions, the medical professions, post secondary education and teacher education. Within each area studies which support and do not support the experiential learning theory and/or the LSI are discussed in terms of their findings and conclusions. These articles either present a descriptive review of Kolb's theory or LSI in relation to their field, or present a study that was conducted. The studies are chronologically presented within their academic areas. The studies presented in part three are listed in Table 4.

Business Education - The first article by Kolb (1976B) is entitled: "Management and the Learning Process." Kolb presented an overview of his formulation of experiential learning theory, (the learning cycle and four learning styles), and the concept of interaction between career, high level of education and undergraduate major. He proposed that these three variables may produce distinctive learning styles; and observed that one's undergraduate major is a key factor in the development of one's learning style. This observation was based on his own study of 800 practicing manager and graduate students and Plovnick's research (1971). The approaches applied were discussion of the theory and use of the experiential learning theory.

His article concluded with discussions concerning learning styles, managerial education, problem solving and managing the learning process. Kolb made two recommendations: (1) Learning should be an explicit objective that is pursued consciously and deliberately. In this way, managers and organizations should budget time to specifically learn from their experiences. (2) The nature of the learning process is an oppositional process, (action and reflection, and concrete involvement and analytic detachment), in which these four components are essential for optimal learning (Kolb, 1976B).

Wolfe and Byrne's (1976) study entitled: "A Comparison of Perceived Learning in Three Pedagogically Different Sections of a Required Business Policy Course", had two major objectives: "(1) to determine the relationship, if any, of student learning styles to choice of section and amount of self-perceived student learning; and (2) to examine the relationship, if any, between the amount of perceived student learning and participation in one of the three different sections" (Wolfe & Byrne, 1976, p. 475).

The approaches used in the study were discussion of the theory and testing of the learning style theory. The findings revealed that there were no correlations of significance between learning styles and self-perceived learning. It was also found that there was no relationship

between learning style and type of course section selected (simulation, classical or case study methodologies). One key conclusion presented was that the researches found that measures of student-preferred learning styles were not predictive of either selection of learning methods, or of how much the students will learn in a given learning environment. They further explained that although the findings were nonsupportive, they continue to find the learning cycle and learning styles concepts particularly useful in managing and improving the learning process.

Brenenstuhl and Catalenello's (1976), paper is entitled: "An Analysis of the Impact upon the Learning Effectiveness of Traditional Instruction, simulation Gaming and Experiential Learning Teaching Methodologies: An Experimental Design." The central purpose was to define and describe the design of an experimental longitudinal study which focused on the effectiveness of teaching methodologies upon learning. One methodology was experiential learning. One inventory administered was the Kolb, Rubin and McIntyre Learning Profile. The approach used in this paper was primarily theory discussion and description of the study design.

The authors were supportive of experiential learning theory, although they did not acknowledge Kolb's specific formulation of the theory. They did acknowledge the Kolb concept of learning styles, which was termed learning

profiles. The key hypothesis of the study was: "There is a significant difference in the problem-solving skill of students in simulation groups who have different learning profiles." One example of support for experiential theory was the reference to experiential groups in six of the seven hypotheses. An example of this is: "There is a significant difference between the motivation achieved by students in discussion, simulation or experiential groups." The study design description was the only means by which support for the theory could be demonstrated.

A study by Certo (1977) entitled: "Stages of the Kolb-Rubin & McIntyre Experiential Learning Model and Perceived Trainee Learning: A Preliminary Investigation", presented a comparative investigation of the four stages of the Kolb experiential learning model on the basis of levels of perceived trainee learning at each stage of the learning cycle. The study supported the experiential learning theory. The approach used was testing of the experiential learning theory. The study results indicated a statistically significant difference among perceived learning scores.

The author concluded that the study design involved a certain amount of bias (the topic of the experiential unit and the selected sub-group). Yet, even with this bias the implications of the results were noteworthy to the investigator. Certo concluded that because reflective observation

and concrete experience stages of the model resulted in higher levels of perceived learning than abstract conceptualization and active experimentation. He also concluded that experiential exercises and reflection appeared to be the most effective instructional activities within the experiential learning process. He noted that related readings and forming new behavior seemed to be less effective instructional activities. The implications of the study were consistent with findings that emphasize the importance of the reflective dimension of the experiential learning situation (Certo, 1976; Certo & Peter, 1976).

A study by Brenenstuhl and Catalanello (1979) entitled: "Can Learning Styles be Used as Curriculum Aids?", involved the random placement of 503 college juniors and seniors in comparable courses which emphasized either discussion methodology experiential methodology or simulation methods. The academic performance was then evaluated using 11 traditional measures (e.g. grade point average, pretest score), and three individualized measures (e.g. absences in lecture, absences in lab). The key approach used was testing the theory and LSI. This study also supported Kolb's theory. The investigators indicated that learning style is a useful tool in curriculum development at the university level. They observed that students might reach higher levels of academic performance

if learning style is used as an aid to individualize learning environments.

The Gray, Quick and Laird (1979) article entitled: "A Contingency Model of the Management Learning Environment", described a model of management education which is supportive of Kolb's learning style concepts. The paper presented a systematic, contingent approach to management education and development.

The key questions posed with regard to learning styles in management education were the following: (1) Do students/training participants display different styles of learning and knowledge acquisition? (2) Are there interrelationships between instructional styles, learning styles, teaching methodologies, and content frameworks of presentation which lead to success in the educational/training experience? (Gray, Quick & Laird, 1979). The approach used was discussion of experiential learning theory.

The authors explained how their model, assuming it has face validity, may be advanced. They recommended that tests be conducted that would encompass a series of educational/training experiments which examine various combinations of factors. They further proposed that if a set of meaningful relationships could be uncovered, a set of model educational/training designs could be developed and applied.

An article by Randolph and Posner (1979) entitled: "Designing Meaningful Learning Situations in Management: A Contingency, Decision Tree Approach", focused on the pedagogy of management education. The approaches used were theory discussion and use of the experiential learning theory. The article supported Kolb's formulation of experiential learning theory. The authors claimed that in the final analysis there is no one best pedagogical approach for all courses in management. They observed that what was lacking was a conceptual framework for determining when the various pedagogical techniques are most appropriate. The authors stated that their paper represented the first step in developing such a framework which systematically focused on important pedagogical and situational considerations.

The authors concluded that the proposed conceptual framework (topology) and model were offered as one possible guide for systematically considering the contingencies critical to the pedagogical design of effective learning situations in management courses.

Hunsaker's article (1981), entitled: "The Experiential Learning Model and the Learning Style Inventory: An Assessment of Current Findings", did not support the LSI but did support Kolb's theory. The purpose of this article was to review and summarize the various applications, findings and conclusions with regard to



Kolb's formulation of experiential learning theory and the LSI. It particularly evaluated the usefulness of the model and the instrument based upon the evidence of the articles cited (Carlsson, Keane & Martin, 1979; Freedman & Stumpf, 1980; Kevin & Liberty, 1975; Kolb, 1974; Plovnick, 1975; Reifle & Edwards, 1975; Wunderlich & Gjerde, 1978).

In summary, the author explained that current evidence supporting Kolb's LSI and experiential learning model was limited to anecdotal-type information without studies with appropriate methodology or data. She discussed that other available studies, except one, that used the LSI and/or examined the learning model consistently disagreed with Kolb's and his colleagues' findings. The studies that were focused on evaluating the reliability of the LSI indicated some support for the learning model, but at the same time discredited the reliability of the LSI (Freedman & Stumpf, 1979; 1980; Lamb & Certo, 1978; Certo & Lamb, 1980).

Although the reliability of the LSI is in question, there remains support for the learning model itself. According to Hunsaker (1981), the current use of the learning model as an explicative device for communication and problem solving did not appear to be in question. The author concluded that the LSI did not demonstrate sufficient predictive reliability that such as instrument requires. Yet, she reiterated that the underlying model

received enough support to merit further use and development.

Carricato's (1982), study entitled: "The Implementation and Evaluation of a Practical Management Development Course Based on Experiential Learning", was supportive of Kolb's theory of experiential learning. The central purpose was to implement and evaluate a modular practical management development course based on experiential learning, and the specific work of Kolb. Both formative and summative evaluation methods were employed to identify and change those aspects of the course which were not operationally sound. The investigator used the case study method. The approaches used were use of the theory and testing of the theory.

Carricato concluded that the course was designed and implemented in such a practical manner that it was of great benefit to the operation of the industry being trained, and that management development courses must respond to the needs of both the organization and the trainees.

An article by Noel and Sims (1984), entitled: "An Experiential Learning Model for Continuing Education", supported Kolb's formulation of experiential learning. The purpose of the article was to familiarize continuing educators with the work of Kolb. The authors explained that Kolb's learning model is grounded in the fundamental assumption that learning should be experienced-based. The

approaches used were theory discussion and theory use. The authors concluded the article by stating their very supportive views of Kolb's learning model:

We think Kolb's Experiential Learning Model has application to continuing education programs. The experiential learning model focuses upon a work related problem or situation, requires the learner to reflect upon the experience, examine possible solutions or alternative approaches, and finally construct a strategy for implementing the required change. (Noel & Sims, 1984, p. 26)

Pollack's (1984) article entitled: "The Relationship Between Matching University Students' Learning Styles and Their Teacher's Learning Style and Business School Course Achievement", did not support Kolb's Learning Style Inventory. The investigator tried to determine the relationships between student learning styles, teachers' teaching styles, or teachers' learning styles, and business school course achievement. The approach used was testing the learning style theory and LSI. The investigator matched students and teachers according to their learning ability (CE, RO, AC and AE) scores. The analysis of variance results indicated an advantage for some matching situations and a disadvantage for others.

In conclusion, the investigator recommended that matching students and teachers on the basis of their learning styles as determined by using the Kolb LSI could not be advocated.

The article by Sims and Sauser (1985) entitled: "Guiding Principles for the Development of Competency-Based Business Curricula", proposed that Kolb's model be used to create more effective business curricula, along with seven guiding principles for the development of competency-based curricula.

The authors concluded that the learning environment and process for learning must be planned due to their important contributions to managerial competence. They suggested that both the student and teacher need to join in a collaborative effort, in which both aspire a common goal: the development of managerial competence in the student.

In conclusion of this discussion on business education articles as related to Kolb's theory and LSI, it should be noted that nine of the twelve articles supported Kolb's theory and/or LSI (Brenenstuhl & Catalanello, 1976; 1979; Carricato, 1982; Certo, 1977; Gray, Quick & Laird, 1979; Kolb, 1976; Noel & Sims, 1984; Randolph & Posner, 1979; Sims & Sauser, 1985). These nine studies all tended to describe various applications of Kolb's experiential learning theory (Carricato, 1982; Certo, 1977; Kolb, 1976; Noel & Sims, 1984; Randolph & Posner, 1979; and Sims & Sauser, 1985) or described and discussed the use of Kolb's four learning styles (Brenenstuhl & Catalanello, 1979; Gray, Quick & Laird, 1979).

The three studies which did not support or showed support and nonsupport for Kolb's theory or learning styles conceptualizations, (Hunsaker, 1981; Pollack, 1984; Wolfe & Byrne, 1976) were either a descriptive review of the theory, or a quantitative experimental study.

The Helping Professions - This section is composed of three academic areas: career education (Pelsma, 1982), counselor education (Abbes, Hunt & Weiser, 1985; Sugarman, 1985) and counseling psychology education (Pelsma & Borgers, 1986).

The first counselor education study reviewed is by Pelsma (1982) which is entitled: "Effects of Learning Style on Satisfaction with a System of Interactive Guidance and Instruction." The purpose of the study was to investigate the effects of learning style on satisfaction with the system of Interactive Guidance and Instruction (SIGI), a computerized career guidance methodology. The secondary purposes of the study were: (1) to investigate the differences between individual learning styles and the values profile, and (2) to investigate the differences between individual learning styles and the main occupational field of interest. The approach used was primarily testing of the learning style theory and LSI. The study was supportive.

The findings of the study indicated that, with respect to three of Kolb's learning styles, no significant

difference was found on either satisfaction score as related to values, or the total satisfaction score in relation to the use of SIGI. In regard to the effect of learning style on the value rating, the results indicated that there was a significant difference between learning style groups for some values and not for others.

Pelsma's conclusions were: (1) There was no evidence to suggest differences in satisfaction with using SIGI in subjects who differ in their learning style. This suggested that SIGI is a satisfactory method of career guidance for at least three of the four learning style groups. (2) There were indications of significant differences in the rating of values in subjects who differ in their learning style. (3) There was mild evidence to indicate that different learning style groups chose significantly different main occupational fields of interest.

Sugarman's (1985) article entitled: "Kolb's Model of Experiential Learning: Touchstone for Trainers, Students, Counselors, and Clients", was highly supportive of Kolb's theory and its application within the counseling setting. The article was descriptive, in which the author proposed that a sophisticated conceptualization of the learning and the teaching process is needed for both trainers and students. She presented Kolb's (1976, 1984) model of experiential learning as an effective teaching model, as

well as the concept of Kolb's learning styles as a useful basis for curriculum planning, implementation and evaluation. The approaches used were theory discussion and use of the experiential learning theory.

The author explained the implications of Kolb's experiential learning model for discussing the model's high level of abstraction, which, according to Sugarman, is one of its strengths. The model's abstract qualities allows it to be used flexibly. In this way it allows the perceptions of each stage of the learning cycle to be a reflection of the goals of the user.

In concluding the author observed that Kolb's experiential learning framework tends to help people expand their repertoires of learning skills. The author concluded that, although Kolb's model has made a significant impact on management training and development (Beck, Cox & Radcliff, 1980), it has not been taken up with the same interest by the counseling field. Sugarman expressed concern because of the many possible applications to the counseling field.

A third article reviewed within the field of counseling is by Abbey, Hunt and Weiser (1985), which is entitled: "Variations on a Theme by Kolb: A New Perspective for Understanding Counseling and Supervision." The article was, again, descriptive and offered a very supportive stance with regard to the use of Kolb's learning cycle theory. Kolb's model (a variation of the learning

cycle) was used in an analysis of clinical dialogue between client and counselor, and between counselor-in-training and supervisor. The model was used to demonstrate that effective counseling and supervision demands that all four modes of experience be available to the clinician and that treatment be seen as making these modes available to the client. The approaches used were theory discussion and use.

The last article representing the helping professions is by Pelsma and Borgers (1986), which is entitled "Experience-Based Ethics: A Developmental Model of Learning Ethical Reasoning." In this article a model is proposed to explain how the learning process of ethical reasoning occurs. Again, this descriptive counseling article is very supportive of the use of Kolb's formulation of experiential learning theory. The model proposed by Pelsma and Borgers integrated the learning process (Kolb, 1976) and a developmental scheme of ethical reasoning (Van Hoose, 1980). The approaches used were experiential learning theory discussion and use of the theory.

Some of the key implications of the model are as follows: (1) The value of the Experience-Based Ethics Model lies in its emphasis on the how rather than the what of learning. Consequently the model encourages learning techniques for responsible, ethical reasoning. (2) It is important to develop a personal theory that is grounded in



a professional code, but tested through active experimentation and concrete experience. (3) An important implication of the dilemma of how to teach ethical standards is that counselor educators must assume that individuals are ultimately responsible for their ethical decisions and behaviors (Pelsma & Borgers, 1986). Thus, an experiential learning approach is quite appropriate.

The helping professions studies supported the Kolb formulation of experiential learning theory and/or the LSI. The articles tended to be more descriptive in nature, yet presented the concepts of Kolb's theory and LSI with greater depth.

Medical Education - The two medical education studies primarily focused on the use of the LSI. Both articles were written in the late 1970s (1978 and 1979), and both cited the Learning Style Inventory Technical Manual as their only source specific to Kolb. This may reflect their understanding of Kolb's theory, and their singular focus on learning styles.

The first article by Sadler, Plovnick and Snoop (1978) entitled: "Learning Styles and Teaching Implications." This supportive study pertained to the quality of the residency education in the Department of Family medicine at an eastern university medical school. The original study by Plovnick (1975) was cited, in which he concluded that the differences

between the various medical specialties were reflected in their relative attractiveness to medical students with varying learning styles. A reference was also made to the Wunderlich and Gjerde (1978) study in which no correlation between learning style and career choice in medicine was reported. The authors proposed that this discrepancy occurred due to Wunderlich and Gjerde's different methodology. The major approaches used were use of the LSI and testing the LSI.

It was found that 40% of the family practice residents were accommodators, which Plovnick previously found to be the most common learning style among family physicians. The second highest percentage was 31% for convergers. In terms of faculty learning style, 40% were accommodators, 20% were divergers, 53% were convergers, and 13% were assimilators. The authors concluded that the faculty learning styles were somewhat more abstract and more reflective than the residents' learning styles.

The key conclusions focused on the resident's learning style. The authors found that the mean scores indicated learning style preferences of family physician residents tend toward the concrete and active modes. The trend observed in this study was generally consistent with Plovnick's earlier study, except that there was a higher percent of convergers (31%) in the more current study than in Plovnick's earlier study (4%). They explained that while

there is no clear explanation for this variance, the key conclusion was that family practice residents tend to prefer learning situations which offer concrete examples and active participation in the learning process.

The second study by Christensen, Lee and Bugg (1979) is entitled: "Professional Development of Nurse Practitioners as a Function of Need Motivation, Learning Style and Locus of Control", assessed the relationship of loci of control, learning styles, and motivational needs of 53 graduates of a University Nurse Clinician Program, to amounts and types of professional activities performed in a clinical setting. The approach used was testing the Kolb learning style theory. The study both supported and did not support the concepts of the LSI.

It was found that amounts and types of professional activities performed were not significantly related to loci of control or to learning styles. Furthermore, the findings reported that no differences were found between the professional activities of assimilators and convergers. Also, there were no differences between the self-appraisals of the previous two learning style groups. Other findings revealed no differences between the job performance of any two of the four groups. It was found that 70% of the nurse clinicians studied were accommodators or divergers. This finding was consistent with Plovnick's (1975) study which reported that medical students who were accommodators or

divergers tended to choose medical careers in primary and family care.

With regard to correlations between the four learning abilities and the type of professional activity, it was found that only one significant correlation was found. Although the patterns of correlations were logical. For example, reflective observation was most related to medical care management. The authors observed one other salient feature of the learning style data; those with active or concrete learning style preferences tended to be more productive than those with abstract or reflective learning styles.

Overall, the medical education studies focused on the use of the Learning Style Inventory and theory and its relation to specific medical career groups and their residency or professional activities. It is clear that the medical educators scrutinizing the LSI and its relationship to medical education are concerned about the quality of education and career development of their students.

Postsecondary Education - The articles and studies within postsecondary education span a nine year period between 1977 and 1988.

The earliest report is a dissertation by Weathersby (1977) entitled: "A Developmental Perspective on Adults' Formal Uses of Education." Weathersby applied the LSI as a

survey instrument to determine the adult students' perceptions of the "degree of match" between their natural style of learning, the style of instruction and modes of learning expected in the Adult Degree Program at Goddard College. A secondary goal of the paper was to conduct a preliminary exploration of the relationship of learning style characterizations to satisfaction and success in the program to students' perceptions of valuable features of the program, and to sources of exhilaration and frustration that accompany study in this individualized mode. The approaches used were theory discussion and LSI use and revision. The study was supportive of Kolb's LSI and theory.

Weathersby's key findings as related to the LSI were as follows: The percentages of the four learning styles and of mixed types (a Weathersby's classification, which was determined by the two highest scores being opposite on the learning cycle) were; accommodators 27%, divergers 20%, convergers 14%, assimilators 3%, and mixed types 36%. The investigator explained that the learning style scores parallel the adult degree program's emphasis on integrating past and present life experiences with formal study. This was reflected in the findings that the two highest groups, accommodators and divergers, fall in the quadrants adjacent to concrete experience, whereas only 11 of the 64 respondents were assimilators or convergers who favor abstract conceptualization.

Weathersby observed that there seemed to be a direct relationship between the learning styles of the adult students who chose the Adult Degree Program and the instructional mode of the program. The author found a most interesting result; that largest group of the sample were mixed types (36%). These individuals preferred one of three possible score combinations: RO and AC, CE and AE, and balanced scores, in which the highest scores are distributed among three points of the cycle so that there is a two- or three-way tie. This finding of mixed types is contrary to Kolb's theory, which explains learning style as a result of a dialectical incorporation followed by an integration of an opposite mode of learning (Weathersby, 1977). It was found that 52% of the mixed type scores were highest at concrete experience and abstract conceptualization. This trend demonstrated a lack of dialectical incorporation and integration. Weathersby hypothesized that the mixed types of learning styles represented the development of a more integrated learning style, which in turn related to basic growth processes in adulthood (Weathersby, 1977).

The students' learning styles fell mainly in the active and concrete quadrants, or they tended to prefer active experimentation and concrete experience over reflective observation and abstract conceptualization. It was observed that the structure of the program respected adult experiences and allowed them to build on their strengths.

Generally, there were important congruencies between the structure of the program and the learnings styles of adult students.

Fry and Kolb's (1979) article entitled: "Experiential Learning Theory and Learning Experiences in Liberal Arts Education" presented an experiential learning model, (Kolb's formulation), for the liberal arts educational setting in higher education. The three objectives of the article were; (1) to present an experiential learning framework for classroom environments, (2) to address methods of viewing differences in learning styles among the students college teachers teach; and (3) to integrate the two previous objectives with outcomes related to lifelong learning and development (Fry & Kolb, 1979). The major approach used in the article was experiential theory discussed.

Fry and Kolb proposed a common set of competencies that related to learner style and job demands or environmental needs. The competencies were correlated with a particular learning mode in the learning cycle. The authors pointed out that the result of linking adaptive, competency-based output to our previous notions of learner style and instructional methods is a powerful diagnostic description of the impact of the learning environment. They presented a circular diagram of measured job or career demands in competency terms of liberal arts graduates, which demonstrated the current learning environment or perceived

contribution of that environment to the measured competencies. Given such an analysis educators could then suggest design changes in the learning environment.

The authors concluded with their view of education; the problem of helping learners to acquire or specialize their learning styles and to attain performance level competencies. Although, equally important is the role of educational programs to foster lifelong learning and the integration of disparate learning modes which contribute to individual growth and development (Fry & Kolb, 1979).

Another key conclusion derived from the previous two studies was that learning styles can be used for future planning. This knowledge may be used to advise students, modify teaching techniques, and set up courses that fit different students' styles.

A third study discussed within postsecondary education is by Kolb (1981A). It is a chapter from Chickering's book The Modern American College. The chapter is entitled: "Learning Styles and Disciplinary Differences." The key approach used in this article was experiential learning theory discussion. Kolb opened the chapter with an extensive description of the tremendous diversity within one university, as reflected in the many departments and college cultures of a university. He also observed that the university community is responsible for the intellectual, moral and personal development of its students. However,



what often occurs is that the university emphasizes a unitary linear trend of human growth and development at the expense of acknowledging and managing the diverse developmental pathways that exist within different disciplines and professions. These different paths foster some developmental achievements, and inhibit others.

The chapter introduces the concept of learning styles, the learning cycle, and theories Kolb has centered on and derived his formulation of experiential learning theory from. One summarizing statement as to the meaning and purpose of Kolb's (1981A) research was stated as follows: "My own research work during this time (1965-1980) has focused on an approach to learning that seeks to integrate cognitive and socioemotional factors into an experiential learning theory" (p. 235).

Following the description of his theory and learning style types he warned that the types should not become stereotypes. Through the extensive research on cognitive style there has resulted documentation of the diversity and complexity of cognitive processes and their resulting behaviors. This research has identified three key dimensions of diversity: (1) Within any single theoretical dimension of cognitive functioning it is possible to identify consistent subtypes. (2) Cognitive functioning in individuals will vary as a function of the area or content it is focused on - the so-called cognitive domain. (3) Cul-

tural experience plays a major role in the development and expression of cognitive functioning (Kolb, 1981A).

The chapter concluded with several implications. Kolb proposed that higher education encourages early specialization, which accentuates specific interests and skills. He then posed the question if higher education should continue with the specialization trend, or create new educational programs that represent the integrative emphasis lost in the classical liberal arts education. He then summarized higher education historical trends in two past decades; the pendulum toward specialization (which began in 1869) reached its peak in the late 1960s (Kolb, 1981A). The "back to basic skills" that began to affect all levels of American education in the 1970's, Kolb estimated, may have signaled the reassertion of an integrative emphasis in the American educational process.

The "how" of implementing a more integrative and interdisciplinary university organization is a very difficult issue. Universities typically focus their resources and efforts on the scientific establishments as opposed to the humanities within their institutional structures. As described by Kolb, it's as if there is "a subtle but powerful imperialism of the dominant scientific culture on research and teaching activities", (p. 252).

In concluding the implication discussion, Kolb described how the societal trends of the knowledge

explosion, and the estimated change of careers and jobs in an average person's lifetime will stimulate the development of integrative learning. In this way the university becomes a center for lifelong learning for the integrative changes in adult life, instead of a "front-loading" educational experience for one phase of a person's life. He proposed that perhaps the richest sources of integrative development lie in the dialogue across age groups that a university for lifelong learning can provide.

A fourth postsecondary study is by Gypen (1980), which is entitled "Learning Style Adaption in Professional Careers: The Case of Engineers and Social Workers." A central purpose of the study was to conduct a cross-sectional survey of 44 engineering and 22 social work alumni of a major university. The study involved interviewing each participant, and administering the adaptive-competency scales, an instrument which addresses the perceptions of four learning orientations, and four learning "presses" in the individual's first and current job. The approaches taken in this study were use of experiential learning theory and testing the experiential learning theory. Gypen's study was supportive of Kolb's experiential learning theory.

The findings indicated that as engineers move upward from the beginning positions to management, they complement their initial strengths in abstract conceptualization and active experimentation with the nondominant orientations of

concrete experience and reflective observation. As social workers move from the direct services into administrative positions, they move in the opposite learning mode directions of engineers. These results corroborate Jung's developmental ideas of individuation. The regression analysis suggested that changes were due to an adaption between personal and job demands, with these changes less tied to aging. A key conclusion focused on the need for more interaction between career counseling and organizational psychology.

The fifth study in this area is by Claxton, Adams and Williams (1982), which is an article entitled: "Using Information on Student Learning Styles to Improve Educational Practices." Basically, the purpose of the article was "to describe a number of practical ways to capitalize on student learning styles in teaching, orientation, counseling and other areas" (Claxton, Adams & Williams, 1982, p. 2). The authors used two approaches with regard to Kolb's theory and LSI; (1) they defined and discussed Kolb's learning style concepts and learning cycle theory throughout the introduction of the article; and (2) they discussed the use of the LSI as related to their university setting. The article was highly supportive of the Kolb theory and use of the LSI in higher education settings.

Claxton, Adams and Williams (1982) acknowledged and recommended the LSI as one of five key learning style instruments which can be used effectively in higher education and adult education settings. They also recommended Kolb's learning cycle model as extremely helpful in course design.

The authors' strongest support and recommendation of the LSI was stated in their description of LSI administration to over 1600 freshmen per year, during two summer orientations at their university. The effects of the LSI administration were as follows: (1) following an orientation LSI seminar 45% of the students (approximately 700) indicated an interest in further information about the LSI and its implications for career and major choice. (2) A career workshop based on the LSI was designed and offered to all of the students interested, of which 10%, used this opportunity. (3) As a follow-up to the summer orientations, LSI scores were compiled by major and distributed to all department heads and deans. (4) The College of Education faculty was trained in the use and implications of learning styles. (5) Three university departments used the LSI periodically (geography, chemical engineering and higher education) of which the chemical engineering faculty have presented a study at a national conference on the implications of the engineering process on learning style. (6) The Office of Student Development prepared a

longitudinal study of a representative sample of the 1600 freshmen to determine if learning style was stable, if learning style is impacted by major, or if major choice is a result of learning style. A more extensive description and supportive discussion of Kolb's theory & LSI in relation to student development and higher education were reported by Claxton and Murrell in their 1987 publication Learning Styles: Implication for Improving Educational Practices.

The sixth study discussed with regard to postsecondary education is by Mark and Menson (1982) which is entitled: "Using David Kolb's Experiential Learning Theory in Portfolio Development Courses." The purpose of the article was to serve as a chapter in a book entitled New Direction for Experiential Learning: Building on Experiences in Adult Development(1982). The focus of this descriptive article was to explain how Kolb's learning theory and LSI related to and enhances the personal development and process of seeking academic credit through assessment of adults entering or re-entering colleges and universities. The key approaches used throughout the chapter were the description and discussion of Kolb's learning cycle theory. The application of the LSI in portfolio development and revision through the adaption of Kolb's learning cycle to the process of receiving credit for prior learning experience was explained.

The support for the learning model and LSI was demonstrated by the authors explanation of the model and LSI benefits to learners and faculty members. Three benefits were described: (1) The model and inventory can be viewed as instructional aids. (2) The model and LSI assists faculty in identifying special characteristics of adult learners in their classrooms. (3) The model and LSI are still helpful to students who do not develop a portfolio of prior learning. It was found in the teaching of their portfolio development course, that the model and LSI provided important knowledge and fostered self confidence.

A seventh study to be discussed is by Dixon (1982) who entitled her article: "Incorporating Learning Style into Training Design." This descriptive article focused on the purpose of learning styles as related to training, which is one specialty within postsecondary education. The major concepts of learning style were discussed in relation to important training design concepts (e.g. faculty skills and preferences, input and processing modes). The major approaches used in this article were primarily theory discussion and use. The author was supportive of Kolb's learning model and learning style concepts as demonstrated by her description of the model as one of three important learning style models.

The eighth study presented within the area of postsecondary education is by Rush (1983) whose study is entitled: "Comparative Study of Learning Styles and Related Factors Between Traditional and Nontraditional Students at the University of Akron." The central purpose of this study was to compare a group of 154 traditional students, under 25 years of age, with a group of nontraditional students over 50, in learning styles and other related factors within the setting of an urban university. The key approaches of this study were discussion and critique of theory, and the testing of the learning style theory. The text and results that demonstrated these approaches were quite extensive. In the literature review a specific section on "The Importance of Learning Style" presented an aspect of Kolb's theory, as well as a large section on the reliability, validity and meaning of the LSI within the procedures chapter of the dissertation. The testing of the learning styles theory was stated in the hypotheses of the study.

(1) There is a significant interaction between learning style and student groups predicting types of test preferences, educational goals, and other responses related to educational activities. (2) There is a significant difference between traditional and nontraditional students in their learning styles and in their questionnaire responses (Rush, 1983, p.12).



The investigator was both supportive and nonsupportive of Kolb's learning style theory. In terms of supportive findings the discriminant analysis indicated a significant difference existed between traditional and nontraditional students with regard to learning styles and questionnaire responses. The author expressed nonsupport based on previous studies. The investigator expected a greater percentage of accommodator learning style scores among the traditional students. The results showed a greater number of divergers. The researcher concluded that attitudes and the environment may be more important to classroom success than the identification of learning styles.

Another postsecondary education dissertation study is by McCall (1983) which is entitled: "Effects of Learning Style and Learning Environment on Achievement by Levels of Learning." The key purpose of the study was to determine whether or not interactions occur between/among individual differences (learning styles) of learners with instructional treatments. Kolb's conception of learning styles was used, although the LSI was not referred to. The investigator sought to determine if adult students enrolled in a non-credit computer programming course of different learning styles would achieve more in certain learning environments, and if matching (learners and environments) would effect their ability to learn at different levels.

The key approaches used in the study were theory discussion and testing of the learning style theory.

The findings revealed that learning style and learning environment do interact to affect achievement. However, a further analysis (multiple analysis of covariance) demonstrated that there were no differences between learning style and levels of learning. Thus, the study acknowledged that there is an interaction between learning style and the learning environment that affects achievement. Yet, no differences were specifically found between the learning styles and the rate or the understanding levels of learning.

Another study which focuses on the postsecondary education is by Mentkowski and Strait, (1983) which is entitled: "A Longitudinal Study of Student Change in Cognitive Development and Generic Abilities in an Outcome Centered Liberal Arts Curriculum." The key purpose of the study was to answer the question of whether college students change in broad abilities indicative of human potential for cognitive development, learning styles and other generic abilities. Over 750 students participated in longitudinal and cross-sectional studies by completing 12 instruments, one of which was the LSI. The instruments were drawn from cognitive-developmental theory, experiential learning theory, and competence assessment.

The key approaches of this study with regard to Kolb's LSI and theory were theory discussion and practical use of the LSI. The study basically supported Kolb's LSI and notions about learning style and experiential learning. This support was demonstrated in the major conclusion that cognitive-developmental and learning style measures were better indicators of student change than were the generic ability measures, and recognition measures showed more change than did the production measures. Kolb's LSI was the only learning style instrument applied in this study.

Another dissertation which focused on Kolb's learning styles as related to a higher education setting is by Koch (1984) which is entitled: "Assessment of Dominant Learning Styles and Preference for Teaching Methods in Adult Students Attending a Small Liberal Arts College". The major purpose of the study was focused on two questions related to postsecondary learning: (1) Was there a difference in dominant learning style related to the stage of adult development? (2) Was there variation in preference among the learning style groups for instructional methods commonly used with adults in formal educational experiences? (Koch, Dissertation, no. DA 8420083)

The key approaches used in the study were theory discussion and testing of the learning style theory. The author was supportive of the Kolb LSI and learning style theory, which was reflected in the findings. The findings

showed a significant difference in the dominant learning style of the four identified stages of adult development. A significant difference also resulted in the preference indicated for different teaching methods by each of the four dominant learning style groups studied.

An article by Williams (1984) entitled: "Designing Learning Activities for Adults: A Practical Approach", described Kolb's learning cycle and discussed its applications for continuing education curriculum development. Overall, the author was very supportive of Kolb's theory and its application, which was demonstrated in the description of the learning cycle theory as a method to examine their own curriculum in terms of Kolb's learning cycle model and a strong justification that educators should incorporate the four learning modes of the cycle into their curriculum.

de Hainer's (1985) article focused on the postsecondary educational area of English as a second language. The article is entitled: "Learning Styles: A New Approach to Teaching ESL." The author's purposes were to present the theoretical framework of Kolb's theory and then to discuss the application of the theory through a learning style format. The key approaches of the study were theory description and use of the learning style theory. The author has clearly supported Kolb's learning cycle and learning style theory, which was demonstrated in

the clear description of the learning cycle and learning style theory. The application of Kolb's theory was presented in a lesson plan format which sequentially described a goal, action and approach specific to each of the four learning styles. This article demonstrated a learning style interpretation for applying Kolb's learning cycle theory.

A dissertation by Liberman (1986), focused on learning and teaching styles in the community college setting is entitled: "The Effect of Congruence Between Learning/Teaching Styles on Student Retention at Broward Community College." The purpose of this study was to determine whether student's grades and retention in a community college were affected by the degree of congruence between their learning styles and their respective teacher's teaching styles. The approaches used in this study were theory discussion and testing of the learning style theory.

She found that an understanding of congruence of learning and teaching styles is a critical concept in terms of an overall view of student achievement in the academic environment. She also recommended that further research be conducted in the area of student learning style flexibility to determine if student adjustment of learning strategies to teaching styles, which are contrary to their learning style, is warranted. She also suggested a follow-up study

to replicate her study to determine which learning styles are found among graduates and then ascertain the percentage of style changes between freshmen and graduates.

The investigator was not supportive in regard to the study findings. The results suggested that an instructor's age and teaching style, and a student's degree of self-directed learning have a stronger relationship to academic achievement and retention in class than does congruence between learning and teaching styles. It was also stated that the relationship of congruence between learning and teaching styles was statistically significant. Thus, the author acknowledged the possible relationship between teaching and learning style congruence, but explained that it could not be used as an isolated factor in predicting a student's academic potential. She suggested that congruence is one of many interdependent aspects of learning which includes teaching style, learning style, degree of self-directed learning, instructor age and sex, type of class taken, and level of cognitive development.

Baxter-Magolda (1987) presented a paper at the American Education Research Association national conference entitled: "Gender Differences in Cognitive Development." The central purpose of the study was to investigate sex differences on Perry's stages of epistemological development. The study involved the interviewing of 100 freshmen, and the administration of two inventories, one of

which was the LSI. The emphasis of the study was on the six domains of Perry's theory. The key approaches used with regard to Kolb's theory and LSI were theory discussion and critique, and testing of the Kolb LSI and learning theory.

The investigator both supported and did not support the LSI and theory. The author's support was reflected in the discussion of the LSI reliability, the conclusions and implications. She explained that the data clarified the gender related reasoning patterns and supported the hypothesis that such patterns are not exclusive to either gender. She stated that the learning style data were consistent with the gender related patterns. She further explained in the implications that most educators agree that intellectual functioning that integrates objective and subjective processes is more effective than only one of these processes. In addition, contextual thinking requires the ability to integrate evidence with contextual circumstances. She stated that Kolb's four learning modes are depicted as more highly integrated as development becomes more complex (Kolb, 1984). The author then recommended that educators recognize different learning preferences and ways of making meaning. She also suggested that educators foster appreciation for learning modes and ways of making meaning that are incongruent in order to ultimately promote integration.

The investigator did not support the LSI. She stated that the data from the LSI was inconclusive. A second key conclusion was that the relationship between learning styles and intellectual development remains unclear.

A study by Korhonen and McCall (1987) entitled: "The Interaction of Learning Style and Learning Environment on Adult Achievement", focused on the adult learner and Kolb's learning model. The central purpose of the study was to examine learning styles as they interact with the learning environment. The key approaches used in this study were theory discussion and testing of the learning style theory.

The investigators did and did not support the Kolb learning style theory. Their support was demonstrated in the description of the historical background of Kolb's learning theory, and of the four learning styles. The investigators demonstrated support of the learning style theory by their recommendation to educators of the value of the awareness of student learning style. They also explained that it is important to observe the interaction between the learning styles and the learning environment. From the findings they concluded that learning style and learning environment interact to affect achievement. They also noted that it was clear that learning style research will be used in educational practice.

The investigators found that they could not support the notion that learning styles alone can explain trends



toward adult achievement. They also did not support the overall concept of learning styles as a critical variable in developing effective adult education programs.

The Vondrell and Sweeney (1989) study is entitled: "Independent Study: Using Learning Style Assessment to Predict Student Success" was conducted to determine if identification of learning styles would assist in predicting adult student's success - both academic and satisfaction level outcomes - in an independent study program. The age of the 130 students was primarily over 22 years. Three instruments were completed: a self-report background information form, the LSI (1976) and a satisfaction level report form. The approaches taken within this study were theory discussion (specifically focused on the learning styles) and testing the learning style theory.

Vondrell & Sweeney's findings and conclusions indicated that accommodators and convergers tended to do well in an independent study program (as demonstrated by grades and satisfaction levels), with assimilator close behind, and divergers performing significantly worse than the total group. They pointed out that these findings were consistent with Kolb's description of the four learning styles.

The key conclusions also supported the learning style theory, although they observed that the LSI does not have

to be an essential screening device to eliminate participants from an independent study program. They further stated that the LSI may be a beneficial self-help tool for the student and planning aid for the program administrator. The investigators concluded that the study assessment indicated that learning style is appropriate for better advisement of students, specifically when formats as independent study programs are under consideration.

This concludes the postsecondary section of the chapter. In observing the overall trends it appeared that the majority of the studies or articles supported the Kolb learning model or LSI. Four of the 18 postsecondary articles demonstrated partially supportive and nonsupportive findings and/or conclusions. None of the articles were entirely nonsupportive of the theory or LSI. This, in itself, may indicate the positive regard the field of higher education and adult education has in reference to the meaning and/or use of Kolb's formulation of experiential learning theory and the LSI.

Teacher Education. The presence of learning style models has been in educational literature for over twenty years. The actual discussion and application of learning style models within teacher education programs has only occurred within the past 12 years in regard to Kolb's learning style

within the past 12 years in regard to Kolb's learning style theory. The following articles and studies presented range chronologically between 1977 to 1987.

Banks (1977) in an article entitled: "An Examination of the Relationships Among the Teacher's Learning Style, Principal's Learning Style, and the Degree of Teacher's Satisfaction with the Principal's Job Performance" examined the relationships among the teacher's learning style, principal's learning style, and the degree of teacher's satisfaction with the principal's job performance. The approaches used within this study were theory discussion and testing of the learning style and cycle theory.

Banks was generally supportive of both the learning styles and the learning cycle theories which was reflected in the key findings; (1) More than 70% of the teachers with more experience, but not on tenure favor a learning style high in active experimentation; (2) More than 70% of the tenured, more educated teachers favor a learning style high in reflective observation in order to be satisfied with their principal's job performance (Banks, 1977). A major conclusion was that the principal should not choose a problem solving method that is strictly one dimensional, but is able to implement varying degrees of both dimensions of learning: abstractness/concreteness and experimentation/reflection (Banks, 1977). Thus, this study recognized both the learning style within the teacher

sample, and the connection of the learning cycle to a problem solving methodology.

The second article was written by the staff of Phi Delta Kappa's Newsletter Practical Applications of Research (1980). This teacher research organization focused one newsletter on the meaning of learning and teaching styles which is entitled: "On Mixing and Matching of Teaching and Learning Styles". The central purpose of the article was to present an overview of some of the major learning style models, of which Kolb's was one of seven models. The article was descriptive throughout. The authors were supportive of Kolb's learning style theory which was reflected in their introductory comments prior to describing his theory: "Research is providing important clues to how students take in and process information. The most important efforts have resulted in the identification of four major learning styles" (Phi Delta Kappa (PAR), 1980). The article offered a clear description of the learning style theory, and in turn supported Kolb's learning style theory.

Kotar (1980) in a dissertation entitled: "An Investigation of a Learning Style Inventory with selected Educational Groups", investigated the abstract-concrete dimension of learning as measured by Kolb's Learning Style Inventory and to compare these measurements with measurements of integrative complexity made by the

Interpersonal Topical Inventory. Some of the key questions of the dissertation were as follows:

- (1) What relationships exist between scores on the abstract-concrete dimension of learning as measured by the Learning Style Inventory and the Interpersonal Topical Inventory.
  - (2) What relationships exist between learning styles as determined by the Learning Style Inventory scores of selected educational groups?
  - (3) What evidence exists in this study concerning the validity and reliability of the Learning Style Inventory?
- (Kotar, 1980, p. 17)

The major approaches used throughout this study were theory discussion and critique, and testing of the theory and LSI. The author reflected both support and nonsupport of Kolb's learning style theory and LSI. According to the summary of findings relationships between scores on the abstract-concrete dimension of the LSI and the Interpersonal Topical Inventory (ITI) were not established, which was the issue addressed in question one. Findings as related question two, indicated that a concentration of in-service and pre-service teachers preferred the accommodator learning style. It was also found that university students had a significantly higher abstract-concrete score and a significantly lower active-reflective score than the in--service and pre-service elementary teacher subgroups. With regard to the third question, the investigator stated that evidence supporting the validity and reliability of the Learning Style Inventory was established in this study.

Split-half reliability coefficients indicated the existence of moderate levels of reliability. Whereas, theoretical validity of the LSI was clearly indicated in the results of a factor analysis of the LSI words. Using a major factoring method with varimax rotation finding revealed evidence to suggest the existence of the two primary dimensions of learning as hypothesized by Kolb (1971, 1976).

Thus, the first question was a form of construct validity evaluation (comparing the LSI to the ITI) in which the LSI and ITI correlation was not supported in this study. Although, the investigator presented several findings which demonstrated that several relationships exist among learning styles and various educational groups (in-service and pre-service elementary teachers, and University students in other major fields. It was also found that learning styles of in-service elementary teachers were not related to environmental considerations of their teaching situations. The final conclusion of the study was that responses to the LSI determined the learning styles of individuals in a format that is consistent with Kolb's formulation of experiential learning theory. This was evidenced by the validity and reliability findings.

Fitzgibbon's (1987) article entitled: "Kolb's Experiential Learning Model as a Model for Supervision of Classroom Teaching for Student Teachers" was to describe to

educators how Kolb's model of experiential learning is adapted and applied to the supervision of the student teaching process. The major approaches used in this article were discussion of the theory and use of the theory and LSI.

The author was very supportive of Kolb's formulation of experiential learning theory, which was evidenced throughout the description of the theory and LSI. The application concepts were primarily drawn from the learning cycle theory. The conclusions particularly reflected strong support for Kolb's theory. She began her concluding statements by reiterating that the key recommendation of the paper was that Kolb's experiential learning model can, with advantage, be applied to the supervision of student teachers. She then presented six possible benefits of using the model and LSI adapted from Carlsson, Keane & Martin (1984) and presented five additional benefits. The author concluded the article by proposing that adopting a model such as Kolb's offers the opportunity for linking the theory and the practical of the student teaching program at several levels.

This article concluded the teacher education section of part three. It is evident in all four articles that these particular authors and investigators are quite supportive of Kolb's formulation of experiential learning theory and/or the LSI. Both of the articles used the

theory discussion approach with the, two studies (Banks 1977 and Kotar 1980) testing the theory and/or LSI. The study which presented some nonsupportive evidence was by Kotar. Although his supportive findings out-weighed his nonsupportive findings. It is evident that the teacher education articles or studies which scrutinized Kolb's theory and/or LSI between 1977 to 1987 were, overall, very supportive.

#### Part 4 - Learning Style Reviews and Topologies

The concluding part of Chapter Five focuses particularly on articles and studies within teacher education and postsecondary education. The articles or studies provide either a topology or a review of the learning style models. A topology organizes several learning style models into a framework. The framework defines the control concepts upon which each learning style model is based, and places each model within the framework, and thus offers a perspective of each model within the "bigger picture" of the learning style research. The articles which offer a review typically select a few or several learning style models and then critique the characteristics of the models and/or inventories. Some reviewers conclude by explaining which models they would and would not recommend for various applications. The following nine articles and studies, which ranged from 1981



to 1988 were presented chronologically. The studies discussed in part four are listed in Table 5.

Dunn and DeBello's (1981), review is entitled: "Learning Style Researchers Define Differences Differently." The purpose of this descriptive article was to outline the varying definitions of learning style according to the theorists, the different applications of the theories, and the instrumentation or key concepts of the inventories. The approach used was theory and inventory discussion.

This article very briefly discussed and described the LSI, its applications and implications, along with seven other learning style models. No ratings were presented. Because the authors acknowledged the Kolb LSI, it appeared that they supported the Kolb theory and LSI.

A second learning style instrument review from the area of teacher education is by Ferrell (1983). It is entitled: "A Factor Analytic Comparison of Four Learning-Styles Instruments." The key purpose of Ferrell's review was to conduct a validity study of four learning style models: the Kolb LSI, the Dunn & Dunn LSI, the Johnson Decision Making Inventory (DMI), and Grasha-Riechmann Student Learning Style Scales (SLSS). The four models were factor analyzed, with the results of the analyses compared to the conceptualizations of learning style as defined by the authors. Factors shown from the inventories were

compared to types of behaviors outlined by Keefe (1979) as comprising learning style, and factors shown from each instrument were compared to those derived from the other instruments to determine the overlap in factors. The literature demonstrates a plethora of learning style definitions and characteristics aside from behaviors.

The key approach used in this study was the comparative discussion of the learning style theory and LSI. Overall, the author was both supportive and nonsupportive of the Kolb theory and LSI. The author gave the best evaluation of the factor analysis in regard to Kolb's LSI. The author explained that the LSI was the only instrument for which a match between factors and learning styles existed. Thus, results of the LSI factor analysis supported Kolb's conceptualization of learning style.

In concluding the review the author also pointed out that efforts to accumulate evidence of construct validity of learning style instruments has been clouded due to the lack of establishment of a single conception of learning style by the literature. The results of the factor analysis found all four instruments to be lacking in relation to the characteristics as conceptualized by Keefe. She concluded that no one instrument stood out as better than the others, and they varied in the degree of factor analytic support for their conceptualization, as well as the amount of variance accounted for.

She found that some overlap of factors did exist, but that the instruments did not measure the same thing. From a psychometric perspective learning style instruments may never result in high levels of validity. Perhaps this is due to a "state", environment-influenced view of most learning style researchers, as opposed to the "trait" measurement orientation of individual differences in psychology. The author proposed that increasing the evidence for construct validity could help develop a convergent conceptualization of learning style. Yet, if one observes people to be unique individuals it may be contrary to developing a singular definition of learning style.

Another comparative study of learning style instruments was conducted by Tenore (1988). This dissertation study is entitled: "An Exploratory Study of the Interrelationships Among Variables which Impinge on Cognitive/Learning Styles." The central purpose was the investigation of interrelationships among three tests of learning styles: (1) Group Embedded Figures Test; (2) Kolb Learning Style Inventory; and (3) Tenore Learning Style Assessment Inventory. The relationship among these measures as they related to students enrolled in a competency-based psychology course was also investigated.

The author used two approaches: theory discussion and testing the learning style theory. The investigator was

nonsupportive in regard to all three learning style inventories. The key results indicated that the three assessment instruments were unrelated. In observing the relationships of various elements of the instruments to selected student characteristics (grade point average, ethnic group, age and sex) the investigator found low correlations. The major conclusion was that the findings suggested that with the widespread practice of learning style inventory administration and categorizing of learning style types operational definitions are not uniform. This conclusion was similar to Ferrell's key conclusion.

A fourth learning style inventory review is by Sewell (1986), which is entitled: "The Measurement of Learning Style: A Critique of Four Assessment Tools."

The key purpose of the study was to address the issue of whether four of the learning style instruments, (Myers-Briggs Type Indicator, Kolb LSI, Canfield Learning Styles Inventory, and Gregors Style Delimiter), are of sufficient psychometric quality to warrant their use for research or educational purposes. The instruments were selected based on the frequency of references in the literature, and referrals from several adult educators.

The central approach used in this review was theory and LSI discussion and critique. The author was basically nonsupportive of Kolb's LSI. The descriptive findings, based on the first version of the LSI, encompassed

practical features of the test, manual instructions of scoring and test interpretation, and characteristics of the test: reliability and validity.

The author concluded that the unreliability and lack of evidence for construct or predictive validity suggests that the LSI may produce quite misleading results. He recommended that the LSI be studied much more carefully before it continues to be used in any setting. It should be noted that the author explained that none of the instruments have established an appropriate normative base for acceptable or valid interpretation of scores. It appears that there is a trend; authors who base more of their critique on psychometric findings are the most critical of the Kolb LSI and most learning style instruments throughout the past twenty years.

A study by Marshall (1987) presents one of two learning style topologies within part four. The study is entitled: "The Examination of a Learning Style Topology." The study was designed to provide an initial examination of Curry's learning style topology; that which was described in chapter four of this dissertation. Marshall did this through the comparison of the information processing toponymy (level) and instructional preference toponymy of the model. The investigator hypothesized that learning style modes would be discernible within each of the two

toponomies, and that the toponymies would demonstrate orthogonality.

The investigator used two approaches: theory discussion and testing of the Kolb theory and LSI. The investigator was supportive of the Kolb learning style theory as reflected in the verification of the hypotheses. It was concluded that the results supported the hypotheses which stated; (1) the experiential learning style dimensions within the information processing toponymy would be discernible and that (2) the dimensions would be independent if identifiable instructional preference behaviors of students. The overall results of the study provided support for Curry's learning style topology as well. The author also recommended that before confidence is placed in this topology further validation was needed.

The second of the two topologies is by Davidman and Chiarelott (1987). This descriptive article is entitled "Analyzing Diverse Learning Style Conceptions and Approaches: A Synthesis of Learning Style Informed Education." The major purpose of the article was to provide teachers and administrators with a framework which would allow for an eclectic, adaptive synthesis approach to learning style informed education, they referred to as LSIE, at the classroom, school and district levels of operation. The description of the framework encompassed the following: (1) There is a diversity of the learning

style definitions currently available in the literature; (2) they discussed the methodology used in the analysis of competing conceptions; (3) they presented a visual representation of the analysis, which involved three continua - grade level continuum, magnitude continuum, and expansionism continuum; (4) they discussed the application of the framework to specific learning style conceptions/ approaches.

The key approaches used in this article were theory discussion and use of the learning style theory. The authors acknowledged, and in this way, supported Kolb's learning style theory and LSI. Their support was expressed in the selection process they used for the learning style models chosen. They based the selection on three qualifications; (1) conception of learning style which had clearly articulated well-developed applications; (2) the framework would share a set of conceptions which would indicate a wide range of definitions in the field; and (3) the conception would be able to illustrate a natural linkage between the conception and the approach. The Kolb LSI was classified as relating to grade 12 through college. Magnitude continuum rated the number of learning style characteristics evaluated by the inventory. Kolb's LSI was one of four rated at the third level, on a possible scale of 21. The expansionism continuum reflected the degree of adaptability the learning style model required of the

learner. The low rating indicated that the model encouraged practitioners to identify learner strengths and to teach to those strengths, whereas the high rating would indicate learning style approaches oriented to strengths in order to stimulate new strengths. The Kolb LSI was not placed on this continuum, which was not explained. The McCarthy LSI, which was based on Kolb's learning style theory, was placed as one of three models at the high rating on the expansionism continuum. In summary it may be concluded that the authors did support the Kolb learning style theory and LSI.

Another article which descriptively reviewed and critiqued learning style models and inventories is by Bonham (1988), which is entitled: "Learning Style Instruments: Let the Buyer Beware." This author began the article with many of the key problematic issues of cognitive and learning style theories (which she differentiated between). The central purpose of the article was to discuss and critique each of four learning style instruments individually, and comparatively among themselves. The approach used throughout this article was theory, and LSI discussion and critique.

With regard to the Kolb LSI, the author was primarily critical and nonsupportive. The major criticisms are in reference to the original LSI (1976). The first concerns were the inventory's brevity, the resulting lack of



reliability (Moore & Sellrs, 1982), the possible different interpretations of the inventory words (Wunderlich & Gjerde), and the lack of correlation with statements taken from Kolb's descriptions (Fox, 1984). Kirby (1979) has pointed out that word options are always presented in the same order, which increases the possibility of response set. Bonham presented a discussion on the drawbacks of the ranking format, and how the lack of independence prevents the LSI from measuring style-flex. This point may reflect some misinterpretation of the Kolb's intention for the use of the learning style inventory, which is to measure a pattern of preferred learning style.

The ranking format was also criticized as it makes the inventory inappropriate to factor analyze (Freedman & Stumpf, 1978, 1980). A problem arises with the inventory scores when the interpretation is based on norms. The ranking is an ipsative approach which measures the subject against self. The norm concept is the comparison of the subject to other subjects. The LSI data has been collected for several college and professional populations, and has produced normal tables which confirmed Kolb's assertions that different styles predominant among different college majors. These norms have been questioned in the literature throughout the past twelve years (Wunderlich & Gjerde, 1978; Biberman & Buchanan, 1986).

A concluding statement with regard to Kolb and the LSI; the author acknowledged that Kolb has consistently pointed out the limitations of the LSI, and has suggested that administration of the LSI encourage the subject to scrutinize the placement and change it if it does not seem to fit. Bonham stated that this suggestion had merit for Kolb's and all the cognitive and learning style instruments.

Another learning style review is by a Swiss author, Karrer (1988), who presented a review and critique of six learning style inventories. The study is entitled: "Comparison of Learning Style Inventories." The key purpose of the paper was to examine and critique six learning style inventories in an effort to find an optimal research instrument for a proposed empirical study. The strengths and weaknesses of each model (Dunn LSI, Entwistle's Styles of Learning, Hunt's Conceptual Levels, Kolb's LSI, and two preference scales for students; Grasha-Riechmann Student Learning Style Scales, and Owens and Straton's Learning Preference Style for Students), reasons for choosing the Kolb LSI as the study instrument, and a brief outline for the study were presented. The approaches applied in this article were theory and LSI discussion and critique, and discussion of the LSI's use.

The author clearly supported the Kolb theory of experiential learning (learning cycles) and LSI as

reflected in the individual and comparative descriptions of the theories and inventories, and the conclusion that Kolb's LSI was the selected inventory for the empirical study. Some nonsupport was shown for the LSI and all the inventories in a discussion of the limitations of the instruments, and a specific description of the LSI "shortcomings". The key limitation stated was that these psychometric instruments resulted in a restricted analysis only in reference to the set of statements presented in each inventory, and in this way did not describe the totality of the students' experience. This particular statement reflected the author's European, qualitative approach to learning style, and perhaps the inadequacy of the American approach to learning style research. The two weaknesses of Kolb's LSI were described as "focuses on the cognitive behavior only" (which is not accurate), and "originally designed in and for the college environment," (Karrer, 1988, p. 12).

The author concluded that the LSI demonstrated better than average reliability and validity ratings. With the empirical study's goal of assessing the relationship between learning outcomes and a learning task dependent on student characteristics, as learning style, the LSI was judged to be most appropriate.

A concluding study by Rule and Grippin (1988), was a review and critique of seven learning style instruments.

The study is entitled: "A Critical Comparison of Learning Style Instruments Frequently Used with Adult Learning."

The purpose of the study was to offer a review of the reliability, validity, an interpretation, and discuss the utility of each inventory. The seven instruments (Kolb's LSI I and II, 1976, 1985; the Myers-Biggs Type Indicator, 1985; the Productivity Environmental Preferences Survey, Dunn, 1982; the Self-Directed Learning Readiness Scale, 1977; the Personal Style Indicator, 1985; and the Group Embedded Figures Test, 1971) reviewed came from various theoretical perspectives and have been in existence for varying lengths of time. The predominant approach used in this study was theory and LSI discussion and critique, and discussion of the LSI's use.

The author was generally nonsupportive of the LSI I and LSI II. The LSI I was initially reviewed. The author concluded that given the conflicting reports of reliability, (the Technical Manual, 1976, and research results), and conflicting support for validity of the LSI I, interpretation of individual scores should be made in reference the normative data. He also commented that with the concerns over the instrument's reliability, individual scores near the intersection of the two dimensions should be interpreted as nondefinitive.

The author's key conclusions with regard to the LSI II were that the LSI's gain in internal consistency over the

LSI I was cancelled by the loss in stability. Another problem was the general lack of validity information making interpretation of LSI II scores difficult. The author recommended that further study of the LSI II's psychometric qualities be conducted. Until this is done, individual and group interpretation and/or advisement should be considered with great care.

In summary of all studies or articles of this section, it may be observed that four studies or articles fully supported the Kolb theory and/or LSI, four studies or articles were nonsupportive of the theory and/or LSI, and one study partially supported and reflected some nonsupport of the theory and LSI. It is interesting to observe that both topologies (Marshall, 1987; Davidman & Chiarelott, 1987) acknowledged and/or supported the theory and/or LSI. The three other authors who supported the LSI were all accomplished or seeking to accomplish learning style research (Dunn & DeBello, 1981; Karrer, 1988), and, in turn, had a positive bias toward the learning style research. Whereas the authors, (Ferrell, 1983; Tenore, 1984; Sewall, 1986; Bonham, 1988; Rule & Grippin, 1988), who opposed or were nonsupportive of the theory or LSI were critiquing the learning style models from the biases of their respective fields, (Teacher Education, Postsecondary Education or Education), without any particular interest in

the learning style models, aside from administering the inventories.

It was also noted that the particularly nonsupportive articles in reference to the LSI (Sewall, 1986; Bonham, 1988; Rule & Grippin, 1988) all emphasized the psychometric properties of the LSI. From a quantitative research perspective, these may be well founded arguments, which are based on viewing learning style as a trait. From a qualitative, contextual research viewpoint, in which learning styles are observed as relatively stable and as a state, the psychometric arguments opposing the use of the LSI tend to be inappropriate.

In conclusion, this fourth part of Chapter Five reflected equally supportive and nonsupportive articles and studies. In this way, it may be observed that Kolb's formulation of experiential learning theory and the LSI has resulted in both critical and positive findings and conclusions in the American higher and adult education literature. It has been a theory which has both provoked opposing conclusions and stimulated the thinking and applying of learning theory in American higher and adult education for twenty years.

## CHAPTER VI

## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was:

1. To provide an historical overview of the origin and development of Kolb's formulation of experiential learning theory and to survey the major North American and Australian learning style inventories; and to
2. To determine the use and effects of Kolb's formulation of experiential learning theory and inventory in American higher education and adult education settings between 1971 and 1990.

The three major objectives of the study were:

1. To determine the historical background which led to the development of Kolb's formulation of experiential learning theory.
2. To determine the application and effects of Kolb's formulation of experiential learning theory and/or the LSI in American higher education, 1971-1990.
3. To determine the application and effects of Kolb's formulation of experiential learning

theory and/or the LSI in American adult education settings, 1971-1990.

### Conclusions

The conclusions reached by this research are discussed under each of the three objectives of this study. Table 7 presents the distribution of the studies and articles reviewed in Chapter Five.

1. To describe the historical background which led to the development of Kolb's formulation of experiential learning theory.

Analyzing historial origins of Kolb's formulation of experiential learning theory led to six key conclusions:

First of all, it was found that Kolb considered Dewey's conceptual descriptions of learning to be the historical source of his learning cycle model. Dewey originally described the stages that are similar to the four found in Kolb's learning cycle. Dewey's conception of impulse, observation, knowledge and judgment, correlates essentially with Kolb's concrete experience, reflective observation, abstract conceptualization and active experimentation. Dewey introduced the learning dialectic process, integrating experience and concepts, observation and action, as dialectical opposites to be chosen between in the learning process. From Dewey's perspective the major dialectic taking place in learning is between the



Table 7. Article and Study Distribution

Article and Study Distribution	Part 1	Part 2	Part 3	Part 4	Total
Accounting and Business	4	8	12	0	24
Helping Professions	1	2	4	0	7
Medical Professions	8	4	2	0	14
Post Secondary Education	3	0	18	3	24
Teacher Education	2	0	4	3	9
Education	0	0	0	3	3
<b>Total</b>	<b>18</b>	<b>14</b>	<b>40</b>	<b>9</b>	<b>81</b>

impulse that gives ideas their "moving force" and reason that gives desire its direction. From Kolb's viewpoint both dialectics of concrete experience (impulses) versus abstract conceptualization (reason), and active experimentation (judgment) versus reflective observation (observation) are of equal importance in the learning process.

Kolb further interpreted Dewey as the theorist who saw that the experiential learning cycle was not a cycle but a spiral, which filled each episode of experience with the potential for movement, from blind impulse to a life of choice and purpose.

A second key conclusion was that Kolb incorporated concepts most directly from the learning cycle conceptualization of Lewin. Kolb explained that the concept of reciprocally determined transactions between the person and learning environment is central to Lewin's laboratory-training method. Learning in T-groups, as interpreted by Kolb (1984), is considered to result not only from responding to a fixed environment, but from active creation by the learners of situations that meet their learning objectives.

Lewin's learning theory also contributed to Kolb's developmental theory. Kolb observed that specialization of learning style characterizes early adulthood. Then, the pattern changes in the middle years of life, as people

begin to question their purpose in life and reassess their direction. Thus, Kolb explained that specialization precedes integration in adult development. Kolb then cited Lewin's earlier observation that "pulsation from differentiation to integration is the throb of the great engine of development" (cited in Kolb, 1984, p. 212).

The third conclusion was that Kolb's interpretations of Piaget's developmental learning model found that Kolb particularly drew from Piaget's structural dimensions of figurative and operative thinking. Kolb redefined them as prehension and transformation respectively. Kolb differentiated his structural dimensions of learning from Piaget's by explaining that Piaget emphasized the transformation dimension, whereas Kolb gave both dimensions equal status. Kolb also differentiated his learning model as a cyclical spiral that continues throughout adulthood in order to stimulate development. In contrast, Piaget's hierarchical developmental model, according to Kolb, concluded in adolescence. This concept of Piaget's model ending in adolescence has been questioned by scholars who claim that Piaget was aware of the developmental stages functioning in adulthood.

The fourth conclusion was that of Curry's (1987) who evaluated Kolb's Learning Style Inventory within the context of her topology. The topology is a framework which categorized 21 Australian, North American, and European

learning style inventories into one of three categories. She classified the LSI as an information processing inventory, with a strong reliability rating and a fair validity rating. It was found that the majority of American learning style instruments were classified within the information processing or instructional preference categories. Kolb's LSI was one of two instruments, out of 21, which had been revised two or more times. It was also found that the LSI was the only instrument from which four other learning style instruments were developed. Curry's learning style topology was favorably evaluated by Marshall's investigation in 1987.

The fifth conclusion was that the description of the four learning abilities within Kolb's learning cycle are analogous to James' descriptions of consciousness at particular points. James (1899) specifically referred to several classes of fields of consciousness: states of emotion and sensation relate to concrete experience; state of perplexity relates to an aspect of reflective observation; state of abstract thought refers to abstract conceptualization; and the state of volition correlates with active experimentation.

Finally, the researcher found that according to a 1990 interview with Kolb he explained that his major discovery is the following: "the existence of dual knowledge and that both types of knowledge are equally important" (Kolb,

1990). The two types of knowledge are described by the two oppositional concepts of Kolb's prehension learning process: apprehension and comprehension.

2. To determine the application and effects of Kolb's formulation of experiential learning theory and/or the LSI in American higher education, 1971-1990.

In order to elaborate on the major conclusions on the effect and use of Kolb's formulation of experiential learning theory in higher education, the key conclusions are representative of the five academic areas: business and accounting education, the helping professions, the medical professions, postsecondary education, and teacher education. Within the five areas parts one, two, three and four are discussed. Part one refers to studies which focused on the LSI and its use with special populations. Part two represented LSI validity and reliability studies. Part three included qualitative and quantitative studies on the theory or LSI. Part four presented learning style reviews and topologies.

Accounting and Business Education- The accounting and business studies and articles were all supportive of Kolb's theory and/or the LSI within part one. The investigators either favorably reported on the use of the LSI in determining learning style trends for their student sample (Biberman & Buchanan, 1986) or observed particular relationships between learning styles and instructional

preferences (Coulter, Coulter, Widing & Schultz, 1990; Baker, Simon & Bazeli, 1987). One recommendation by Coulter, Coulter, Widing & Schultz (1990) was the need for the use of experiential learning techniques in marketing education. Considering that the Coulter, Coulter, Widing & Schutz study is a 1990 study, and that Kolb's theory has been accessible to business education for over 15 years, it appears to these investigators that marketing education has overlooked Kolb's formulation of experiential learning theory and its applications.

A key conclusion drawn from the part one LSI business and accounting education studies was that all four studies acknowledged that Kolb's learning model and/or the LSI offered important learning awareness for accounting and business education students, but did not elaborate on specific connections to teaching methodologies.

In reference to the accounting and business education validity and reliability studies of part two, the majority of the studies were critical of the validity and reliability of the LSI. The sharpest critique by the investigators (Freedman & Stumpf, 1978; Freedman & Stumpf, 1980; Stumpf & Freedman, 1981) was concerned with the LSI reliability, specifically through the use of the test-retest reliability. In response to this critique of the low test-retest reliability Kolb has explained that the variable nature of learning style, ("This idea of

variability seems essential, since change and adaption to environmental circumstances are central to any concept of learning" (Kolb, 1981B, p. 290), make split-half reliability the more appropriate measure.

In summary, the researcher found that the most critical investigators (Freedman & Stumpf 1978, 1980, 1981; Lamb & Certo, 1978; Certo & Lamb, 1980) opposed the LSI format without understanding the underlying theory of Kolb's formulation of experiential learning.

Part three, presented 12 business education articles, which reflected a majority of very supportive studies. Nine of the twelve studies (Brenenstuhl & Catalanello, 1976, 1979; Carricato, 1982; Certo, 1977; Gray, Quick & Laird, 1979; Kolb, 1976; Noel & Sims, 1984; Randolph & Posner; 1979; Sims & Sauser, 1985) supported Kolb's theory or LSI which all tended to describe various applications of the experiential learning theory.

Three of the twelve business education articles or studies did not support Kolb's theory or LSI. Two of these studies (Hunsaker, 1981; Pollack, 1984) demonstrated limited understanding of the underlying conceptualizations of Kolb's experiential learning theory. Overall, it was demonstrated that the accounting and business education researchers have chosen to focus on the constructive uses of Kolb's formulation of experiential learning theory.

The Helping Professions - Studies reviewed within this academic area as presented by Kurzich, Friesen and VanSoest (1986) were supportive of Kolb's theory and LSI. Overall, Kruzich, Friesen and VanSoest recommended the LSI as a useful tool for students and faculty.

Fox, 1984, and Highhouse and Doverspike 1987, were nonsupportive of the LSI. These were validity studies in continuing medical education and career education. Both studies reflected some of the misunderstandings previous investigators have had in regard to the psychometric properties and meaning of the LSI.

The helping professions studies within part three all supported Kolb's theory and/or LSI. (Abbey, Hunt & Weiser, 1985; Pelsma & Borgers, 1986; Pelsma, 1982; Sugarman, 1985). The studies tended to be more descriptive in nature, yet presented Kolb's conceptualizations and LSI with greater depth. It is interesting to note that the fields of social work and counseling education (Abbey, Hunt Weiser, 1985; Kurzich, Friesen & VanSoest, 1986; Pelsma & Borgers, 1986; Sugarman, 1985) were the two fields which strongly emphasized the usefulness of Kolb's learning style theory with respect to individual development and the learning process.

The Medical Professions - Four of the medical profession studies supported the theory and/or LSI (Baker, Cooke, Connoy, Bromley, Hull & Alpert, 1986; Baker,



Wallace, Cooke, Alpert & Ackerly, 1988; Baker, Wallace & Cooke, 1987; and Whitney & Caplan, 1988). The three anesthesiology studies (Baker, Cooke, Conroy, Bromley, Hullon & Alpert, 1988; Baker, Wallace, Cooke, Alpert & Ackerly, 1986; Baker, Wallace, Cooke, 1987) investigators had looked at the underlying theory of the LSI. Overall, these supportive studies recommended the LSI as a counseling technique during residency training, as well as Kolb's learning model for curriculum design.

Contrary to the supportive studies by the medical profession was Wunderlich and Gjerde's (1978) study which concluded that the LSI did not discriminate among medical specialties. However they indicated that the majority of physicians and students were of the accommodator and converger learning styles. Wunderlich and Gjerde interpreted the LSI to be an instrument which should indicate traits as related to career specialty. This is not the underlying premise nor an appropriate use of the LSI.

The nursing education LSI studies (Lassen, 1984; Merritt, 1983) reflected both support and nonsupport for the LSI. A study by Garvey, Bootman and McGhan (1984), was supportive of Kolb's learning model. They recognized the usefulness of Kolb's model for observing the learning process and individual development.

Four medical profession studies (Geller, 1979; Marshall & Merritt, 1985; Merritt & Marshall, 1984; West, 1982) focused on validity and reliability issues. Generally, the supportive or partially supportive medical profession studies tended to demonstrate a more holistic understanding of experiential learning than the nonsupportive researcher (West, 1982). These supportive investigators (Geller, 1979; Merritt & Marshall, 1984) tended to perceive the value of receiving LSI information in order to relate it to the instructional setting.

In summary, the majority of medical researchers were concerned about the quality of education and the career development of their students. It is also evident that some medical researchers were not as knowledgeable about the underlying theory of Kolb's learning model, this lack of awareness was also related to the earlier time period in which the studies were published.

Postsecondary Education - The postsecondary education studies encompassed the greatest number of articles of the five academic areas, along with accounting and business education. In postsecondary as well as in accounting and business education, 24 articles were presented.

Three postsecondary education studies (Dorsey & Pierson, 1984; Groetsch, 1986; Strange, 1978) supported Kolb's theory and/or LSI. A pattern observed in all three studies with adult samples was that males tended to prefer

the abstract conceptualization learning ability, whereas females tend to prefer concrete experience. Either one or both patterns were reported in each of these studies. These trends confirm Kolb's gender observations in relation to the LSI.

Several trends may be noted in postsecondary education research. It was found that 13 of the 18 articles of part three were supportive of the theory and/or LSI. Not one of the articles was entirely nonsupportive of the theory or LSI. It may be concluded that Kolb's theory and/or LSI are highly supported and used within the postsecondary education field. Kolb's research and theory are based in higher education, and, as a result, is a complimentary theory to adult learning theory often referred to by postsecondary researchers and educators.

A study by Marshall (1987) supported the LSI and presented an investigation of Curry's topology. Marshall acknowledged the Kolb theory, its function and type of learning style instrument the LSI is. He also demonstrated a clearer, theoretical understanding of the LSI. Thus, it is concluded that the greater the understanding of Kolb's experiential learning theory, the more supportive an investigator within higher education tends to be of the LSI.

Teacher Education - Of the teacher education studies found, only one within part one was relevant to higher

education; VanCleaf and Schkade (1987). These investigators were highly supportive of the use of the LSI with respect to their student teacher sample. They concluded that studies which used the LSI as an instrument to encourage self development of individuals within an academic field or profession found greater success with the instrument, as opposed to characterizing the learning behaviors across several professions or academic areas. Three other teacher education studies within part three reflected strong acknowledgement and use of Kolb's theory and LSI within the context of teacher education. Overall, it was evident that the teacher education studies which scrutinized Kolb's theory and/or LSI between 1977 to 1987 were very supportive.

With the analysis of the teacher education learning style reviews and topologies (Dunn & DeBello, 1981; Ferrell, 1983) it was concluded that when an investigator evaluates learning style inventories based on a psychometric model, nonsupportive conclusions result due to a lack of a broad and deep understanding of the learning style theories and inventories being evaluated. In summary, of all the learning style reviews and topologies, it was observed that half of the learning style reviews or topologies supported the Kolb learning style model and half of the reviews did not. This trend was also a trend for the teacher education reviews and topologies.

The following discussion is a summary of the trends observed with regard to the effect and use of Kolb's formulation of experiential learning theory within American higher education, 1971-1990.

It appears that there is a split in the views of accounting and business educators with regard to the effect and use of the theory and the Learning Style Inventory. It appears that the support, and in turn, effect and use of Kolb's theory and/or LSI, comes from the accounting and business researchers who have focused on Kolb's formulation of experiential learning theory or applied the LSI and/or the theory to accounting or business education settings in higher education.

The business researchers in higher education who primarily opposed Kolb's theory and/or LSI have conducted validity and reliability studies. Those who were most critical tended to emphasize the psychometric properties of the LSI and viewed it as a psychological trait measurement instrument. Whereas, the LSI measures relatively stable behaviors, which may be influenced by the environment; the measurement is of a state. This emphasis is in direct opposition to the trait viewpoint of the inventory, and nonsupport from the psychometric perspective could be expected. It was also observed that those who were most critical of the LSI reflected less understanding and

interpretation of the theoretical framework of the LSI: Kolb's formulation of experiential learning theory.

The other two academic areas with the greatest number of studies represented were the medical professions and postsecondary education. Again, in the medical professions twice as many studies, (8 to 4) were supportive as opposed to nonsupportive of the theory and/or LSI. Although, the trends were different within parts one, two and three. The majority (six) of the studies which focused on the use of the LSI with a special population (part one), were supportive of the LSI. Whereas, in part two (validity and reliability studies), more of the studies, (two), were nonsupportive as opposed to supportive, (one). Similar critical perspectives as discussed in regard to accounting and business education also arose in the medical profession. The primary opposition to Kolb's LSI was in regard to its psychometric properties and its ability to predict learning style trends across various medical specialties. The major support by medical researchers was in reference to the use of the LSI and experiential learning theory for student support and curriculum design within medical specialties. Overall, it may be concluded that medical researchers who have demonstrated the greatest support for Kolb's theory and/or LSI have clearly found the theory and/or LSI effective and applicable within their medical specialties in higher education.

The postsecondary education area demonstrated the trend consistently within parts one and three of support for Kolb's formulation of experiential learning theory and/or the LSI. All of the studies (three) in part one supported Kolb's theory and/or LSI. The majority of studies (13) in part three also supported the theory and/or LSI. In part four, two of the three postsecondary learning style reviews did not support the LSI. Again, their (Bonham, 1988; Rule & Grippin, 1988) major criticisms were with regard to psychometric issues, and demonstrated a lesser degree understanding of the LSI's theoretical framework.

Overall, it may be concluded that the majority of postsecondary researchers who have studied the theory and/or LSI have found Kolb's theory and/or LSI effective and applicable to a greater degree in higher education as compared to postsecondary researchers who have not supported the theory and/or LSI. This considerable trend of postsecondary researchers support for the theory and/or LSI may be related to Kolb's underlying theory of adult learning and development, which is an important body of literature within this academic area.

3. To determine the application and effects of Kolb's formulation of experiential learning theory and/or the LSI in American adult education settings, 1971-1990.

Accounting and Business Education - In observation of the studies which focused on adult education settings, it was found that two studies (Carricato, 1982; Collins & Milliron, 1982) represented the adult education setting. Overall, both studies were very supportive of the theory and/or LSI. It may be concluded that the business and accounting adult education studies cited in this research found the Kolb formulation of experiential learning theory or the LSI effective and useful in the adult education setting.

The Helping Professions - It was found that two of the seven helping professions studies (Abbey, Hunt & Weiser, 1985; Fox, 1984) specifically related to the adult education setting. One validity study (Fox, 1984) did not support the LSI, and a counselor education study (Abbey, Hunt & Weiser, 1985) strongly advocated the experiential learning theory as a framework for the counseling setting. Again, as the psychometric properties of the LSI were emphasized no support resulted, and as understanding and application of Kolb's experiential learning theory were focused on, strong support for the theory was manifested. Thus, it may be concluded from the studies related to the helping professions within the adult education setting,



that researchers who focused on the psychometric aspects of the LSI, or misinterpreted its use, may not advocate the LSI. On the other hand adult education researchers who emphasized understanding of Kolb's theoretical framework tend to support the application of Kolb's formulation of experiential learning theory.

The Medical Professions - Within the medical professions area three studies (Christensen, Lee & Bugg, 1979; Sadler, Plovnick & Snope, 1978; Whitney & Caplan, 1978) all supported or partially supported Kolb's theory or LSI as related to adult education. Overall, these three medical profession studies are quite supportive of Kolb's theory, and, in particular, the use of the LSI in order to better meet the instructional needs of the adult student.

Postsecondary Education - Within postsecondary education, 12 studies or articles focused on, or partially spoke to, the issues of adult learners. Parts one, three and four all involved studies related to the adult education orientation. Within part one, two studies (Dorsey & Pierson, 1984; Strange, 1978) were both supportive of Kolb's theory or the LSI. In part three eight studies (deHainer, 1985; Gypen, 1980; Koch, 1984; Korhonen & McCall, 1987; Rush, 1983; Vondrelt & Sweeney, 1989; Weathersby, 1977; Williams, 1984) all supported or partially supported the theory and/or LSI. The two studies (Korhonen & McCall, 1987; Rush, 1983) which partially

supported the LSI, both were designed to correlate variables with the learning style variables within their samples. Within each study the investigators found a lack of significant findings to support the hypotheses which predict a relationship between learning style and adult achievement, or a specific learning style and a specific student group. Although, both studies generally supported Kolb's experiential learning theory and the learning style conceptualizations.

In part four, two of the postsecondary learning style reviews (Bonham, 1988; Rule & Grippin, 1988) related to both the higher education and adult education settings. Both reviews, as was previously discussed, were not supportive of the LSI. Both studies criticized the psychometric qualities of the LSI (i.e., ipsativity, reliability and validity). They presented little evidence or understanding of the LSI's theoretical framework.

In summary of the postsecondary perspective of Kolb's theory and LSI, as related to adult education, it can be concluded that the majority (eight) of these investigators were supportive of the LSI and/or Kolb's formulation of experiential learning theory. It is concluded that Kolb's theory and/or LSI has affected a majority of the postsecondary adult education researchers positively in terms of understanding and/or application of the theory or LSI.

Teacher Education - In observation of this research representing all four parts of Chapter Five, four teacher education studies or articles related to the adult education setting. Of these studies (Banks, 1977; Davidman & Chiarelott, 1987; Dunn, 1982; Kotar, 1980), two supported the theory and/or LSI, one gave partial support and nonsupport, and one did not. In part one, Dunn's (1982) study was nonsupportive. In part three, Banks (1977) supported Kolb's learning theory and the LSI.

A third teacher education study which related to both higher education and adult education was by Kotar (1980). Kotar's study was partially supportive and nonsupportive of Kolb's learning style theory and the LSI. The learning style topology by Davidman and Chairelott (1987) was supportive of Kolb's LSI by its recognition and inclusion of the LSI within their learning style topology. The authors acknowledged that the Kolb learning style theory and LSI offered a valid theory and clear application for teachers and administrators to consider.

Overall, the four studies representing teacher education which were oriented to adult education primarily supported the Kolb theory and LSI, with some nonsupport expressed as well. The nonsupport was voiced in regard to the LSI's nonprediction of the learning styles of certain subgroups (Dunn, 1982), although in two studies the investigators quite successfully observed the predominance

of specific learning styles within specific subgroups (Banks, 1977; Kotar, 1980). Thus, it is concluded that the majority of investigators (three) found Kolb's theory and/or LSI effective and applicable to teacher education as related to adult education.

In summary of the effect and application of Kolb's formulation of experiential learning theory and/or LSI in American adult education, it is concluded that the majority of adult education researchers in four academic areas found Kolb's formulation of experiential learning theory and/or the LSI effective and applicable. Within the fifth academic area, the helping professions, the investigators (two) were split in terms of their support for the theory and/or LSI. Although, it should be emphasized, that the majority of the academic areas within adult education clearly supported Kolb's theory and/or LSI.

### Recommendations

In analyzing the studies presented in this investigation it is clearly evident that a considerable majority of the investigators and studies, (61.7%, 50 studies) have supported Kolb's formulation of experiential learning theory and/or LSI, 22.2% or 18 studies did not support Kolb's theory and/or LSI, and 16.1% or 13 studies partially supported and partially did not support Kolb's theory and/or LSI. The researchers who have opposed Kolb's

theory and/or LSI tended to focus on the quantitative psychometric arguments and placed less emphasis on the meaning and theoretical framework of the theory. Whereas the researchers who have supported Kolb's theory and/or LSI tended to emphasize the theory and understanding of the theory's applications.

In view of these trends, derived from the 81 studies and articles reviewed in this study, the following recommendations are made:

1. In recognition of the extensive support for Kolb's theory throughout the past 20 years in American higher and adult education, research which focuses on the meaning and application of Kolb's formulation of experiential learning theory should continue to be implemented within American higher and adult education. One example of current research showing significant effects for the application of Kolb's theory is by Williams (1990).

2. Further research is needed in the study of the actual effects of applying Kolb's formulation of experiential learning theory in higher and adult education. Research is particularly needed in the helping professions, the medical professions, postsecondary education and teacher education.

3. The misunderstandings in the research on the LSI indicated the need for investigators to have a broad and deep understanding of the theoretical framework of Kolb's

formulation of experiential learning theory prior to conducting research related to all learning style theories, Kolb's learning style theory, or the LSI.

4. In observation of the support for the Learning Style Inventory, the favorable uses of the LSI which should be implemented are; development of student self knowledge; advisement of students; and the development of a diversity of units/courses/curricula that relates to the four student learning styles.

5. Because of the extensive support for Kolb's formulation of experiential learning theory the favorable uses of the theory which should be implemented are; the development of educator learning knowledge; the modification and expansion of educator methods and techniques which align with Kolb's learning cycle; the design and implementation of units/courses/curricula that emphasize one or more of four key learning environments; the affective, perceptual, symbolic and behavioral environments; and the development of educator knowledge with regard to Kolb's learning cycle and its relationship to the growth and development of students in higher and adult education.

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## APPENDICES

## Appendix A

Interview Dialogue with David Kolb,  
April 16, 1990  
First five pages of 119 page transcript

001 K: So anyway, what was I saying?

Oh, how I started with the -- where the LSI idea came from. And that is -- well, when I started teaching I went to MIT right after I got my degree at Harvard and I was a psychologist. I started teaching MBA students by standing up and lecturing about motivation and psychological ideas. Needless to say, it was not a big hit.

002 L: It was didactic then?

003 K: It was very didactic and, you know, they really didn't want to know about motivation. They wanted to know about how to run companies or -- more of a management language, and stuff like that.

So it was sort of, I guess in that sense, my own ineffectiveness as a teacher, that stimulated me to say, is there another way to look at learning and to make these classes somewhat more valuable in the eyes of the students.

And -- In another context at the time, in the Peace Corps we had begun working on the experiential learning model as it had evolved in the laboratory training t-group methodology and stuff, which of course goes back to Lewin.

004 L: I understand.

Did you attend Lewin's seminar?

005 K: No. No.

006 L: Okay.

-- change in thought, did not complete sentence

\_\_\_ not understood by transcription typist

007 K: When did Lewin die I wonder?

008 L: It was 1947 or late 40's you said.

009 K: Yeah. Yeah.

He had been at MIT quite a while before that. And when I came to MIT Doug McGregor had just died. And Doug McGregor was one of -- a Lewinian, I guess.

But anyway --

010 L: That was in the 50's you went to MIT, or was that --

011 K: I went to MIT in '65.

And actually, one of the things Reta has for you is a resume which sort of gives you all those different things. And you had some questions about specific papers and stuff that I think will be covered there.

012 L: And so McGregor, Dr. McGregor --

013 K: Yes.

014 L: -- was instrumental toward \_\_\_\_?

015 K: Well, he -- I'm sort of telling three stories at once here which \_\_\_\_\_. I was talking about the origin of the LSI and experiential learning and maybe I ought to finish that in the cycle here.

016 L: Okay.

017 K: So we were involved in this research in the Peace Corps using the -- Lewin's model of the -- what was called the laboratory method in t-groups. And typically t-groups would be started -- Do you know about T groups?

018 L: Some. I am a counselor.

019 K: Okay.

So, you know, typically a T group would be started and the trainer would say something like, well, what we're going to do here is we're going to have experiences together and reflect together and share our observations about those experiences, and try to interpret and understand those together and make some sense out of them. And out of that sense that we make, we'll act in the group and create the kind of group situation that's best for all of us.

And so we begin saying, you know, what if you took that idea seriously as a theory of learning. And people experience things and reflect on them and conceptualize them and then act.

And so I began to say in my introductory course that in organizational behavior in management, could I organize that course that way -- this is, could I give people some kind of experience and have them talk about it and provide theory and so on to help interpret that, and then have them do active experiments as a result of it?

And so Irv Rubin and Jim McIntyre, who were colleagues of mine at that time, we began writing this book which now -- the 5th addition of it is just coming out. Have you seen that, "Organizational Psychology"?

020 L: I've seen the title and(I)probably could do a lot to review that.

021 K: This is the 4th edition here. And as I said, the 5th edition is coming out in June.

022 L: That's great.

023 K: So what we did was we said for each of the -- as you can see in the outline here. I'm sure if you wrote to Prentice Hall they probably would give you a free copy of this, of the new edition.

So we have, you know, organization socialization, learning and problem solving, motivation, sort of typical topics. And for each one we then created some kind of exercise or simulation or case or personal experience, some mechanism for observation of it. There's a companion book of readings that go along with this that introduce theoretical ideas and then focus on applying this to your own life or what you're going to do differently as a result of it.

024 L: Is this book designed with the experiential learning cycle?

025 K: Right.

026 L: So it's all --

027 K: That's right.

And this is where we started with this in 1967 -- 1966 or 67. We started developing these exercises and putting this together.



And what we discovered was that this seemed to help with the problem -- the didactic problem, as you put it. But also it was very clear that some of the people who didn't like the previous stuff, liked the exercises. But also, some of the people who liked the previous stuff, didn't like the exercises. And so this whole idea of learning style, or different approaches that people had toward learning, I think that's the first place where that came out, and we could see.

And so we began to ask ourselves, or realize as we did this, that we really needed some vehicle to share with the students' theory of learning that we were operating from. And that's the context in which we came upon the idea of a learning style inventory. That if we asked people sort of, where they were on the different phases of this cycle, they would both learn something about the learning cycle and also something about the possible individual differences in the process.

And so then that's how we got to doing learning the problem solving early on really as a way of introducing people to a new learning methodology.

028 L: Do you think -- the cycle lends itself so easily to styles automatically, and then the feedback you've gotten, over say 15 years, using the inventory. Did it come out in 1971, the inventory as well?

029 K: The first paper I wrote that described that was a paper called, "Individual Learning Styles in the Learning Process". And it was a working paper at \_\_\_\_ school.

Let's see if I can get you some of this material. It may save you some note taking.

## Appendix B

Listing of Phone Dialogues with  
David Kolb

<u>Date</u>	<u>General Topics</u>
April 30, 1990	<p>To clarify statements within the interview; the 4 world hypotheses, which do you align with, (contextualism); elaborate on the concept of acquisition; elaborate on masculine and feminine ways of knowing.</p> <p>Is evaluation a part of your learning definition? (part of the convergent learning process).</p> <p>Confirmed the audiences I may share the interview tapes or material with.</p>
May 30, 1990	<p>In application of the learning cycle does one (teacher/students) have to move through it in a particular order?</p> <p>Confirmed the five categories of article/study types, I suggested. He suggested one classification was not needed (doctoral studies). Thus, four categories are used in the study.</p> <p>He agreed to review Chapters 2, 3 and 4.</p> <p>Discussed his paper on "The Challenges of Advanced Professional Development."</p>
June 29, 1990	<p>Confirmed the initial publication date of the LSI, 1971.</p> <p>Discussed the initiation of McBer &amp; Company.</p> <p>Reported that he was cited extensively, according to the <u>Social Sciences Citation Index</u>, between 1971 to 1989.</p>

He discussed his reactions to Chapters 2, 3 and 4.

Chapter 2 - He felt like he had been heard, like someone was listening.

Chapter 3 - He was very interested in my explanation of James, and liked the behavioral aspects of Bandura described.

Chapter 4 - He thought that Curry's topology is a good learning style presentation.

Overall, he felt quite positive about my work. He liked the three chapters.

August 14, 1990

We confirmed the major academic areas of the articles to be reviewed in Chapter Five.

We further discussed the different orientations to experiential learning theory and practice, specifically of Australians, Europeans and Americans. It was commented that Europeans and Australians emphasize the reflection process.

I mentioned my developing New Zealand experiential learning contacts. He affirmed me for this.

September 26, 1990

We discussed findings and issues related to the Chapter Five articles reviewed. We agreed to send relevant articles of interest (i.e. he sent an article on "Mind" and I sent a copy of the Social Sciences Citation Index findings).

October 12, 1990

Discussed his reference(s) with regard to a speaker for a Linn-Benton Community College inservice day.

We confirmed his definition of his discovery of dual knowledge.

Further discussed world hypotheses and their correlation with quantitative and qualitative research perspectives.

He confirmed that his theory draws on the contextualism and organicism (Dewey, Lewin) as well as the Mechanism and Formism (Piaget) work/hypotheses.

October 22, 1990

We confirmed some of his views related to the literature being reviewed (i.e. stated in Dunn & DeBello's (1988) article that he viewed learning style as related to genetics, the adaptive competencies of 1979 have been revised, 1989).

We discussed issues related to the origins of his experiential theory (i.e. Dewey).

## Appendix C

## Correspondence with David Kolb

Letter to request interview - February 11, 1990

Letter defining interview questions - March 31, 1990

1412 NW Harrison, Apt. B  
Corvallis, Oregon 97330  
February 11, 1990

Dr. David Kolb  
Chairperson  
Case Western University  
Department of Organizational Behavior  
University Circle  
Cleveland, Ohio 44106

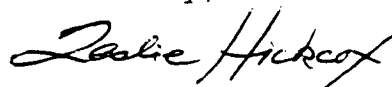
Dear Dr. Kolb:

Since I last wrote you a good deal has happened. I have continued my dissertation research, and have refocused the topic of my dissertation. The title is as follows: "An Historical Review of Kolb's Experiential Learning Theory". The study proposes to provide an historical overview of the origin and development of Kolb's experiential learning theory, and to determine the use and effects of Kolb's theory and LSI in American higher education and adult education between 1971 and 1989.

Having investigated the literature to date it appears that such a study has not been done. I've found 32 dissertations alone that have studied the LSI or your theory. I have begun to write the historical background. Basically, I have two questions at this point; (1) Would you be able to send me your most current bibliography, in relation to your works, and/or articles written about the theory or LSI? (2) It has been suggested that I arrange to interview you. Would it be possible that I meet with you at Case Western for an interview? I can meet with you on any Friday or Monday beginning with March 16th through June of this year. I will plan to call your office to inquire, or you may respond to this letter. You may leave a message at my home phone (503) 753-4246.

Enclosed is a draft of chapter one. I am open to any of your suggestions. I also mentioned in my last letter that I was presenting your theory and the 4MAT System at an international conference in New Zealand. I have interested a few New Zealand and Australian health and physical educators in your theory and LSI. It was a great experience. I have enclosed this paper as well. Thank you for your time and consideration.

Sincerely,



Leslie Hickcox

1412 N.W. Harrison, Apt. B  
 Corvallis, Oregon 97330  
 March 31, 1990

Dr. David Kolb  
 Chairperson  
 Case Western University  
 Department of Organizational Behavior  
 University Circle  
 Cleveland, Ohio 44106

Dear Dr. Kolb:

Recently, I spoke with your secretary, who arranged for the interview I have requested in relation to my dissertation. The interview is scheduled on Monday April 16. The title of the dissertation is "An Historical Review of Kolb's Experiential Learning Theory". I previously sent chapter one. The following are some key questions I would like to discuss with you at the interview:

- What did you initially entitle your first article or publication on experiential learning theory?
- When and what was it published in?
- What major events contributed to and lead up to your writing the book Experiential Learning: Experience As The Source of Learning and Development in 1984?
- How do you believe experiential learning theory arose as a reaction to idealists or rationalists thinking in education?
- How did William James (1907) arrive at the conclusion that rationalists dominated education since the middle ages? ( in reference to p.12 of Experiential Learning)
- Would you further explain your meaning of the word "thinking" in relation the your description of abstract conceptualization?
- Would you explain how to interpret a LSI final score that falls on the AC-CE axis, or AE-RO axis?
- Why do you see the scientific method as Dewey's, Lewin's and Piaget's model for the adaption process, when their theories stand quite contrary to the rationalists world view?
- Isn't it quite difficult to present abstract concepts (i.e. intention/extension) and relate them to concrete structures in the body (i.e. parasympathetic and sympathetic nervous systems)? (in reference to p.60, Experiential Learning)

- On page 20-21 of your book you explain that experiential learning theory does not offer an alternative to cognitive and behavioral learning theories. You only suggest that a more holistic approach is needed. Doesn't experiential learning theory seem to offer a third alternative learning theory?

- Is there a diagram which pictures Lewin's model of learning?

- Why has Lewin's theory had the greatest impact on experiential learning theory? (in reference to pps.8-12 in book)

- What is (in relation to education) and why is isomorphism used in relation to Lewin? (in reference to p. 223 in book)

-In one discussion of Piaget's developmental stages you explain that cognitive growth occurs between birth to ages 14 to 16 (p.23). At 2 other points in the book (pps. 24 & 142) you identify the formal operations stage "with the onset of adolescence (12-15 years)". Which age group is the best reference for the formal operations stage?

-What were the "commonly used instruments" applied in the longitudinal study correlating the LSI and cognitive development (p. 74). Was this the Alverno College study? Did this study contribute to the development of the LSI?

-Why did you call the preoperations stage the iconic stage (p. 142) as opposed to ikonik learning Piaget referred to during this stage? Is iconic your term, or is it referring to Piaget's concept?

-Would you explain genetic epistemology as related to Piaget's theory of learning (accommodation and assimilation) (in reference to p. 26, "Piaget, for example, considers the creation of new knowledge to be the central problem of genetic epistemology..."). How do you view the creation of new knowledge as related to Piaget?

-Would you further explain the similarity and unsimilar aspects of your theory and Piaget's developmental stages? Particularly clarify the note (1) on p. 40, with specific reference to "I there suggest an integrative developmental scheme by proposing that the stage of formal operations represents a return at a higher developmental level to the active orientation characteristic of stage 1."

-Would you further explain individuality and experiential learning theory? Would you contrast Piagetian conceptions of individuality with experiential learning theory's approach (pps.137-138)?



-You spoke of the difficulties that characterize all cross-cultural research (p.122). What are the cross-cultural implications of experiential learning theory? I understand the LSI has been translated into to German, Tiwanese, and Hebrew.

-Would you further explain the concepts of integrity and integrative knowledge (in reference to pps. 224-225)?

Note - All page references refer to your Experiential Learning (1984) book.

Thanks very much for your thought and time. I look forward to meeting with you on April 16.

Yours sincerely,

A handwritten signature in cursive script that reads "Leslie Hickcox". The signature is written in dark ink and is positioned above the printed name.

Leslie Hickcox

## Appendix D

### Correspondence with Australian Learning Style Researchers:

#### Dr. Paul Ramsden and Dr. J. B. Biggs

Letters of inquiry to Drs. Ramsden and Biggs	June 5, 1990
Letters of response from Dr. Ramsden	June 19, 1990
from Dr. Biggs	Aug. 7, 1990

1412 NW Harrison, Apt. B  
Corvallis, Oregon 97330  
(Oregon State University)  
June 5, 1990

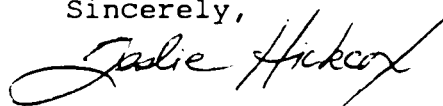
Dr. Paul Ramsden  
Center for the Study of  
Higher Education  
University of Melbourne  
Parkville, Victoria 3052  
Australia

Dear Dr. Ramsden:

Throughout this past year I have been completing doctoral research in the area of learning/cognitive styles. Part of my literature review involved a review of all the major learning style instruments in North America and Australia. Your Approaches to Studying inventory, along with Dr. Biggs' Study Process Questionnaire were the two instruments created in Australia. I understand you also collaborated with Dr. Schmeck and created a combined learning style inventory. Do you know of other Australian learning style instruments?

I would like to speak with you during my visit and conference in Australia this July 5 through 16. I would appreciate a brief reply in regard to a contact phone and preferred time that I may call you. Thanks very much for your cooperation.

Sincerely,

A handwritten signature in cursive script, appearing to read "Leslie Hickcox", with a long, sweeping horizontal stroke extending to the right.

Leslie Hickcox

1412 NW Harrison, Apt. B  
Corvallis, Oregon 97330  
(Oregon State University)  
June 5, 1990

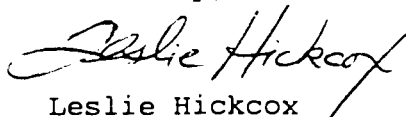
Dr. J.B. Biggs  
Department of Education  
University of Newcastle  
New South Wales  
Australia 2308

Dear Dr. Biggs:

Throughout this past year I have been completing doctoral research in the area of learning/cognitive styles. Part of my literature review has involved a review of all the major learning style instruments in North America and Australia. Your Study Process Questionnaire and Ramsden and Entwistle's Approaches to Studying were the two key Australian instruments reviewed in my study. Do you know of other Australian learning style instruments I should study?

I am also interested in the use and application of learning style theory and inventories in your schools. I would like to contact you during a visit and conference I am attending. I will be in Australia through July 16. I would appreciate a brief reply as to a contact phone and preferred time that I can call you. Thanks very much for your consideration.

Sincerely,

  
Leslie Hickcox



THE UNIVERSITY OF MELBOURNE  
Centre for the Study of Higher Education

19 June 1990

Ms Leslie Hickcox  
1412 N.W. Harrison. Apt. B  
Corvallis. Oregon 97330  
USA

Dear Ms Hickcox.

Thank you for your letter about the inventories. I'm not aware of any other Australian instruments of this kind. The ASI was in fact developed in the United Kingdom, in collaboration with Noel Entwistle, and I believe he did some work with Schmeck on a combined instrument. You could write to Professor Entwistle (Department of Education, University of Edinburgh, 10 Buccleuch Place, Edinburgh EH8 7JT) for further details. He might also know of other inventories.

I am on a sabbatical from 1 July to 31 December and away from the University, in Hong Kong and elsewhere. However, if you feel there are any specific questions I could answer by mail, please write to me at the above address.

I hope your work goes well and that your time in Australia proves to be productive.

Yours sincerely,

Paul Ramsden.

UNIVERSITY



OF HONG KONG

## DEPARTMENT OF EDUCATION

Professor J. B. Biggs, B.A. (Tas.), Ph.D. (Lond.)  
Head of Department

Telephone: 8592518 (Professional Office)  
8592544 (General Office)

7th August, 1990

Ms. Leslie Hickcox,  
1412 N.W. Harrison, Apt. B,  
Corvallis, Oregon 97330,  
U.S.A.

Dear Ms. Hickcox,

As it happened, I was in Australia when you were there, but coincidentally. Your letter caught me in Newcastle, too late to contact you.

To my knowledge, there are no similar instruments to my own in Australia. I enclose 2 papers: 1985, which gives the theory and development, and 1989, which distinguishes "styles" from "approaches" which may be of interest to you.

The use of the instrument is largely through monitoring teaching, and interventions.

Hope this is of value to you.

Yours sincerely,

Professor J. B. Biggs  
Head, Department of Education

Encl.  
JBB/ykc