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**Cultural Background and the Epistemic Orientation
of University Students: An Exploratory Study**

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**Dissertation submitted to the School of Graduate Studies
of the University of Ottawa
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Education**

**Faculty of Education, University of Ottawa
Ottawa, Canada, 1998**

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ABSTRACT

The present study examined the impact of cultural background on the epistemic orientation of university students. Epistemic orientation refers to how groups access and organize information in ways that may include cognitive styles but are broader and more pervasive than them. The Epistemic Orientation Model (Rancourt, 1988) identifies three epistemic modes: Rational, Empirical, Noetic (intuitive), and provides a measure for their assessment. Cultural background was defined as having been born in a cultural setting, having lived all one's life in that setting, being absent from that culture no more than five years, having its language as mother tongue and as the language most used. A sample of undergraduate students drawn from two Canadian universities (N= 540) were compared with a sample drawn from two universities in Lebanon (N= 663). Subjects in each sample belonged to six fields of specialization: sciences, social sciences, health sciences, engineering, business, and fine arts.

Epistemic orientation was operationalized in terms of the two selected instruments. The *Knowledge Accessing Modes Inventory* (KAMI) (Rancourt, 1988) measures the three epistemic modes: Rational, Empirical, and Noetic. The *Gregorc Style Delineator* (GSD) (Gregorc, 1982) provides measures for four stylistic preferences: Concrete Sequential, Abstract Sequential, Abstract Random, and Concrete Random. The GSD was used to provide corroborative support for KAMI's three modes from a somewhat different epistemic perspective.

On the basis of previous scholarly analyses and cross-cultural comparative research, it was hypothesized that: 1) the Arab sample is more rational than the Canadian sample as measured alternatively by KAMI's Rational mode, by GSD's Abstract Sequential scale, or by the combination of both; 2) the Canadian sample is more empirical than the Arab sample as measured alternatively by KAMI's Empirical mode, by GSD's Concrete Sequential scale, or by the combination of both; 3) the Canadian sample is more noetic than the Arab sample as measured alternatively by KAMI's Noetic mode, by GSD's Concrete Random, by GSD's Abstract

Random, or by the combination of KAMI's Noetic with each of the two latter GSD scales; and 4) the dominant epistemic modes in each of the fields of specialization in both samples are consistent with those indicated in previous research. Data were analyzed using descriptive statistics, z-tests and correlational analysis.

The results, confirmed three (one partially) of the four hypotheses. The Arab sample was found to be more 'rational' on all three scales: the Rational mode of KAMI, the Abstract Sequential scale of GSD and by their combination. The hypothesis of Canadians having a higher proportion of 'empiricals' was not confirmed. The hypothesis of Canadian sample having a higher proportion of noetics was only confirmed by the Abstract Random scale of GSD. In addition, the results indicated that epistemic differences related to gender were, on the whole, consistent with previous research: males were higher on the Rational and Empirical modes and females were higher on the Noetic Mode. Gender differences, on the whole, also reflected the differences hypothesized in the first three hypotheses: Arab males and females were more rational, less empirical and less noetic than their Canadian counterparts.

Engineering, sciences, social sciences, business, and health sciences students indicated a Rational dominant mode which was consistent with previous research. Also, as expected, fine arts students indicated a Noetic dominant mode.

It was also found that the similar scales of KAMI and GSD were correlated. The Rational and Noetic modes of KAMI were related with the Abstract Sequential and Abstract Random scales of GSD respectively. The correlation between Empirical and Concrete Sequential scale of GSD was low. A low correlation was found between the Noetic mode of KAMI and the Concrete Random scale of GSD.

Results have implications for the organization and for the method of delivery of educational programs that are intended to be used with different cultural groups.

ACKNOWLEDGMENTS

I wish to express my gratitude to Dr. Richard Rancourt for providing invaluable support as thesis advisor, for his continuous intellectual challenges, and for his feedback to my questions and formulations which motivated me to undertake this project. I would also wish to express my gratitude to the members of my committee: Dr. Jean-Paul Dionne, Dr. Robert Ross, and Dr. Michel Saint-Germain for the time and effort they contributed to the process of completing the dissertation.

In addition, I would like to thank External Examiner, Dr. Robert Cormier, for his assessment and critique of the thesis and Dr. René Bédard for his valuable comments.

I am also grateful to the professors at the University of Ottawa, Carleton University, American University of Beirut, and the Lebanese American University who facilitated the process of data collection, and to the students in these universities who volunteered to take part.

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Chapter I

OVERVIEW AND STATEMENT OF THE PROBLEM

A substantial body of research indicates that there are significant differences among individuals in how they gather and process information. Reliable differences have been found in a variety of areas such as perception, learning, thinking and teaching approaches and orientations. The interest in styles (mainly cognitive, thinking and epistemic) continues to attract the attention of researchers for their theoretical and practical value.

The concept of cognitive style was developed more than four decades ago in an attempt to explain the process of mediation between stimuli and responses (e.g., Messick, 1976, 1984; Goldstein & Blackman, 1978; Furnham, 1995). Viewed as consistent patterns of processing information, cognitive styles represent consistencies in the manner or form or structure of cognition, as distinct from the content of cognition and cognitive ability. As such, cognitive styles evidence stability and pervasiveness across diverse spheres of behaviour and relate to other personality characteristics of individuals. More than twenty-five cognitive styles have been conceptualized; most of them identified and researched before the early seventies. Cognitive styles, such as field independence/dependence, conceptual integration, levelling/sharpening, complexity/simplicity, abstract/concrete, reflection/impulsivity, converging/diverging, category width and scanning, continue to be useful constructs in cognitive research. Such constructs have also been incorporated in broader stylistic concepts referred to as learning and thinking styles.

At the broader level of psycho-epistemology, three basic modalities of "knowing" have been identified: deductive, inductive and intuitive (Bruner, 1960; Pribram, 1971). These three psycho-epistemic modalities were taken as basic components of a general personality model proposed by Royce (1975; Royce and Powell, 1983). Royce's model presents a conceptual framework consisting of a number of factorially identified traits organized in a hierarchical suprasystem that provides for interaction within and among six subsystems. The part-whole problems of personality integration are analyzed in terms of factor and system interactions. Personality functioning involves simultaneous internal and external processing, and molar psychological constructions, such as world view and lifestyle, are the outcomes of the integration of style: cognitive and cognitive-affective systems. Of particular interest to the present study is that of the cognitive-affective style subsystem which is considered to be near the apex of the suprasystem and one that has a higher integrative function than both the cognitive and the affective subsystem (illustrative figures are presented in Chapter Two).

Royce locates at the apex of the cognitive-affective style subsystem three constructs that he considers to be different patterns of information processing: the *metaphorical*, *empirical* and the *rational* styles. Within each style there are particular cognitive processes. Thus, in the metaphorical style are insight and symbolization; in the empirical style are the seeking of sensory perceptions; and in the rational style are rational analysis and synthesis of ideas. A psycho-epistemic style system such as Royce's provides a more holistic conceptual understanding of how an individual processes information. The reliance on one epistemic style at the expense of the other two styles can further account for differences at the broader or *weltanschauung* type of thinking (Royce & Wardell, 1978; Spiro, Feltovich, & Coulson, 1995).

The Epistemic Orientation Model

Royce's conceptualization of psycho-epistemic styles and their assessment were further developed through the *Epistemic Orientation Model* which adopts the three styles and develops an efficient measure for their assessment: *The Knowledge Accessing Modes Inventory (KAMI)* (Rancourt, 1986b, 1988; Rancourt & Ballantine, 1990). Each of the three styles, empirical, rational and noetic (referring to the intuitive-metaphorical processing), are operationalized in terms of their measure and referred to as epistemic modes. The relative strengths of the three modes is referred to as epistemic style. This mode arrangement or style can be used to describe the epistemic style of an individual or the epistemic orientation of groups.

Rancourt's model is based on eight assumptions (Lauzon & Rancourt, 1992); they will be presented in the next chapter. Rancourt conducted a series of studies using the KAMI to reexamine four hypothesized epistemic orientations: the epistemic orientation pertaining to the structure of a discipline; the epistemic orientation of practitioners of the discipline; the epistemic orientation of prospective candidates for entry to the discipline; and the epistemic orientation associated with gender (Rancourt, 1995). The results of these studies concurred with previous research that had indicated that specific disciplines have specific epistemic orientations and that the practising or the inclination towards a professional field are related to a level of epistemological match.

Does Culture Influence Epistemic Orientation?

The Epistemic Orientation Model assumes that knowledge acquisition and knowledge transmission are structured by epistemic styles that are in turn influenced by individual differences, by the structure of a discipline, by practising a professional

discipline, and possibly by gender. The present study aims to extend such research by examining the possible association between epistemic orientation and culture.

A considerable number of cross-cultural studies such as those cited below have examined differences among cultures in various cognitive processes. In this literature, culture has generally been assumed or conceptualized in ways consistent with that of Greetz (1968) as historically transmitted patterns of meaning embodied in symbols, communicative structures of language, and cognitive-learning styles. Such cross-cultural comparisons have consistently indicated differences on perceptual and cognitive styles. As a more detailed review in the following chapter will indicate, several dimensions of cognitive style such as field-independence/dependence, levelling/sharpening, category width, and conceptual integration have been investigated in relation to many cultural groups.

For example, Mexican-Americans were found to be more field-dependent than Anglo-Americans (Ramirez & Prince-Williams, 1974); African-Americans were found to be more field-independent than Black South Africans (Natzel, 1997); Indo-Pakistani college students reared in the United States were found, using the Embedded Figures Test, to be more cognitively differentiated than Indo-Pakistanis studying in the U.S. (Nagy, 1988); Chinese university students scored as broader on category width than their American peers (Chao, 1996); Middle Eastern immigrants to Canada showed more integrative perceptual tendency than Euro-Canadians (Zebian, 1996).

Cross-cultural differences were also found in broader epistemic and learning style domains. For example, Mexican-Americans, in tasks involving telling stories about pictures, demonstrated more verbal and character elaboration than Anglo-Americans

(Ramirez & Prince-Williams, 1971); Black-Americans' reality ties were observed to be more affective-oriented while those of Whites were more objective (White, 1970); among Black-Americans knowledge was found to be gained effectively more through kinetic and tactile senses than through visual senses, and they were found to respond better to verbal material than to pictorial representation (Shade, 1997).

Impact of Language

Whorf (1956) has argued that language, which is the medium of transmission of thought in a culture, imposes its own structures on cognitive and epistemic processes. His hypothesis was supported by studies such as that of Kuroda, Hayashi and Suzuki (1986), who found that the responses of Japanese students to an attitude questionnaire containing the middle response category (i.e., it depends on; undecided) was more polarized when they answered the questions in English than when answering them in Japanese. Data on Arab, Japanese and American students revealed (Kuroda & Suzuki, 1989) that the Japanese language encouraged respondents to choose the middle response category, while Arabic encouraged extreme positions, with English in the middle. This latter finding indicates that the Arabic language tends to encourage dichotomous and categorical cognition which is consistent with abstract thinking.

Al-Jabiri (1984) among others has suggested that linguistic structures are also part of a more pervasive epistemic style typical of a certain culture. In particular, he observed that the influence of the linguistic structures of the Arabic language can be identified at various domains of Arab intellectual expression. The research on the relation between culture and language supports the position of Galtung and Nishimura (1983) of a "cosmology" of language, culture and structure, a perspective that guided the present study.

The Epistemic Orientation of Two Cultures

Analytical scholarly research (e.g., Al-Jabiri, 1984, 1987) and some cross-cultural empirical studies (e.g., Zebian, 1996) point out to possible epistemic differences between the Anglo-North American culture and Arab culture. The analyses of the intellectual trends that have dominated North America (e.g. pragmatism) reveal that they are rooted in British empiricism and that the epistemic approaches of this thinking continue to distinguish the North American cultural perspective (White, 1973; Solomon & Higgins, 1996). The above- mentioned studies that compared mainstream Anglo-American cultural groups with other minorities, immigrants and other foreign cultural groups also indicated that the dominant epistemic perspective in North America appears to be empirical, analytic (field-independent) and atomistic. In contrast, analysis of Arab schools of thought presented by Al-Jabiri (1984, 1987) indicated that the dominant epistemic perspective seems to be global, abstract, categorizing and deductive, which is consistent with a rational style.

Thus, there is a body of research that points to the existence of a possible basic difference between the epistemic orientation of Arab and North American cultures. In the case of Arab culture, most of this research has been scholarly rather than empirical. The present study aims to add an empirical investigation to a scholarly, well-grounded hypothesis of epistemic difference between the two cultures, using two psychometrically adequate measures of epistemic style.

The research question of an epistemic style impact of cultural background in the case of Canadian and Arab cultures was investigated by comparing two samples of undergraduate students drawn from universities in the two cultures. Five hundred and

forty (540) Canadian Anglophone undergraduates in Canadian universities were compared to 663 Arab speaking undergraduates in universities in Lebanon on two selected epistemic style measures: The Knowledge Accessing Modes Inventory (Rancourt, 1988), and The Gregorc Style Delineator (Gregorc, 1982). In order to control for factors that may interfere with the hypothesized epistemic influence of culture, the only students included in the study were those who had been born in the particular culture, had its language as the mother tongue, used that language, and had lived in that culture most of their life. Moreover, since epistemic style has been found to be influenced by the field of study or discipline, subjects were selected in such a way as to ensure that the two cultural samples were comparable in terms of fields of study.

General Statement of the Hypotheses

It was hypothesized that the Arab sample would be higher on measures of rationalism while the Canadian sample would be higher on measures of empiricism. It was also hypothesized that the Canadian sample would be higher on measures of the noetic modality. This latter hypothesis was based on some data provided in this study and on logical inferences that suggest that the noetic modality is closer to the empirical than to the rational modality. Based on the research indicating a consistent impact of fields of specialization on epistemic style, it was further hypothesized that the dominant epistemic modes in each of the fields of specialization in both samples would be consistent with those indicated in previous research on KAMI.

Chapter II

REVIEW OF THE LITERATURE

Cognitive Style: A General Review

The concept of cognitive style has a long history. It was originally conceived as a way to explain the process of mediation between stimuli and responses. Thus, Harvey (1963) viewed cognitive style as the way an individual filters and processes stimuli so that the environment takes on psychological meaning. Messick (1976) similarly viewed cognitive style as a consistent pattern that individuals follow in organizing and processing information and experiences. Cognitive styles represent consistencies in the manner or form of cognition, as distinct from the content of cognition or the level of skill displayed in the cognitive performance. Thus, cognitive styles are conceptualized "as stable attitudes, preferences, or habitual strategies determining a person's typical modes of perceiving, remembering, thinking, and problem solving" (Messick, 1976: p. 5). As such, the influence of cognitive styles extends to almost all human activities that involve cognition, including interpersonal and social functioning.

Cognitive styles are not viewed as habitual modes of information processing in the technical sense of learning theory for they are not directly responsive to principles of acquisition and extinction. They develop early in life, slowly, experientially, through

socialization and differential deployment and do not appear to be easily modified by specific instruction or training (Kagan and Kogan, 1970). Sternberg (1996b) noted that people demonstrate preferences for certain styles of thinking quite early which would indicate some heritable component, however, the personality-centred and broader styles of thinking he outlined (see section on thinking styles in this chapter) were found to be modifiable with effective teaching, interaction with role-models and under the impact of social constraints.

The stability and pervasiveness of cognitive styles across diverse spheres of behaviour also suggest that they develop in adaptive ways around underlying personality trends. Cognitive styles are thus intimately interwoven with affective, temperamental, and motivational processes as part of the total personality structure; they influence the nature and form of adaptive traits, defence mechanisms, and pathological symptoms (Shapiro, 1965). In this view, according to Messick (1976), a core personality structure is manifested in the various levels and domains of psychological functioning--intellectual, affective, motivational, defensive--and the manifestation of this core personality structure in cognition is cognitive style. He illustrates this concept of unity within personality by referring to the authoritarian personality (Adorno, Frenkel-Brunswik, Levenson, and Sanford, 1950). Based on an emotional structure of aggressiveness and ambivalence, the content of the authoritarian's belief system is ethnocentric prejudice. The authoritarian's typical mode of cognition has been called dogmatism or closed-mindedness characterised by the use of closed categories and stereotypes (Rokeach, 1960a). Similarly, Holzman and Gardner (1960) found out that levellers (characterized by memory organizations in which

the fine distinctions among individual elements are lost) are also prone to use the defence of repression. As another illustration, Messick (1976) suggests that field independence which is viewed as the manifestation in perception of an articulated cognitive style is also reflective of a still broader dimension of psychological differentiation which includes personality consistencies in addition to cognitive ones. The field independent person is characterized as analytical, self-referent, and impersonal in orientation and the field-dependent person as global, socially sensitive, and interpersonally oriented (Witkin and Goodenough, 1981).

Such evidence indicating the pervasiveness of cognitive styles across diverse spheres of behaviour induced Messick (1984) to restate his earlier (1976) conceptualization of cognitive styles as: "characteristic self-consistencies in information processing that develop in congenial ways around underlying personality trends"(1984, p. 61).

The characteristics of approaches to cognitive style identified by Brody (1972) appear to be still the bases of more recent research:

1. Individual differences in styles of thinking (not motivation, emotion, or biological processes) as a starting point.
2. An emphasis of style over content.

characteristics of individuals.

4. The treatment of cognitive styles as traits or invariants (i.e., their characteristics are independent of situational influences, a position leading to an emphasis on the consistency of style).

There are three basic distinctions endorsed in most theory and research on cognition that further distinguish cognitive style from other constructs:

1. *Style is Distinct from Content*

Cognitive styles represent consistencies in the form or structure of cognition, as distinct from content of thought. Structure refers to how cognition is organized whereas content refers to what knowledge is available. For example, two individuals may show equal ability in solving analogy problems but may differ in the way they proceed in attempting to accomplish the task. One may follow a logical inferential route, the other an intuitive one. Consistency in behaviour is viewed as product of the cognitive structure (e.g., Suedfeld, 1971).

2. *Style is Distinct from Strategy*

Cognitive style can be seen as high level heuristics that organize information and control behaviour across a wide variety of situations. In contrast, cognitive strategies are decision making regularities in information processing that are mainly dictated by the conditions of the particular situation (e.g., Shouksmith, 1970) .

Cognitive strategies such as specific hypothesis testing and data driven grouping and analysis, are selected and organized by situational constraints and problem contents. Thus, in comparison to styles, such strategies are more amenable to change through training and structured learning. Individuals can thus learn to use optimal problem-solving and learning strategies consistent with their cognitive style and can also learn to utilize less congenial strategies that are more effective for a particular task than their preferred ones (Messick, 1976).

3. *Style is Distinct from Ability*

It has been suggested (e.g., Messick, 1976, 1984) that styles differ from abilities in a number of ways:

- a) Cognitive styles refer to *how* behaviour occurs whereas ability dimensions essentially refer to the question of *what*, i.e. the content of cognition.
- b) Ability implies the measurement of capacities in terms of maximal performance, with the emphasis upon level of accomplishment, whereas the concept of style implies the measurement of characteristic modes of operations in terms of typical performance.
- c) Abilities are generally thought of as unipolar, while cognitive styles are typically considered to be bipolar. Abilities vary from zero to a great deal, with increasing levels implying more of the same facility. Cognitive styles,

on the other hand, range from one extreme to an opposite extreme, with each end of the dimension having different typological implications for cognitive functioning.

- d) Abilities are value directional: having more of an ability is usually considered to be better than having less. In contrast, cognitive styles are value differentiated: each pole has a different adaptive value in different circumstances. This differentiated character of their value implications makes cognitive styles a less threatening concept to people than are abilities or intelligence (Witkin, 1974).

- e) Cognitive styles differ from abilities in their breadth of coverage and pervasiveness of application. An ability usually delineates a basic dimension underlying a fairly limited area such as memory for figural units (Guildford, 1967). While abilities are specific to a particular domain of content or function, cognitive styles cut across domains. They serve as high-level heuristics that organize lower-level strategies, operations, and propensities, often including abilities, in such complex sequential processes as problem solving and learning (Messick, 1973; Royce, 1975). Cognitive styles also function as controlling mechanisms influencing an individual's characteristic regulation and control of impulse, thought, and behavioural expression in diverse areas (e.g., Klein, 1970).

Cognitive Style Dimensions

There have been numerous approaches to the study of cognitive style; more than twenty of them have been identified in the past five decades. The following are brief summaries of some of these dimensions that have been theoretically established and empirically researched and are of relevance to the present study.

1. *Field independence versus field dependence.*

This dimension is by far the most researched facet of cognitive style originating with Witkin and his associates over forty years ago. Field independence refers to a consistent mode of approaching the environment in analytical, as opposed to global terms. It refers to a tendency to articulate figures as discrete from their backgrounds and an ability in differentiating objects from embedding contexts, as opposed to the tendency to experience events globally in an undifferentiated fashion. The field independent pole includes competence in analytical functioning combined with an impersonal orientation, while the field dependent pole reflects less competence in analytical functioning, limited self non-self segregation, and greater social orientation and social skills (Witkin & Goodenough, 1981). More recent studies (e.g., MacLeod, Jackson & Palmer, 1986) indicate a high association between field independence and spatial ability. The Rod-and-Frame and the Embedded Figures are the two major measures used to assess this dimension.

2. *Field Articulation*

This dimension is somewhat similar to field dependence/ independence although authors such as Gardner and Long (1962) suggest that it is a broader concept. Two relatively independent modes of perceiving complex stimuli are involved in this dimension: *element articulation* which refers to the articulation of discrete elements from a background pattern; *form articulation* which highlights large figural forms against the patterned background. Those individuals who can identify either the figure or the background would be considered high in field articulation because they can attend to either the background or the figure by removing the irrelevant stimuli. Tests such as the Embedded Figures Test, the Rod and Frame Test, and the Size-Estimation Test have been used as measures of field articulation (Mos, Wardell, and Royce, 1974; Wachtel, 1968).

3. *Conceptualizing Styles*

By examining how individuals group objects, Kagan, Moss, and Sigel (1963) postulated that individuals could be rated on the basis of their tendencies to conceptually categorize stimuli. Three formal bases for conceptualizing were identified: *relational*, *analytic-descriptive*, and *categorical-inferential*. The Conceptual Style Test asked subjects to select pictures from a triad that could go together. Individuals who would group pictures according to themes or functions would be relational; those who grouped according to common elements would be

analytic in their style; those who grouped according to more abstract criteria such as happiness or poverty would be more inferential.

3. *Breadth of Categorization*

This dimension is concerned with the *structure* of concepts or abstract categories rather than with their number; it entails consistent preferences for broad inclusiveness as opposed to narrow exclusiveness in establishing the acceptable range for specified categories and concepts. The narrow categorizer tends to employ detailed categorization and to have relatively exact standards for judging similarity, whereas the broad categorizer tends to group stimuli into broader categories, to be more tolerant of deviant instances, and is more likely to be a risk-taker (Bruner and Tajfel, 1961; Messick and Kogan, 1965). Breadth of categorization has been found to be related to creativity (Kogan, 1971). A test for measuring this construct was developed by Pettigrew (1958): the Category Width Scale Scale.

5. *Conceptual Differentiation*

The term "differentiation" refers to the extent to which an identifiable field is broken down into clearly distinguishable parts. This dimension refers to individual differences in the tendency to categorize perceived similarities and differences among stimuli in terms of many differentiated concepts or dimensions. The more distinct concepts a person possesses the more differentiated his or her conceptual

network is assumed to be. It is usually assessed using free-sorting tasks which require the spontaneous classification of heterogeneous stimuli into an unrestricted number of groups, each containing an unrestricted number of related items. Individuals who are considered high in conceptual differentiation will consistently utilize many categories in sorting out a variety of objects. Gardner (1953) used an Object Sorting Test to assess the range of classifications as an indication of differentiation. This task differs from the category-width tests, in which items assess the perceived limits or range of one conceptual realm. Thus, conceptual differentiation refers to the number of conceptual distinctions made in relation to a subject matter. (Gardner, 1953; Gardner and Moriarty, 1968).

6. *Conceptual Integration*

This dimension refers to the inclination to explore, develop and link concepts in consistent and meaningfully interrelated wholes. Integration involves the ability to combine information according to categories, rules, programs, causal relationships, and various abstract and hierarchical systems (Harvey, Hunt, and Schroder, 1961; Schroder, Driver, and Streufert, 1967). High conceptual integration often presupposes an increasing level of conceptual differentiation which have warranted the calling of this dimension integrative complexity. However, these two cognitive processes may not vary in a direct fashion as high integration may be accompanied by low differentiation and the converse may also be true.

7. *Cognitive Complexity Versus Simplicity*

This is a broad dimension referring to the tendency to construe the world, and particularly the world of social behaviour, in a multidimensional and discriminating way (Harvey and others, 1961; Zimring, 1971; Tetlock, 1983). According to Messick (1976), an individual who is cognitively complex is expected to have a conceptual system with at least three characteristics: it is highly differentiated; it is finely articulated; and it is flexibly integrated. However, as noted before, high integration is not a necessary attribute in differentiated conceptual systems, and this weak association is more true in relation to abstraction. Thus, referring to the complexity versus simplicity of conceptual systems as the abstract versus concrete (e.g., Harvey, Hunt and Schroder, 1961) may not be accurate. Messick (1976) argues that complex individuals may use many dimensions, but discrete multiple dimensions can be organized to reflect compartmentalization which implies relative concreteness and weak hierarchic integration (i.e., weak integration). The term *integrative complexity* was subsequently chosen (Suedfeld & Tetlock, 1977) to stress the integrative dimension in conceptual complexity.

8. *Abstract Versus Concrete*

This dimension refers to the preferred level and capacity for concept formation, concept manipulation, and concept integration as distinct from mere conceptual differentiation. Conceptual differentiation is mainly concerned with the production of concepts that serve making distinctions and categorizations (Harvey, Hunt, &

Schroder, 1961). The abstract person uses more information and more strategies to solve problems and tends to integrate concepts. On the opposite pole, concreteness refers to constriction in the production and utilization of concepts, and a dependency on immediate physical attributes of the activating stimulus (Goldstein, 1940; Goldstein & Scherer, 1941; Schroder, Driver, & Streufert, 1967).

9. *Levelling versus Sharpening*

This dimension is related to individual differences in memory assimilation. Persons at the levelling extreme tend to blur similar memories and to merge perceived objects or events with similar but not identical events recalled from previous experience; differences in remembered objects tend to be lost or reduced.

Sharpeners, at the other extreme, are less prone to confuse similar objects and may even exaggerate change and differences between similar memories in order to keep adjacent or successive stimuli from fusing or losing identity, thus accentuating the difference between the present and the past (Holzman and Gardner, 1960). The Schematizing Test (Gardner, Holzman, Klein, Linton, & Spence, 1959) has been used to measure this cognitive style. Ten series of five squares of increasing size are projected onto a screen with a systematic increase in size. Individuals are requested to state whether the new square is different in size from the old.

Sharpeners tend to keep the absolute size in mind and not just the relative size.

10. *Scanning*

Scanning is an individual difference in the intensity of attention deployment, leading to variations in the clarity and discreteness of experience and in the span of awareness. The propensity for extensive scanning (focussing) is associated with meticulousness, concern with detail, and ignoring the overall field. Extreme scanning is related to defence mechanisms of isolation which is extensively relied upon by obsessives, and that of projection, the typical defence of paranoid personalities. This dimension was proposed by Schlesinger (1954) and modified by Gardner, Holzman, Klein, Linton and Spence (1959).

11. *Tolerance for Unrealistic Experiences*

This dimension refers to the extent to which a person is willing to accept and report perceptions and ideas that are at variance with conventional experience. The tolerant pole of this dimension reflects a tendency to accept events and ideas which differ markedly from the ordinary, while the intolerant extreme involves a tendency to remain closely oriented to conventional reality. Individuals who tolerate unrealistic experiences tend more than their intolerant counterparts to report wider ranges of apparent movement when exposed to flashing lights, more rapid reversals when viewing reversible figures, more form-labile responses on the Rorschach, and more and longer associations on word-association tests (Klein, Gardner, and Schlesinger, 1962; Messick, 1976).

12. *Converging versus Diverging*

This cognitive dimension represents the degree of an individual's relative reliance upon convergent thinking (oriented toward logical and objective outcomes that are correct or functional within conventional parameters) as contrasted to divergent thinking (oriented toward variety and multiplicity of relevant output).

Convergence versus divergence has been studied as a manifestation of an intelligence versus creativity distinction, with special emphasis upon the production of unique and original responses or ideas as manifestations of creativity (Hudson, 1973; Wallach, 1971).

13. *Reflection versus Impulsivity*

This dimension involves individual consistencies in the speed and adequacy with which alternative hypotheses are formulated and responded to. Reflective individuals tend to consider alternative solution possibilities before deciding, whereas impulsives tend to offer the first answer that occurs to them, even though it is frequently incorrect. Accordingly, reflective children tend to make fewer errors in word-recognition tests, serial learning, and inductive reasoning. There also appear to be personality differences between reflective and impulsive individuals. Impulsive people tend to have minimal anxiety over committing errors, have an orientation toward quick success rather than toward avoiding failure, have relatively low standards for their performance, and have low motivation for mastering tasks. This dimension is thus mainly concerned with the

degree to which individuals reflect on the validity of their hypotheses for solutions in problems that contain response uncertainty (Block, Block, and Harrington, 1974; Kagan, 1965, 1966).

14. *Attribution Style*

According to the learned-helplessness model of depression (Abramson, Seligman, & Teasdale, 1978) individuals vulnerable to depression differ from others in the causal judgments they habitually make for good and bad events in their lives. The "depressive attributional style" is characterized by the tendency to view aversive events as: a) caused by factors that are internal or personal rather than external, b) are stable rather than unstable or temporary, and c) exert global rather than specific influences across many domains in one's life. Various measures of attributional style exist (e.g. Furnham, Sadka, & Brewin, 1992), and the style results have been correlated with various personality variables and have been shown to affect academic performance (Ryckman, Peckhman, Mizokawa, & Sprague, 1990).

15. *Information Gathering and Evaluation*

A two-dimensional model of cognitive style was proposed by McKenny and Keen (1974). The information gathering dimension of the model distinguishes a *perceptive* strategy from a *receptive* strategy. The perceptive strategy emphasizes concepts and generalizations or relationships among the elements of the data.

Perceptive thinkers have preconceived notions about the needed information and are often convergent thinkers with a focus on the whole. The receptive strategy focuses on detail, or on the specific attributes of each element of data, rather on relationships among the elements. Receptive thinkers are less concerned with what may be relevant and tend to examine all data; they are often divergent thinkers who focus on parts of the whole. The information-valuation dimension of the model distinguishes a *systematic* strategy which approaches a problem from the standpoint of a method or plan with sequential steps, and an *intuitive* strategy which approaches a problem on the basis of "gut feeling" and trial and error. When given a choice, managers were found to prefer decision situations and problem types that are consistent with their own cognitive strategies (Henderson & Nutt, 1980). It should be noted in this context that the above strategies are very similar to the distinctions made by Kurt Goldstein (1940) between the abstract strategy as cognitively active and integrated and the concrete one as passive and segmented.

16. *Gregorc's Energic Model of Styles*

Gregorc (1979, 1984) suggested that styles can be understood in terms of two basic dimensions: use of space and use of time. Space refers to perceptual categories for acquiring and expressing information and is divided into concrete (or physical) and abstract (or metaphorical) space. Time is divided into two different ways of ordering facts and events: sequential (in a step-by-step or

branchlike manner) and random ordering (in a weblike or spiral manner).

The Gregorc Style Delineator (Gregorc, 1982) classifies individuals into four cognitive types: *concrete sequential* which refers to persons who focus their attention on concrete reality and physical objects and validate ideas through the senses; *abstract sequential* which refers to persons who prefer logical and systematic thinking and validate information through pre-set conceptualizations; *abstract random* which refers to persons who tend to focus their attention on feelings and emotions and to validate ideas through inner guidance; and *concrete random* which refers to persons who rely on intuitive and instinctive thinking and who rely on personal proof for validating ideas and rarely accept external authority. These styles together with the Gregorc Style Delineator will be described further in Chapter Three as this measure will be used in this study.

Distinctions Among Cognitive Styles

Since cognitive styles are consistent information-processing regularities, then different dimensions of cognitive style are expected to be associated with particular information processing operations--for example, levelling versus sharpening with memory storage and retrieval, scanning versus focussing with information search; field independence versus field dependence with problem representation and restructuring (Messick 1976). According to Messick (1984) such an association is not accurate because some cognitive styles appear to influence information processing at more than one point. For example, scanning affects information search in both perception and memory retrieval.

Kogan (1976) distinguished three types of cognitive styles. Styles of the first type refer to an ability to perform judged against a standard. An example would be the case of a field independent person who is better than a field dependent person in locating embedded figures. In the second type, greater value is placed by the investigator on one of the stylistic categories. For example, Bieri, Atkins, Briar, Leaman, Miller, and Tripodi (1966) view the cognitively complex person as having an advantage over the cognitively simple in processing information about his environment. The third cognitive type does not involve an investigator's attribution of superiority in performance such as in the case of category width.

Wardell and Royce (1978) hypothesize that style constructs are hierarchically organized and distinguish among three major types of stylistic cognitive constructs: *cognitive styles* (e.g., cognitive complexity versus simplicity, conceptual differentiation, sharpening versus levelling, abstract versus concrete); *affective styles* (e.g., reflection versus impulsivity, tolerance for the unconventional, constricted versus flexible control); and *cognitive-affective* styles that are functionally higher and consist of three general styles: rational, empirical, and metaphoric. Each of these high order cognitive-affective styles influences a number of specific cognitive and affective styles. This model will be discussed in more detail under psycho-epistemic styles.

Messick (1984) suggests that another way of distinguishing among cognitive styles is in terms of their relative levels of generality and pervasiveness. Some styles cut across

diverse domains while others appear to be in comparison domain-specific or function-specific with the latter further distinguishing themselves by their organizing functions. Messick (1984) proposes to formalize this distinction by calling the less pervasive, more strictly regulative styles *cognitive controls* while reserving the term *cognitive styles* for the broader, more organizing variables.

Limitations of the Cognition-Centered Theories of Styles

Despite extensive attempts to generalize and deploy the theories of cognitive styles, there remains, according to Grigorenko and Sternberg (1995), some four problematic areas. First, studies used to verify cognitive styles were more empirically driven than theoretically driven. Many cognitive styles were established on the bases of ever-increasing correlational and experimental data with little organizing input from general principles. Second, the validity of measures used to assess styles have not been satisfactorily determined, thus aggravating the overlap among stylistic variables, intelligence, and trait-like parameters of personality. Third, the boundary between style and ability is blurred in some cases allowing an implicit good/bad evaluation of test performance. Fourth, styles have not yet been assessed in an ecologically natural environment with the exception of studies on integrative complexity which sought to analyse archival records such as speeches written under specific social conditions (e.g., Suedfeld, 1985; Suedfeld, Black, Ballard & Baker-Brown, 1990). Associations between cognitive styles and different psychological variables need to come from varied non-artificial sources in order to enhance the validity and comprehensiveness of styles.

Learning Styles

The term "learning style" came into use in the 1970's when researchers in education began looking for ways to combine course presentation and materials to match the needs of individual learners and to respond to the growing evidence of culture being a mediating factor in the learning process (Kirby, 1979; Riding & Cheema, 1991). From this perspective, learning style is considered a broader term that includes the construct of cognitive style. Thus working under the umbrella of 'learning style' would take cognitive style into consideration, but would focus on the more practical educational or training applications which involve both structure and content and mainly examine the students' fit and comfort with various methods of teaching. A general definition was proposed by Keefe (1979) who defined learning style as the physiological, cognitive, and affective factors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.

Kolb (1978) identified four types of learning styles based on two dimensions--converging versus diverging and assimilation versus accommodating. These four styles yield different kinds of learners. "Divergers" are dominantly reflective and concrete; they grasp experience through apprehension and transform it through intention. "Convergers" are active and abstract; they grasp through comprehension and transform through extension. "Accommodators" are active and concrete; they grasp through apprehension and transform through extension. "Assimilators" are reflective and abstract; they grasp

experience through comprehension and transform it through intention.

Another way of organizing the growing number of learning style approaches and research instruments is Curry's (1983) metaphor of an onion in which the layers are analogous to the different levels of an individual's style. At the core of the onion is the style of the basic personality traits. Information-processing constitutes the next layer. Patterns of social interaction in the classroom, which include the individual's instructional preference, is the third layer.

A different approach to learning styles is a model by Reynolds, Riegel, & Torrance (1977) that is based on the specialized functions of the cerebral hemispheres. They define learning styles as preferred modes of information processing. Three information processing styles were specified: left-dominant (active, verbal, analytic, and logical), right-dominant (receptive, nonverbal, spatial, and intuitive) and whole-brained (complementary, integrated, simultaneously left and right). Thus students with left-dominant learning styles may be better able to generate logical relationships among alternative abstract constructs than those with right-dominant learning styles.

Rancourt (1984) investigated the link between the two cerebral hemispheres and the psycho-epistemic styles by examining the hypothesis that subjects who are dominant on the left neuropsychological style will have a dominant Empirical or Rational psycho-epistemic style, while those who are right dominant will have a dominant Metaphoric

psycho-epistemic style. The research found no relationships between left-right brain dominance and psycho-epistemic styles. These results raise doubts about the discriminatory power of the psycho-epistemic measure used: a predecessor of *Knowledge Accessing Modes Inventory* (Rancourt, 1988). The results also raise doubts about the usefulness of investigating cognitive styles in relation to left brain/right brain functioning and suggest that research and application in the area of cognitive or psycho-epistemic styles is more promising for educational needs.

A well-known model of learning styles is one proposed by Dunn and Dunn (1978) who define learning styles as a biologically and developmentally imposed set of personal characteristics that make the same teaching method effective for some and ineffective for others. The Dunn Learning Style Inventory (Dunn, Dunn, & Price, 1979) measures 18 elements divided into four main categories: environmental, emotional, sociological and physical. The main problem with this model is that it does not address the issue of how a student learns, focussing instead on elements that affect the individual's ability to learn and accordingly depicting learning style more as an ability than a behavioural preference (Hyman and Rosoff, 1984).

Teaching Styles

Teaching styles are related to the delivery of subject matter with student comprehension being the determining criterion. Teachers who have a wider range of teaching styles are likely to be more successful than those with limited versatility (Joyce &

Hodges, 1966). Fischer and Fischer (1979) differentiated between teaching styles and methods of instruction. Two teachers may both use the same methods as lectures, audiovisuals and discussion groups but still differ in their teaching styles. The cognitive style and the resulting teaching style of the teacher can have a significant impact on student learning; an adaptive fit between the teaching style of the teacher and cognitive style of the student and between the style and the teacher and the subject matter should be sought (Kuchinskas, 1979).

Six different and specific categories of teaching styles were identified by Henson and Borthwick (1984): task-oriented, cooperative planner, child-centered, subject centered, learning centered, and emotionally exciting. Beyond the need to fit teaching style to both student and subject, they further suggest that teachers who can successfully use approaches other than their preferred one will be more effective teachers.

Thinking Styles

Cognitive and epistemic styles are focused on information processing and mental-intellectual functioning. Thinking styles came to involve a more personality-centered approach which can be described as closer to personality traits. Styles in the former approach are typically measured by maximum-performance tests whereas in the latter approach, typical-performance tests are employed (Sternberg & Grigorenko, 1997).

An example of thinking styles is Harrison and Bramson's (1985) five "basic styles." The synthesist sees likeness in apparent dissimilarity, seeks conflict resolution, tries to

make data meaningful; the idealist seeks a broad range of views and ideal solutions, interested in values, data and theory equally; the pragmatist seeks whatever "works," seeks shortest route to payoff, interested in innovation; the analyst--seeks models and formulas, interested in scientific solutions, takes data over theory; the realist relies on "facts" and expert opinion, and seeks solutions that meet current needs and yields concrete results.

A personality-centered typology involving thinking styles can be found in Myers-Briggs theory and personality inventory: The Myers-Briggs Type Indicator MBTI (Myers & McCaully, 1985). Their model is based on that of Jung (1927) who proposed that individuals differ in terms of two attitudes (extraversion and introversion), two perceptual functions (intuition and sensing), and two judgment functions (thinking and feeling). The MBTI includes one more distinction, that between judgement and perception. Sixteen types of personality styles emerge from all possible combinations of the four functions.

This measure has been widely used in business organizations (e.g., Fitzgerald & Kirby, 1997) and in education. Extraversion and sensing are cited as most common among school children; extraversion, sensing, and feeling are more common among teachers (Myers, 1980). The model can have implications for the selection of general teaching strategies. For example, Lawrence, (1982) recommends developing teaching strategies for the majority group of extroverted-sensing children and then developing more individualized approaches for the smaller number of introverted and intuitive children. The MBTI sixteen styles can also be used in assessing the learning styles of students and the

teaching styles of teachers (e.g., Huelsmam, 1983). The large number of styles, and their multidimensionality (e.g., Intuitive-extraversion-perceptive-with thinking; sensing-extraversion-judging-with feeling) may contribute to comprehensiveness, but they also tend to make it nonparsimonious and complexly confusing, resulting in the blurring of personality and epistemic distinctions.

Another personality-centered model of thinking style was introduced by Sternberg (1988) in his theory of mental self-government that also appears in several other publications (e.g., Sternberg, 1990, 1994, 1997); Sternberg and Grigorenko 1995, 1997; Grigorenko & Sternberg, 1995). Grigorenko & Sternberg (1995) define thinking styles as "the ways in which people choose to use or exploit their intelligence as well as their knowledge" (p. 205). Thus according to Sternberg, a thinking style is not only a preferred way of thinking, but more specifically, a preferred way of expressing or using one or more abilities. As such, one might view style as a personality attribute for the utilization of abilities. Their model of mental self-government addresses the question of how intelligence is organized or directed. When applied to intelligence, the metaphor of mental self-government generates 13 thinking styles, or stylistic ways of approaching the world.

The basic idea of the mental self-government model is that the various styles of government that are seen in the world may represent external reflections of the styles that can be found in the mind. The model assumes that every individual possesses every style to some degree with variation expressed in the strength of preferences and the kinds of

tasks that evoke various preferences. Just as in the case of governments, the mind has basic **functions** consisting of a *legislative* style which characterizes people who enjoy creating and formulating; an *executive* style which characterizes people who are implementers; and a *judicial* style which characterizes people who like to evaluate rules and procedures. There are four main **forms** of mental self-government: the *monarchic* style characterizing individuals who like to focus on one task until it is completed; the *hierarchic* style characterizing individuals who allow for multiple goals each given a different priority; the *oligarchic* style characterizing people who allow for multiple goals all of which are given equal importance; and the *anarchic* style characterizing individuals who take a random approach to problems. There are two **levels** of mental self-government: the *local* style which characterizes individuals who prefer tasks that require engagement with concrete and precise detail, and the *global* style which characterizes individuals who prefer general problems that require abstraction. There are two **scopes** of mental self-government: the *internal* style characterizing individuals who prefer to work alone, and *external* style characterizing those who prefer to work on tasks involving interaction with others. There are also two major **leanings** of mental self-government, the *liberal* and the *conservative*.

According to the mental self-government model, people have sets of preferred thinking styles however they tend to be flexible in their use of styles in adapting to the demands of a given situation. The flexible use of the mind for mental self-government

accounts for the variety of thinking styles, and flexibility itself may be viewed as a form of metastyle that monitors and evaluates particular styles as higher order executive processes of information processing. Sternberg (1997) stresses that styles are preferences in the use of abilities, not abilities themselves and that a match between styles, abilities and the task creates a synergetic effect. The Thinking Styles Inventory (Sternberg & Wagner, 1991) is a self-rating measure of the 13 thinking styles.

Four studies employing the Thinking Style Inventory of mental self government were carried out and reported by Sternberg and Grigorenko (1995; 1997). The first one examined whether teachers' styles differed as a function of school. Teachers at lower grade levels were more legislative and less executive than were higher grade levels; older teachers were more executive, local and conservative than were younger teachers; teachers showed differences in styles across subject-matter areas; and teachers' styles tended to match the ideology of teachers' schools. The second study examined the style demographics for 124 students. They found that both fathers' education and occupational level were negatively related to judicial, local, conservative, and oligarchical styles. The third study matched students' styles with those of their teachers. It was found that students were more positively evaluated by and received better grades from teachers who matched their styles than from those who did not with teachers overestimating the extent to which their students matched them in styles. The fourth study (Grigorenko & Sternberg, 1997) investigated correlations between styles of thinking and achievement of

199 high school students in an advanced-placement in introductory psychology.

Consistent positive relations were found between judicial style and performance.

The Impact of Cognitive Styles on Education

Cognitive styles have implications not only for schooling but also for occupational choice and performance. Several educational implications were noted (e.g., Messick, 1984; Sternberg & Grigorenko, 1997). They include: improving instructional methods; enriching teacher behaviour and conceptions; enhancing student learning and thinking strategies; improving vocational selection, guidance, and placement; and understanding and tuning the stylistic demands of learning environments.

With respect to the future development and application of styles, Sternberg and Grigorenko (1997) see a "great deal of promise" for the following four reasons. First, styles have provided and continue to provide an important linkage between research on cognition and personality. Second, they have lent themselves to operationalization and direct empirical tests. Third, they show promise in explaining variations in school and job performance that cannot be accounted for by individual differences in abilities. Fourth, they can tell something about the cognitive characteristics of environments and about individuals' interactions with these environments, as shown by the fact that certain styles perform positively in one environment and negatively in another. The cultural background can be seen as a broader form of this environment and it is the aim of this study to explore the stylistic impact of culture.

Psycho-Epistemology

Both philosophical and psychological epistemology are concerned with a concept labelled as "knowing," "thinking," or "modalities of inference" (Pai, 1973). Although terminology may vary from author to author, there is an apparent agreement that there are three basic modalities of "knowing":

An *inductive* process of knowing which involves the drawing of general conclusions from a number of known facts is generally regarded as analytic (inductive) thinking or empirical thinking.

A *deductive* process of knowing where the conclusion follows necessarily from given premises is considered as logical or rational thinking.

An analogical process of direct apprehension is referred to as *intuitive* or metaphorical thinking (Scheffler, 1965; Samples, 1976).

These modalities tend to characterize the structure of disciplines and the intellectual approaches of the learner and the teacher, and accordingly, create the issue of epistemic compatibility (Bruner, 1960). For example, Vernon (1962) noted that there may be incompatibility between inflexible, structured, sequential teaching strategies and learners who are characterized as "intuitive," "analogical" thinkers.

As far back as early sixties Joseph R. Royce began working on a personality model that focused on individual differences. The concept of encapsulation which he advanced in his 1964 book *The Encapsulated Man*, was central to his Psycho-Epistemic Style model of ways of knowing. According to Royce (1964), each approach to reality (whether it is empiricism, rationalism, modernism or idealism) involves certain assumptions from which we view the world. Encapsulation for Royce is having a partial image of life, but making statements about living as a whole without being sufficiently aware of the limitations of one's approach to truth. *"In its most important sense, the term encapsulation refers to projecting a knowledge of ultimate reality from the perceptual framework of a limited reality image"* (Royce, 1964, p. 30).

For example, one of the causes behind the difficulty of specialists to interact and communicate across disciplines is seen by Royce (1973) to go beyond the often-stated answers of technical jargon, different interests, different content, and different methods. He attributes the failures of communication between specialists to an insufficient overlap of reality perspectives. Such absence of overlapping is due to differences in either implicit or explicit epistemological commitments. Empirically oriented laboratory scientists emphasize mainly facts derived from observations; mathematicians rely on logical consistency; poets convey meaning through metaphors. Such restricted ways of looking at the world, is not limited to academicians; it is simply that the partial vision of the specialist is more extreme, more exaggerated, and more obvious. In short, all human beings are

encapsulated and the models explaining the totality of life are dependent upon idiosyncratic psycho-biological histories (Royce, 1973b, p.1-2).

Royce's Multi-Factor Theory of Individuality

In the 1970s, Wardell and Royce (1978) attempted to summarize the literature on styles and to incorporate them within a larger theoretical framework named the Multi-Factor Theory of Individuality. Royce (1973a) defined style as "a characteristic mode or way of manifesting cognitive and/or affective phenomena" (p. 178). This meta-theoretical model, using both theory and methodology of factor analysis as well as systems theory, attempted, according to the author, to "accommodate all psychological differences such as reaction time and accountability to molar differences such as values and world views" (Royce, 1973, p. 3). The culmination of this line of integrated research in individual differences appeared in a book entitled: *Theory of Personality and Individual Differences: Factors, Systems and Processes* (Royce and Powell, 1983). The Multi-Factor Theory of Individuality postulates that the total psychological system is a "multi-dimensional, organized system of processes by means of which an organism produces mental and behavioural phenomena" (Powell & Royce, 1977 p.2). This multi-dimensional, interactional and hierarchical supra-system subsumes six major systems: sensory, motor, cognitive, affective, evaluative and style. Each system is defined by Royce and Buss (1976, p. 6-7) as follows:

1. The *cognitive system* is a multi-dimensional, organized system of processes by means of which an organism produces cognitions.
2. The *sensory system* is a multi-dimensional, organized system of processes by means of which an organism produces sensations.
3. The *affective system* is a multidimensional, organized system of processes by means of which an organism produces affective phenomena.
4. The *style system* is a multi- dimensional, organized system of processes by means of which an organism manifests cognitive and/or affective phenomena.
5. The *evaluative system* is a multi-dimensional, organized system of processes by means of which an organism manifests normative phenomena.
6. The *motor system* is a multi-dimensional, organised system of processes by means of which an organism produces outputs.

What is described is a theory of individuality that is multidimensional, interactional and hierarchical. Within each of the six systems are subsumed traits that have been factorially identified. A total of 150 traits have been identified.

The problem of accounting for the organized complexity of personality, in which parts and wholes must interact, has been solved by Royce and Powell through of the concept of "holons." Holons, according to Royce and Powell (1983, p. 33) are the basic units of individuality theory. They are defined as functional units that are simultaneously a

part of the whole. They act as parts when they are functionally subsumed by a larger functional unit, and they act as wholes when they do the subsuming. The closer a holon trait or group of traits to the apex of a system, the greater is its influence on the system and the greater is its role as a personality integrator. As illustrated in *Figure 1*, the style system would be of more importance as a personality integrator than the cognitive system it subsumes. Similarly, the cognitive system would be of more importance as a personality integrator than the sensory and motor systems. This system domination is dependent on the type of information being processed. For example, if the behavioural event is primarily emotional in nature, such as fear from a dangerous situation, the ongoing information processing will occur primarily via the affective system even though the cognitive, the style, and the value systems are, to lesser extent, evolved.

Thus, the Multi-Factor Theory of Individuality is a conceptual framework consisting of factorially identified traits organized in a system-dynamic supra-structure that provides for intersection within and among the six sub-systems along with a hierarchically organized structure. Of particular interest to this study is the style system. This system, considered to be near the apex of the supra-system, is an important integration system.

Psycho-Epistemic Styles

The theory has defined a style as "a characteristic mode or way of manifesting cognitive and/or affective phenomena" (Royce, 1973). This system along with its subsystems of cognitive, affective and cognitive-affective styles are considered to be

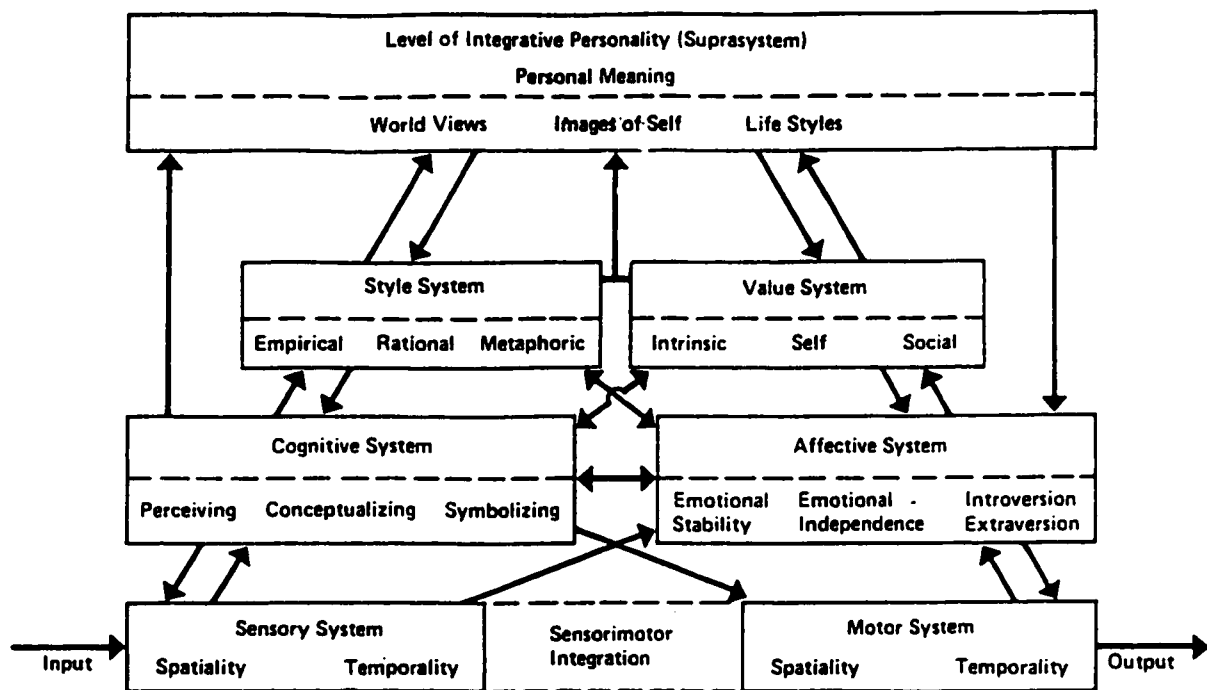


FIGURE 1. The basic systems and interactive relationships of integrative personality. (From Royce & Powell, 1983, p.13)

higher-order dimensions and serve as an integrative system. According to Wardell and Royce (1978), the style system is more *inclusive* than what is generally considered in the literature on cognitive styles. Within the hierarchical structure of the style system theory, three higher-order constructs have been identified; they are at the apex of the system. Wardell and Royce (1978) call these constructs the rational, empirical and metaphorical styles. These three styles reflect the different ways in which an individual programs his information processing pattern using the cognitive, affective and cognitive-affective styles of the style system (*Figures 2 & 3*).

In the context of psychological epistemology, Royce (1975, p.3) defined the three psycho-epistemic styles as follows:

Metaphorism: The person whose view of reality is largely determined by his commitment to symbolic-metaphoric experience would test the validity of his view in terms of the universality of his insight or awareness. The cognitive processes underlying this commitment are of a symbolizing nature, including both conscious and unconscious aspects.

Rationalism: The person whose view of reality is largely determined by his commitment to rationality would test the validity of his view of reality by its logical consistency. The major underlying cognitive processes involve clear thinking, and the rational analysis and synthesis of ideas.

Empiricism: The person whose view of reality is largely determined by his commitment to external experience would test his view of reality in terms of the

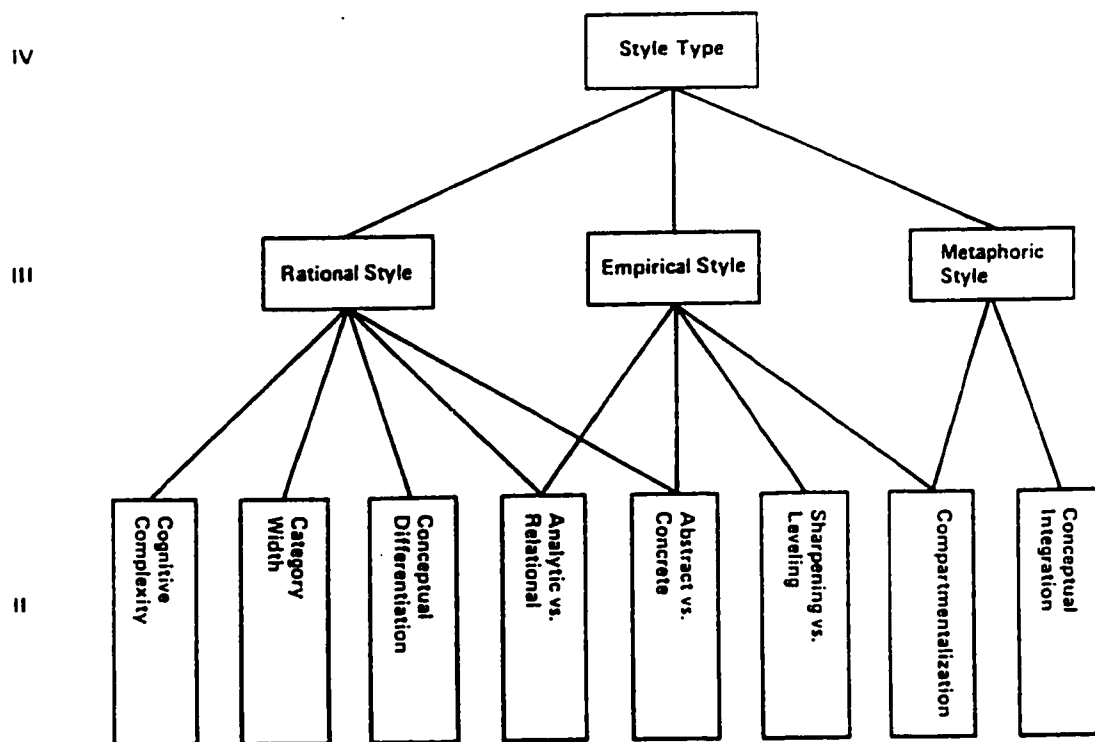


FIGURE 2. Hierarchical structure of cognitive styles. (From Royce & Powell, 1983, p.136)

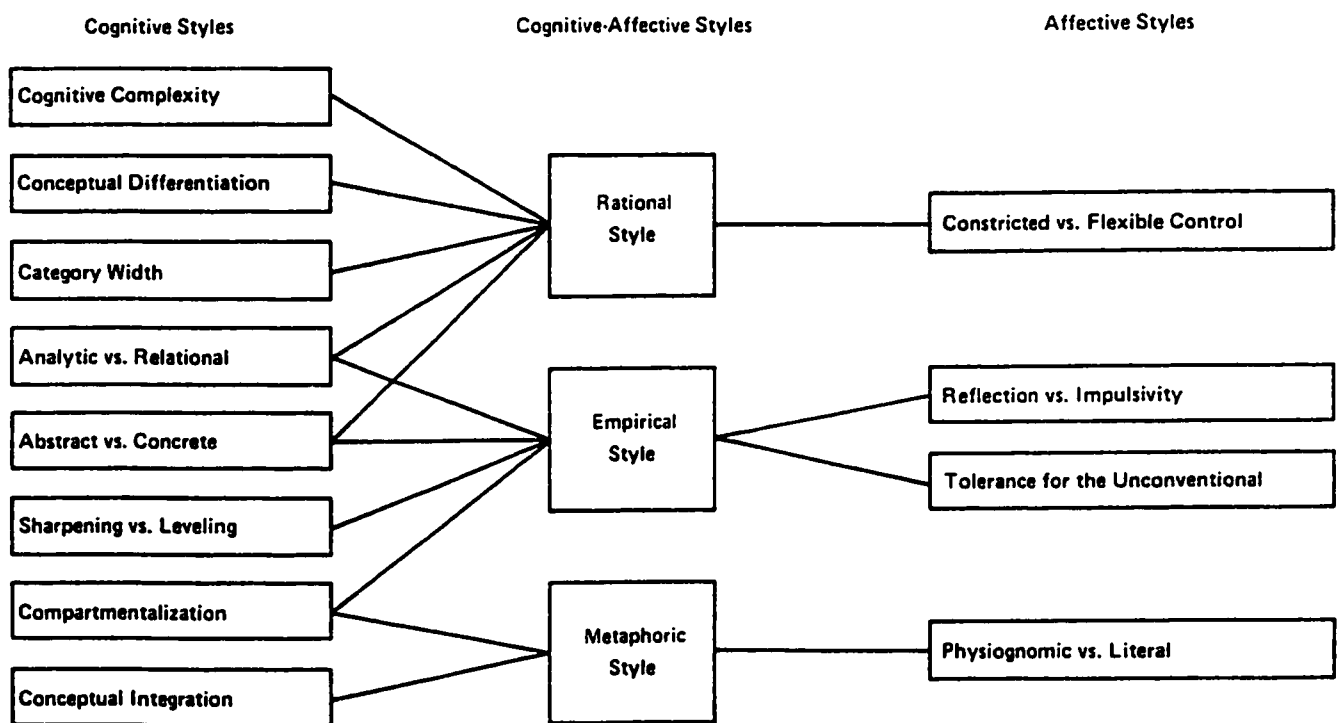


FIGURE 3. Relationship of cognitive-affective styles with cognitive and affective styles. (From Royce & Powell, 1983, p.142)

reliability and validity of observation. The major underlying cognitive processes involve active perception and the seeking out of sensory perceptions.

Subsumed under these three epistemic styles which appear near the apex of the structure are various cognitive, affective, and cognitive-affective styles along with various cognitive and affective traits. Epistemic styles can then be considered of major importance in the selection and integration of information units within information processing. When an individual is faced with a problem, epistemic styles, along with the various subsumed styles and traits, are activated and the information processing route will vary in terms of the situation and the individual.

The psycho-epistemic style system permits a more holistic conceptual understanding of how an individual, faced with a particular task, processes information. Individuals use different information processing routes depending upon their particular hereditary-environmental characteristics. When confronted with a particular learning or teaching task, an individual may utilize an information processing route that may be predominantly rational, empirical or metaphorical.

Epistemic styles appear to be closely linked to the ever-increasing phenomenon of academic specialization. These styles may help to explain the difficulties in communication among different disciplines; the difficulty for some academics to adopt multidisciplinary approaches, and the differential teaching and communication appeal

among teachers and students. The almost total reliance on one particular epistemic style at the expense of the other two can account, at least partially, for differences in *weltanschauung* (a comprehensive conception or apprehension of the world, especially from a specific standpoint). It must be noted at this point that the theory is not suggesting that all individuals function with a "pure" epistemic style. Rather, sensory input, symbol formation, and conceptualizing are necessary and interdependent processes of thinking.

The *Psycho-Epistemological Profile* (PEP) was developed by Royce (1975) as a comprehensive measure of the three epistemic styles. The PEP contains 90 items with each dimension measured by 30 items. The items are randomly ordered in which the subject is to indicate agreement to a proposed statement on a five point scale. Validity studies (e.g., Royce, 1975; Kearsley, 1975; Rancourt and Dionne, 1982) sought to confirm the responses of groups with those whose epistemic characteristics have been examined (Smith, 1967) such as biologists being dominant on empiricism; performing artists being dominant on metaphorism; and mathematicians and physicists being dominant on rationalism. Construct validity of the PEP was established by comparison with other tests such as Myers-Briggs Type Indicator and Allport-Lindsey Study of Values. On the basis of an assessment of such psychometric studies, Rancourt (1983) concluded that they provide sufficient evidence that PEP is a reliable and valid measure of an individual's epistemic style.

A macro epistemic model referred to as "Two Epistemic World-Views" was recently presented by Spiro, Feltovich, and Coulson (1996). Epistemic world-views are beliefs about learning and about the world that prefigure the form of knowledge schemata an individual will take. The two epistemic world-views were proposed based on research on knowledge acquisition in complex and ill-structured domains and the need for the advancement of learning in such domains. The *Reductive World-View* refers to a style that is poorly suited to complexity and situation-adaptive cognitive flexibility. An individual characterized by this style of epistemic prefiguration has the following characteristics: 1) encompassing single representation, 2) analytic decomposition, 3) orderliness and teleological homogeneity, 4) preference for simplicity and intolerance of ambiguity, 5) rigid prescriptions from memory, 6) ideas lack experiential tone, 7) passive reception, adherence to authority, and extrinsic motivation.

On the other end, individuals characterized by the *Expansive and Flexible World View* are well suited to complexity and situation-adaptive cognitive flexibility and are characterized by the following correlated characteristics: 1) multiple partial representations, 2) synthetic integration and interconnectedness, 3) disorderliness and heterogeneity 4) preference for complexity and tolerance of ambiguity, 5) flexible, situation-adaptive assembly of knowledge, 6) ideas can have experiential tone, 7) active learning, self-reliance, and intrinsic motivation.

The Reductive World-View tends to imply the concrete, analytic, compartmentalized, and conceptually undifferentiated cognitive styles, whereas the Expansive World-View implies the abstract, relational, conceptually differentiated, and conceptually integrated cognitive styles. Also the Reductive view tends to represent Royce & Wardell's Empirical and Metaphoric epistemic styles and with the Expansive view representing the Rational epistemic style. More parsimoniously stated, the two epistemic world views represent the concrete and the abstract cognitive orientation as conceptualized by Goldstein (1940).

Psycho-Epistemic Styles and Cognitive Styles

In spite of the vast literature on cognitive style, Wardell and Royce (1978) have suggested that empirical generalizability is limited because the findings are so "instrument bound". They also suggest that there is some conceptual weakness which has to do with the proliferation and confusion of interpretations of style as a theoretical construct. For example they note that in the context of cognition, cognitive styles have born a heavy element of affect. Thus, for Royce, the style system is a higher-order holon than both the cognitive and affective system. These two latter systems are subsumed under the style system. Styles according to Royce and Powell (1983 p. 134) "recruit" abilities and affective traits that are involved in particular situations. The style will then determine a specific combination of traits that are activated. For example, in an object-sorting task, a cognitive style might give more weight to inductive reasoning as well as perceptual abilities rather than deductive reasoning and conceptual skills. Similarly an affective style,

in the same object-sorting task, might moderate between the expression of anxiety or impulsivity. (Royce and Powell, p. 134).

Figure 3 indicates the relationship between cognitive, cognitive and affective, and epistemic styles. As can be seen from the figure, the empirical style is related to the analytic versus relational style, concrete thinking, sharpened and precise memories, compartmentalization on the cognitive side, while related to impulsivity and low tolerance for unrealistic experiences on the affective side. In terms of the rational epistemic style, high conceptual differentiation; narrow categorizing; analysis; and abstract reasoning are the cognitive styles subsumed, while constricted control is the affective style. Finally, the cognitive style of high conceptual integration and low compartmentalization through symbolic and analogical similarities is reflected in the affective domain by the physiognomic rather than literal affective style.

Furthermore, Royce and Powell suggest that the principal impact of psycho-epistemic styles on cognitive processing resides in the fact that there appears to be a selection of processing modes. In other words, as mentioned before, we do not react similarly to all stimuli as do robots, but selectively attend to environmental stimuli. This implies attentional mechanisms. One of these attentional mechanisms, labelled in the literature as extensiveness, relates to the amount and detail of a field that is explored at a given time. Royce and Powell (p. 143) suggest that it is controlled primarily by the

empirical style. Similarly, the extent to which one concentrates on a particular aspect of a field (selectiveness) is, according to Royce and Powell (p. 143), the attentional role of the metaphoric style.

To summarize the characteristics of each of Royce's psycho-epistemic styles, (Rancourt & Dionne, 1982, p. 27-29), **the rational style is:**

1. more abstract than concrete
2. more analytical than relational
3. discriminates better in complex cognitive tasks
4. more flexible than constricted
5. more emotionally independent
6. more autonomous
7. more tough-minded and unbending
8. scores high on reasoning and verbal ability
(syllogistic reasoning and deduction)

The empirical style is:

1. more perceptual rather than conceptual
2. more concrete than abstract
3. high on compartmentalization
4. attentive to detail, and sequential presentation of stimuli (sharpening)
5. more relational than analytic
6. low on tolerance for the unconventional

7. high on realistic experiences
8. more reflective rather than impulsive
9. more inductive in reasoning
10. more interested in "doing" rather than theorizing

The metaphoric style is:

1. low on compartmentalization
2. high on conceptual integration
3. high on creative and synthesizing ability
4. more physiognomic than literal
5. more impulsive, expansive, talkative, independent-minded and unconventional

It would appear then that the psycho-epistemic styles are more inclusive than the various cognitive styles that have been identified in the literature reviewed above. The fact that the psycho-epistemic styles include affective styles along with cognitive style, reflects a much broader spectrum of abilities in terms of how an individual interacts with environmental stimuli. Furthermore, many cognitive styles as well as affective styles have been factorially identified as being subsumed within the concept of psycho-epistemic styles.

The Epistemic Orientation Model

The Epistemic Orientation Model developed by Rancourt (Rancourt & Ballantine 1990b) is premised on the assumption that acquired knowledge is a personal mental construction resulting from a focused interaction of epistemic styles and the context of an educational field or environment. This model is both theory and instrument based. Royce's (1975) three psycho-epistemic styles: *metaphorism*, *rationalism*, and *empiricism* are endorsed and conceptualized by Rancourt as distinct information processing systems or *modes* of knowledge accessing. *Epistemic style* refers to the ordering of the three modes based on the individual differential reliance on each. These modes are seen as distinct and at the same time interrelated and can be activated whenever selective attending is engaged. At any one time one of these knowledge accessing modes may override the other two and exclude them from the information processing activity. Thus differences in processing are basically a differential reliance on one of the three modes of knowledge acquisition rather than transformations in processing functions. A 20-item measure (much shorter than the 90-item PEP) was developed by Rancourt (1986b; 1988) for the assessment of the three modes: the *Knowledge Accessing Modes Inventory* (KAMI).

According to Lauzon and Rancourt (1992), the Epistemic Orientation Model is based on eight assumptions:

1. All disciplines have a structure and it is within the providence of epistemology to elucidate that structure.

2. **The learning of subject matter means the acquisition of the epistemological structure subsumed in the knowledge of the subject matter.**
3. **Thought, language, and content are not antagonistic but are rather inseparable partners.**
4. **Due largely to schooling and genetic predisposition, individuals differ in the way they prefer to acquire knowledge.**
5. **Disciplines, professions and trades differ systematically in the modes of knowing they use and sanction with their members.**
6. **Personal epistemology may predispose learners to seek courses with a content that is matched to their style.**
7. **Epistemic style is the cognitive-affective guidance system that controls the "selective attending" process in the person-environment geography.**
8. **The epistemic orientation of a culture, or a group, or a knowledge-based discipline has powerful implications for the way one learns, the way one teaches, and the way instruction is designed and the way one leads and manages.**

In short, the Epistemic Orientation Model is based on the differential utilization of the three modes of accessing knowledge. Specifically, knowledge is said to be acquired, organized or transmitted via the senses (empirical mode); via thinking (rational mode) or via intuition (noetic mode). The modes can be briefly described as follows (Rancourt & Ballantine, 1990):

1. **Empirical Epistemic Mode** uses sense perceptions as the major criterion for the selective attending to environmental stimuli and the subsequent acquisition of knowledge relying basically on induction. Individuals who make use of this mode tend, as empiricists, to be down-to-earth, full of common sense and easily bored by too much theoretical or conceptual material. They prefer information to be presented in a concrete, structured and inductive fashion.
2. **Rational Epistemic Mode** utilizes a conceptual, ideational, logical process as a major criterion for the selective attending to environmental stimuli and the subsequent acquisition of knowledge. Users of this mode tend, as rationalists, to operate their practice from theory. Their world is logical, orderly, predictable, and rules serve to guide their praxis. They enjoy being in organized environments where autonomy is valued. Rationalists are generally cool-headed, tenacious, and seldom resort to making compromises. A desire to have information presented in a structured and deductive sequence is a natural tendency of this mode.

3. **Noetic Epistemic Mode** employs the self-referent quality of personal experience and intuition as the major criterion for the selective attending to environmental stimuli and the subsequent acquisition of knowledge. Individuals who basically rely on this mode enjoy the "feeling" type of discussion about people and their problems. They dislike too much data-bound discussions or learning that is highly factual or theoretical; however, they are good listeners and often understand intuitively that there is more than one solution to a problem. Their preference for "fuzzy", divergent, random, holistic-type thinking sometimes links them to creative endeavour.

Each of these knowledge accessing modes does not exist in isolation, independent of one another. No individual is purely empiricist, or rationalist or noetic. Rather, individuals exhibit all three modes, each blended into the others in varying degrees of intensity. Six possible combinations result, (NER, NRE, ERN, ENR, REN, RNE) and are identified as epistemic styles. As an example, an ERN epistemic style indicates that a person's preferred mode of accessing knowledge is empirical (major mode) followed by rational as the associate mode and the noetic mode (minor mode) as the least preferred and least utilized (Rancourt & Ballantine, 1990).

Encouraged by his development of a practical instrument (the KAMI, 1988) for the assessment of epistemic modes and styles, Rancourt (1995) set to review and examine four hypothesized epistemic orientations: the epistemic orientation of the discipline; the

epistemic orientation of practitioners; the epistemic orientation of practitioners-to-be; and the epistemic orientation in gender.

Epistemic Orientation in Discipline

Knowledge-making in a discipline relies on the epistemic structure of that discipline and the use of its specific methodologies of inquiry. A theorist or a practitioner within a specific discipline tends to adopt and internalize the epistemic approach of that discipline the more he/she applies it or practices within it. Consequently, the discipline as well as the professions should exhibit their very own epistemic orientation.

All disciplined knowledge has a structure, and it is within the providence of epistemology to elucidate that structure of knowledge. Without structure, any field of knowledge would be no more than a mass of unrelated propositions... The learning of a discipline, in essence, means the acquisition of the "structure of knowledge" that comprises that discipline (Pines, 1982, p. 89).

Evidence of epistemic difference among disciplines is found in the writings of Phenix (1964), Kolb (1976) and Gardner (1983). Belcher (1981) who examined six academic disciplines (biology, history, law, mechanical engineering, physics, sociology) concluded that each of the academic disciplines has its own unique way of selectively attending to data and of determining truth; each is encapsulated by a consistent and characteristic way of knowing. These epistemic differences may help to explain the problems that tend to beset teaching and research activities which attempt to cross disciplinary boundaries.

The responses of various groups in studies dealing with the validity of the PEP were analyzed. Smith (1967) confirmed that empiricism is the dominant epistemic characteristic of professionals engaged in biology; that rationalism is dominant among those engaged in mathematics and theoretical physics; and metaphorism is dominant among those engaged in performing arts. Studies using the KAMI also yielded similar findings (Rancourt, 1987a, 1987b, 1996). The epistemic profiles of 464 secondary school teachers were matched with fields of specializations (Rancourt & Noble, 1991). The evidence was consistent with previous findings of a match between the empirical mode and biology and science teaching; between the rational mode and mathematics; and between the noetic mode and language teaching.

Epistemic Orientation of Practitioners

One of the early studies in this area was done by McKenny and Keen (1974) who assessed stylistic differences among professionals in relation to decision making. For example, managers were found to be more intuitive, global, and field dependent in their approach to making decisions and handling the tasks while the engineers were more analytical, sequential, and field independent. The association between the epistemic orientation of individuals and their choice of discipline or profession was investigated using KAMI. The test was administered to samples of professionals: mathematics, science and fine arts teachers (Rancourt, 1987; Rancourt, Dionne, 1982); nurses, (Niday, 1987); physicians and hospital administrators (Rancourt & Noble, 1991); air traffic controllers

(Rancourt, 1987b); physiotherapists (Rancourt, Ballantine, 1990); and professional golfers (Rancourt & Searle, 1990; 1994).

All indicated a high degree of association between the epistemological structure subsumed in each of the various professions and the epistemic orientation of the respective practitioners. Scores on KAMI indicated: mathematicians were typically Rational; scientists were Empirical when sample subjects were predominantly in applied sciences, but as sample included more theoretically oriented sciences such as physics and chemistry, the epistemic orientation became Rational; fine arts professionals were Noetic; air traffic controllers were Rational; college diploma nurses were Empirical; university degree nurses were rational; physicians and hospital administrators were Rational; physiotherapists were Rational/Noetic; and professional golfers were Rational/Noetic.

Epistemic Orientation of the Learner

Based on the same model, it can be posited that most of the academic disciplines which are offered at universities have an identifiable epistemic structure which is reflected in the epistemic orientation of those students who are majoring in them. Also it can be argued that for students to be successful in their studies within their chosen academic disciplines, their success may well be dependent in part on the fit between their major epistemic mode and the epistemic structure subsumed in the content and structure of their chosen discipline. This relationship can be restated as: the better the epistemological fit, the stronger the possibility the student will continue within that discipline.

Rai & Prakash (1987) administered the Embedded Figures Test (EFT) to 40 graduate university students for the purpose of investigating the relationship between cognitive style and choice of educational majors in natural sciences and social sciences. Subjects in science majors were found to be significantly more field independent than social science. No sex differences were found. The Myers-Briggs Type Indicator was administered to 741 social science and business students by Carland (1987). The business students, in comparison to other students, were predominantly sensation-feeling-judging types. Stewart & Felicetti (1992) administered the Gregorc Style Delineator to 99 underclass and 65 upperclass business majors in areas other than marketing, and to 101 marketing majors. The dominant cognitive styles for marketing majors were Concrete Sequential and Abstract Random. The Group Embedded Figures Test was administered to 75 Chinese and 75 American students by Huang & Chao (1995). The two groups showed a similar style of field dependence and no significant differences were found between engineering and social science majors. It should be noted that in this study and that of Rai & Prakash (1987), the samples were too small to allow drawing confident conclusions about them and much less about their subsamples.

Rancourt & Noble (1996) tested this epistemic congruence on a sample of 724 full-time students using KAMI. The relative frequency of each mode as a major mode was defined as an epistemic orientation. The correlations between the major mode of student and the orientation of the discipline were overall supportive of the epistemic congruence hypothesis of the learner.

Epistemic Orientation of Practitioners-to-be

Attempts in the literature to link personality characteristics to attitudes towards subject matter and achievement are numerous. Studies that showed that link (e.g., Entwistle, Wilson, 1977; Witkin, 1976; Leith, 1974; and Kolb, 1976) found personality differences in the types of learners attracted to the sciences and the arts but not to mathematics. The more recent studies which examine learning styles and subject matter preferences, reveal no consistent pattern and tend to lack a common theoretical position (Hunt, 1987).

The identification of epistemic orientations of high school students was obtained in a study by Rancourt (1987a). Students were asked to rank their preferred subjects for future university studies. Only those students who selected fine arts, mathematics or the sciences as preferred subjects were retained. The students were subsequently administered the KAMI. The resulting sample consisted of 87 males and 84 females. The results revealed a match between the epistemic orientation of learners and the epistemological structure of their discipline of choice. Epistemic matches were found between the choice of mathematics and the rational mode; between the choice of fine arts and the noetic mode, and between the choice of science and the empirical mode.

Epistemic Orientation of Gender

Recent brain research findings regarding gender related cognitive variations (e.g., Kimura, 1992) and the consideration of the possible impact of traditional patterns of socialization, may lead us to expect differences in the epistemic orientation of the two sexes. Such differences have been found in some studies. For example, using the Myers-Briggs, Lawrence (1982) found that women are more likely to be on the feeling end of the thinking/feeling continuum while men tend to be close to the thinking end. In Rancourt's (1987c) study on the orientation of practitioners-to-be, gender does not appear to be a critical factor in the selection of a best-liked subject. Both male and female learners share a common epistemic orientation with respect to best-liked subject. However gender differences on the KAMI were found in general population groups (Rancourt, 1986a). Women outnumber men 5:1 in terms of their preference for the Noetic mode of knowledge accessing and men are found to be more Empirical and more Rational.

Does Culture Influence Epistemic Orientation?

The Epistemic Orientation Model assumes that knowledge-making, knowledge acquisition and knowledge transmission are influenced by the epistemic styles stemming from: the structure of the discipline; from practising a discipline or profession; from individual cognitive differences; and possibly from gender. The present study attempted to examine whether and how epistemic style is related to another variable: culture.

Culture has been conceptualized by Greertz (1968) as "an historically transmitted pattern of meaning embodied in symbols; a system of inherited conceptions expressed in symbolic form by means of which individuals communicate, perpetuate and develop their knowledge about and attitudes towards life" (P. 641).

According to Mercer (1992), Greertz's definition is compatible with the notion of culture employed by Vygotsky (1978). For Vygotsky, the concept of culture offers a way of linking the history of a social group, the communicative activity of its members (where the structures of language play an important role), and the cognitive development of its children. The discipline known as cognitive anthropology (e.g., Reid and Valsiner, 1986; Super and Harkness, 1986; D'Andrade, 1987; Quinn and Holland, 1987) views culture as shared knowledge - not just people's customs and artifacts and oral traditions, but what they must *know* in order to see as they do, make the things they make, and interpret their experience in the distinctive way they do. Thus, the suggestion is that all components of a culture are built upon some basic conceptual system which can allow common themes to be viewed differently within each culture.

It has also been proposed that in each culture reality can be distinctively conceptualized in implicit and explicit premises and derivative generalizations which together form a coherent system. The conceptual system is transmitted to its members through a complex matrix of socialization practices which also involve copying by the individual of choreographed patterns of behaviour (Mathews, 1977).

Cross-cultural research examining perceptual and cognitive differences have consistently supported a cognitive impact of culture. Allport & Pettigrew's (1957) study of the trapezoidal illusion illustrating African-European perceptual differences of movement in children; Bruner's (1966) finding of differences in perception of the conservation task between African and European children are some of the classical examples. Ramirez and Price-Williams (1974) found Mexican-Americans to be more field dependent than Anglo-Americans. Saracho (1983) reviewed studies relating cognitive style of Mexican-Americans to their contact with Mexican culture; first-generation Mexican-Americans were found to be more field dependent than third-generation. Using the Children's Embedded Figures Test on grade four and five subjects, Natzel (1997) found African Americans to be more field independent than Black South Africans. This finding may indicate that culture may have more determining influence on cognitive style such as field dependency than race.

Other studies have identified ethnic differences on variables related to patterns of cognitive functioning. For example, Ramirez and Price-Williams (1971) on the basis of tasks involving telling stories about pictures, found that Mexican Americans demonstrated more verbal and character elaboration than Anglo-Americans. Similar studies have found that American blacks and whites have different cognitive orientation to reality. Black-Americans' reality ties were found to be more affective-oriented while that of Whites was more objective (White, 1970). Among Black-Americans, knowledge has been found to be gained effectively more through kinetic and tactile senses than visual; in selecting cues,

they looked for people and events more than objects, and responded better to verbal material than to pictorial representation (Shade, 1997). Willis (1989) has found that Black-Americans children generally learn in ways characterized by factors of social/affective emphasis, holistic perspectives, and close-to-life experiences and evaluations.

The findings of research on the thinking characteristics of Native-Americans (as reviewed by Florey, 1986) indicated that they differ from the predominant culture in terms of reliance on non-verbal communication, the use of non-detailed verbal accounts, belief in mythology rather than science, superior visual discrimination, and preference for anonymity. At the cognitive level, Native-American students indicate (More, 1993) an orientation towards visual modality, globality, imaginal reflectivity, and concreteness. An ethnographic study of three Algonquin speaking nations by (Hjartarson, 1995) further stresses the holistic orientation of Native American epistemology represented by the circle where each person is a whole world and a member of the larger circles of life; the family, the community, the world and the universe.

Rancourt & Noble (1996), using KAMI, found differences in epistemic style between English speaking and French speaking Canadians. The sample of Canadian students used to investigate the relationship between epistemic orientation and major also yielded significant differences between the Anglophone and Francophone sub-samples.

The Anglophone sub-sample was less rational ($p < .001$) more noetic ($p < .01$), and more empirical ($p < .001$) than the Francophone sample.

Cross-cultural comparisons using the KAMI also dealt with other ethnic groups. For example, Rancourt and Deschenes (1990) administered the KAMI to 308 francophone secondary school students (ages between 13 to 16) from Ontario ($N=80$), Quebec ($N=70$), Tunisia ($N=60$), and the Ivory Coast ($N=98$). The two Canadian groups indicated the same epistemic orientation profile ERN while the profile of the two African groups was (REN). Also subjects in all four groups who indicated mathematics as their preferred subject revealed an REN epistemic profile; those who preferred a career in sciences were all ERN with the exception of those from the Ivory Coast who indicated a REN style; and those preferring a career in arts were split between NER for the Canadian groups and REN for the African groups. Park (1997) examined Korean nurses on KAMI and found them to be more noetic than their North American counterparts. These findings suggest that cultural background and the inclination toward a field of study are both variables in determining epistemic orientation.

Using the Embedded Figures Test, Nagy (1988) compared college students reared in the United States Culture with individuals who grew up in the Indo-Pakistani culture and who were studying in the U.S. Results showed differences in cognitive style between the two groups thus confirming the hypothesis of acculturation. Results also indicated

that competency in the English language is related to a more differentiated cognitive style. Attitude was not found to be a predictor of cognitive style.

Chao (1996) compared American and Chinese university students on category width and on sharpening versus levelling cognitive styles. Analysis indicated that Chinese subjects scored as broader than their American peers in categorization. Sharpening/levelling differences were only found between men and women; the men scored sharper than women. Huang (1994) compared the "thinking styles" of 75 Chinese and 75 American graduate students (96 men, 54 women) using the Inquiry Mode Questionnaire. Chinese subjects scored as more pragmatic than American subjects, and Chinese men and American women scored as more idealistic than did Chinese women and American men. With respect to the field of study, subjects of both samples were consistent with the general epistemic orientation of the field. For example, natural science and engineering students scored as more analytical than social sciences.

Lukehart (1996) compared undergraduates from Tokyo International and Willamette Universities using the Engel Selection Skills Evaluation to index verbal-spatial preferences for learning. Results indicated that Japanese students had the strongest preference for verbal cues followed by the American and South Korean students respectively. No gender differences were found. Riley (1992) gathered literature on the values, cognition and academic performance of African students studying at universities in the United States. The data indicates that Africans differ from Americans in their

organization and development of thought. While Americans think linearly, systematically, sequentially, logically, and tend to use specific and explicit language, the typical English educated African thinks globally, non-specifically with less emphasis on detail and on logical consistency.

Some cross-cultural studies on cognitive style included Arab and Middle Eastern samples. Ritter (1996) compared the performance of college students from the United States, the People's Republic of China, and Saudi Arabia, on cognitive styles affecting communication as measured by the Preferred Cognitive Style Inventory. Students from the United States were found to exhibit a significantly more objective pattern of reasoning than did the Chinese or Saudi students. Zebian (1996) compared immigrant Middle Eastern groups in Canada and Euro-Canadian groups with varying levels of Western education. A test for visual differentiation, the Figures Test, was used to assess the differentiating cognitive style, and an object sorting task was used to assess integrative cognitive style. Results showed significant effects of both culture and of education within culture. Middle Eastern groups showed higher levels of integrative thinking but lower levels of differentiative thinking compared to Euro-Canadian groups. Considering the education within culture effect, results indicated equal levels of integrative thinking among equally educated Middle Eastern groups.

Based on such studies and observations, Anderson (1988) concurs with the idea of two epistemic orientations characterizing Western and non-Western cultures. The West

appears to be field-independent, analytic and non-affective while the non-West is more field dependent, relational-holistic, and affective. But this dichotomy holds only in a highly generalized sense. When more cognitive and psycho-epistemic styles are considered, major differences tend to emerge within the Western cultural style and within that of the non-Western. For example, when the dimension of abstraction is considered, important epistemic differences can be noted between the Anglo-Saxon and Germanic traditions regarding theoretical and ideological thinking; between the Arab and the East Indian regarding ideological thinking; between the Arab and Native-American regarding holistic thinking; and between the Arab and African regarding rational consistency. This issue will be further discussed in this chapter.

Fox (1996) analyzed communication material from a generalized perspective similar to that of Anderson (1988) and outlined three fundamental ways where the East and West differ in relation to written and oral communication and the thinking that lies behind them. The East exhibits a preference for: a) indirect forms of discourse; b) promoting the goals of the group versus those of the individual; and c) valuing ancient knowledge and wisdom versus valuing novelty and the peculiar kind of creativity that comes from the idea of an independent mind. These non-Western traditions are based on deeper assumptions of how society should work and which seem at odds with those of many American educators. To transcend this boundary between the two thinking styles, Fox recommends that American university instructors need to appreciate or be convinced, for instance, that maintaining group solidarity or harmony is more important than "being

yourself," that tradition is more meaningful than history, and that students' role is to thoroughly internalize what others have done rather than to critically question their assumptions.

The Epistemic Orientation Model assumes that epistemic style can be 'acquired' via multiple sources and channels and that it operates by principles that are often abstract. Principle components of what is known go "beyond the information given." This tradition of inquiry asserts the fundamentally abstract characteristics of knowledge by demonstrating that what is known cannot be directly traced to what is perceived. According to Glick (1985) "most of the phenomena investigated by Piaget - the object concept, conservation, logical operations and the like - share the common features that they are phenomena of mind that do not seem to depend at all on the 'surface features' of our perceptual experience" (p. 101). Piaget, however, did not consider the abstract non-perceptual features of our knowledge system as innate. His developmental theory of the origins of mind tries to demonstrate that the presumably innate features show a developmental regularity and to posit mechanisms of acquisition that could account how non-perceptually based knowledge could function.

With Piagetian position in mind, it can be hypothesized that epistemic styles as phenomena of 'mind' can be acquired also from cultural sources such as shared assumptions and patterns of thinking, and from language.

The Epistemic Orientation of the Arab Culture

A substantial number of social-psychological studies attempt to explain the 'Arab basic personality,' the 'Arab national character,' or 'Arab mind.' The alleged purpose of these studies is to understand the 'psychology of the Arabs' and to explain their social and political behaviour. Most of these studies resort to the use of projective analysis of the Arab personality on the basis of supposedly dominant child-rearing practices and major value orientations. There is some empirical research involving the investigation of mainly psychodynamic variables. The personality characteristics which emerge include ambivalence to authority figures, authoritarianism, free-floating hostility, rigidity, lack of reality testing, suspiciousness, fatalism, dichotomous thinking and rhetoricism.

Two major critical surveys of the literature were carried by Moughrabi (1978) and Barakat (1993) who both challenge the suitability of such approaches to the study of collective behaviour. Methodologically, the problem is one of generalization based on anecdotal reports and research studies of either highly educated subjects or village populations which ignore the richness and regional diversity of Arab society. These studies also fail to take into account the transitional nature of Arab society and tend to assume ahistorical and reductionistic approaches. Barakat (1993) noted that some Arab scholars saw the 'psychological warfare' inherent in Western scholarship and tended to undertake a more positive critique of the 'Arab Personality' as in the case of Yassin (1981) who preferred Erich Fromm's (1955) dialectical conception of personality in

constant interaction with economic and social situations of a specific social and historical context.

Two well-known works that address "The Arab Mind" and seek to investigate its epistemic orientation are those of Patai (1976) and Al-Jabiri (1984, 1987). These two works will be presented briefly below.

Patai's View of the Arab Mind

One of the most known works describing the Arab national character is the *Arab Mind* by Patai (1976). The general epistemic approach of this book is in line with that of Vygotsky and of cognitive anthropology. Patai asserts that any statement about the mind of a population is, of necessity, an abstraction since concretely, there are only individual minds (or psyches, or characters, or personalities). The abstractions that Patai proposes for the general collectivity are reached by means of generalization from an assumed or proven modal status of traits. The term "modal" is borrowed from statistics in which it refers to the value or number that occurs most frequently in a given series. Thus, according to Patai, the national character consists of the sum total of the modal personality traits found in the national population. National character can then be equated with the modal personality.

Patai defines national character or modal personality as "the sum total of the motives, traits, beliefs, and values shared by the plurality in national population" (p. 18).

He assumes that Arabs are fairly homogeneous at the cultural level despite their apparent social and ethnic diversity. He proceeds to identify modal traits in Arab society and to explain them by means of social and historical factors:

- a) The Arab proclivity for making emphatic verbal statements of intention and failing to follow them up with actions that could lead to their realization.**
- b) Stylistic tendency for verbal exaggeration and over assertion.**
- c) Representing the positive in an elative form (the best).**
- d) A categorical (non-continuous) distinction between present, past, and future.**
- e) Major values are rooted in Bedouin ethos and tend to fall under: courage-bravery syndrome, hospitality-generosity syndrome, honour-dignity syndrome; also, the importance of preserving self-respect largely through saving face.**
- f) Tendency for polarities and categorical thinking:**
 - private/public**
 - divine/mundane**

controlled/uncontrolled talk

licit/illicit sex

thought/action

male/female

The traits described by Patai as characterizing the Arab modal personality involve cognitive dynamics that point out to certain epistemic orientations that carry more positive and creative value than what Patai was willing to concede. For example, polarities and ambivalent cleavages can be viewed as modes of categorical thinking rooted in a global or rational mode of perception and reasoning. The stress on values of honour and dignity also implies reliance on abstractions in the construing and evaluation of conduct. This reliance on abstractions presupposes a reliance on a rational epistemic mode.

Patai's study was criticized by Moughrabi (1978) and Barakat (1993) for suffering from the above mentioned methodological failures including the assumption of homogeneity of Arab societies, the ignoring of their transitional nature and the failure to support his observations by means of systematic empirical research. Also the study suffers from an implicit anti-Arab bias that can be inferred from his solely problematic depiction of the identified Arab cultural styles and the reluctance to examine other functional or redeeming benefits of these styles.

Al-Jabiri: Critique of the Arab Mind

A recent well known work in the Arab world is a three-volume "critique of the Arab Mind" by Mohammed Abed al-Jabiri. The first volume (1984; 360 p) is entitled "The Formation of the Arab Mind"; the second volume "The Structure of the Arab Mind" (1987; 580 p), and the third volume is entitled "The Arab Political Mind" (1990; 380 p). The three volumes concentrate on the written intellectual heritage produced in the Arabic language between the seventh and the seventeenth century. The present review will only be dealing with the first two books as they focus on the Arab intellectual input. Al-Jabiri states in volume 1, that his goal is to uncover the "epistemological order" underlying this extensive, intellectual heritage. He distinguishes between 'mind' as content of thought and the 'mind' as an instrument of thought although both are part of an interactive process. His concern is with the Arab mind as an epistemic instrument, that itself is influenced by the Arabic language, and by Arab intellectual heritage, and is capable of influencing and directing thinking. Thus, thinking in terms of or from within a certain cultural repertoire implies a form of cognitive 'encapsulation' (Royce's term) that influences an individual's outlook to society, to the future and to the world. Al-Jabiri also states that epistemic inquiry has long been part of the Arab intellectual heritage:

The three civilizations: the Greek, the Arab and the modern European, are the only civilizations that produced, not only science but also theories of science. As far as we know, these civilizations are the only ones that practised not only thinking by means of the mind, but also thinking about the mind. (1984, p. 18)

Al-Jabiri sets to deduce the epistemic structure of the Arab mind by a thorough analysis of the Arab intellectual heritage. He examines the philosophies of classical Arab thinkers and schools of theological thought in a thorough and content focused manner. He depicts the intellectual approaches that characterize each school but does not seek to qualify them in reference to the cognitive and epistemic styles identified in the cognitive literature. Al-Jabiri makes no reference to the fifty-year old research in cognitive and epistemic styles and appears to be unaware of this body of research in the psychological literature. A separate effort may be needed to analyze and categorize the epistemic features he identified in terms of the previously described literature in this chapter. It is hoped that this study may contribute to such needed categorization.

As a result of his analysis of the Arab written heritage, Al-Jabiri (1987) was able to distinguish three major fields of intellectual activity each with its typical epistemic approaches. *Al-Beyan* (expression) refers to the methods of understanding linguistic structures and the structures of discourse. *Al-Urfan* (comprehension) refers to Knowledge of truth mainly as based on revelation and its promise to reveal hidden reality. The treatment of this topic reveals, according to Al-Jabiri, a marked acceptance of supernatural phenomena such as miracles which, from the style perspective adopted in this study, may indicate a stylistic "tolerance for unrealistic experiences". *Al-Burhan* (proof) refers to the attainment of philosophical knowledge through logical analysis. Al-Jabiri proposes that the intellectual activity of those three fields of inquiry are the expression of

one cognitive structure: the Arab mind. This Arab mind was guided by three epistemic "authorities" in its intellectual input: the structures of linguistic expression, the seeking of fundamental truths, and the tolerance of unrealistic occurrences as a result of divine interference. A reader of Al-Jabiri's analysis of the literature surrounding these epistemic authorities will readily note its extensive reliance on deductive thinking.

The cognitive characteristic that appears to be common to the schools of thought described by Al-Jabiri is that of a concern for comprehensiveness or "globality" and for "rational" integration. Almost every Arab theological, philosophical or political movement sought to address an ultimate, universal and "Weltanschauung" reality either as a starting point or as a final conclusion. There is hardly any movement that adopts a naked problem solving or a segmented pragmatic approach to issues. Political and social positions are often taken on the basis of complex ideological thinking involving philosophical notions and synthesized interpretation of religious maxims or history. This globality is characterized by abstraction, conceptual complexity and by a bid for comprehensiveness that seeks to integrate the past, the present, and the future with dogma.

The global approach can be defined as attending to or focussing on a larger aspect of a circumscribed whole of a certain phenomenon or issue. This approach is the opposite of the atomistic one which focuses on specific segments belonging to a circumscribed whole. It should be noted that a global approach need not imply that the topic in question

has necessarily been depicted as an objectively integrated or unified entity. Rather, a larger "chunk" of reality is being identified and addressed. The global approach, by virtue of its need to maintain a level of cognitive unity, tends to rely on generalizations and *abstractions*. The resort to concepts from Greek philosophy and metaphysics and to abstracted precedents from the Prophet's conduct or from early Islamic leaders can be seen as manifestations of the tendency to abstract and generalize. This tendency for dealing with abstract issues (the tendency to transform problems into issues and issues into ideology) need not imply that the concepts and notions employed are necessarily valid or sound in a scientific sense. Also it should be further noted that 'globalistic' thinking need not necessarily imply 'integrative' or 'synthetic' processing. Miller (1987) recommends that a clear distinction be made between holistic/global and synthetic/integrative processing. His reason for stressing this distinction is that certain kinds of holistic thinking are impressionistic, fanciful and unconcerned about empirical reality, whereas integrative thinking implies the tendency to pull together details in the construction of a broader and, at the same time, realistic picture of reality.

Miller, in another work (1991), further elaborates on the above distinctions; his analysis appears to be relevant to the present context. He argues that the analytic-holistic distinction is a generic principle that can be used to organize many of the "traditional" cognitive styles. He defines *analytic* processing as the breakdown of a configuration into its constituent parts, with each part studied as a discrete entity in isolation of other or all parts (whole). Accordingly, the terms *analytic*, *articulated*, and *differentiated* can be seen

as synonymous. Although the contrasting terms *holistic*, *global*, *synthetic*, and *integrated* are used loosely and interchangeably, Miller thinks that *holistic/global* needs to be distinguished from the *synthetic/integrated* thought. He holds holistic and global to be synonymous and referring to immediate and undifferentiated apprehension, while synthetic and integrated are held to refer to differentiated, complex and creative thinking that involves both analytic breaking into segments and their subsequent combination into meaningful wholes. Miller further concludes that analytic and holistic thinking are the more basic processes, while synthetic/integrated thinking involves the capacity for a higher-order integration.

Miller makes important distinctions among epistemic processes, however, his definitions may not be the final word. The literature being reviewed on the epistemic orientation of the Arab culture suggests the need to distinguish between *holistic* and *global* cognition which Miller lumped together as synonymous. Holistic cognition can be understood to refer to direct apprehension (predominantly through intuition) of a certain unified setting or experience, whereas globality can refer to a more conceptual (less intuitive) and more abstract sketch of a generally perceived reality or issue. Thus holism can be seen as typical characteristic of Native American epistemic orientation and globalism as more typical epistemic characteristic of Arabs.

Due to its abstract orientation, the global approach initiates cognitive attempts at *integration* since globality brings into the cognitive picture many diverse domains and

ideas that need to be reconciled and integrated. Attempts at abstraction and integration increase as more intellectual efforts are invested in the construing of a global issue.

Abstraction is seen as a form of integration at the level of concepts while integration refers to the combination of concepts and ideas. The extensive and continuous efforts by Arab thinkers to reconcile religion and philosophy (e.g., Averroës' work in the 10th century) testify to the preoccupation with integration. It is interesting to note that the word mind *Akel* in Arabic is derived from *Akala* which originally referred to tying together the legs of an animal. Thus the mind is what ties together or integrates.

The global and abstracted approach that seeks to develop an integrated perspective to a complex issue tends to rely more on *deduction* than on induction. Linking parts of a perceived whole relies more on inferential reasoning or deduction. The whole thrust of the Islamic Jurisprudence (Fikh) is towards interpreting of the holy dictums in new situations relied heavily on deductive reasoning. A unique form of deductive thinking can be seen in the Arab historical deduction. Parts of early Islamic history were held as important precedents that subsequent political and theological disputes were based on specific interpretations of this history. For example, the Shiat-Sunni theological and ideological dispute is predicated on assertions and conclusions drawn from early Islamic history. These controversies kept that history living.

Al-Jabiri briefly discusses (1984, p. 31) the strong tendency in the Arab mind for normative evaluation. He sees this preoccupation with the consequence of action as

reductionistic and inferior to the objective and detached perspective. He, however, fails to analyze other cognitive implications of this normative perspective such as the maintenance of a state of subjectivity that resists the escape into value neutrality when dealing with social issues.

To summarize, Al-Jabiri describes his analysis of the Arab intellectual heritage as an attempt to uncover the epistemic characteristics of the Arab mind. These epistemic characteristics are largely presented as the intellectual characteristic of each school of thought. There is hardly any separate attempt at a categorical identification of these qualities in the light of the literature in cognition and epistemic styles. The cognitive qualities of globality, abstraction, integration and deduction can be inferred from his presentation of the Arab schools of thought.

Language and Culture: The Arabic Language

Languages, as the medium of transmission of thought in a culture, tend to impose its own epistemic structures. The Whorfian hypothesis (Whorf, 1956) states that the structure of language can condition our thought processes, thereby determining how we see the world around us. Whorf tried to show that various segments of a language impose 'cognitive modes' on the way people categorize their world perceptually or conceptually.

Starting from the Whorfian hypothesis which holds that our perception of the world is determined in a large measure by our mother tongue, Kuroda, Hayashi, and Suzuki (1986) investigated whether people from different cultures think differently when

they react to survey questions in different languages. An attitude questionnaire was administered in two languages to samples of American and Japanese students in Japan and Hawaii. Language appeared to affect most responses to questions involving the mid-response category - "it depends on." The Japanese, when asked to answer questions in English, became more decisive and more likely to choose polarized answers of "yes" or "no" rather than the middle response category. However, those same students, including American students, were indecisive and likely to choose the middle response category when answering in Japanese.

This finding about the Japanese language is consistent with observations made by Kunihiro (1976) regarding its cognitive patterns which can significantly influence intercultural communication. For the Japanese, nonverbal communication is an important element of meaning, with verbal expression often fragmentary and unsystematic. Also, the "homogeneity" of Japan, the pressure for consensus within the group, and the value of non-confrontational style especially influence the patterns of language usage. These factors promote a style which is at odds with western language styles that are based on Aristotelian and Hegelian logic and are rich in dialogue, dichotomy and argumentation. Thus, according to Kunihiro, the unsystematic verbal expression, the ethics of non-confrontation, the tendency to collapse categories among the Japanese, are elements that can contribute to misunderstandings between Japan and other cultures.

Additional data from Arab and American students were added to that (discussed above) of Kuroda, Hayashi and Suzuki (1986) by Kuroda and Suzuki (1989). Analysis revealed that all three nationals responded differently to the same questions when posed in a foreign language as opposed to their mother tongue. In other words, they seem to perceive the questions differently when posed in a foreign language. The difference in percentage of those choosing a middle response category when answering in a mother tongue and a foreign language was largest among the Japanese, followed by the Americans and was least among the Arabs. In all cases, however, the preference for the middle response category appears to be decided more by the language one is using than the nationality of the respondents. Thus the Japanese language encouraged the respondents to choose the middle response category, while Arabic discouraged, with English in the middle. The authors further comment that "although language was the most decisive factor affecting the middle position response, nationality [particularly for the Arabs] accounted for some differences as well" (p. 158).

It should be noted that the above tendency to be categorical is consistent with other trends in Arab thinking such as those identified by Patai and Al-Jabiri and suggesting that this trait goes beyond the structures of language and is characteristic of a more pervasive cognitive style. Kuroda & Suzuki (1989) finally endorse such a position by agreeing with what Galtung and Nishimura (1983) call the "cosmology" of language, culture and structure. They maintain that although languages do not determine thought, they can "condition thought in the language community" (Galtung & Nishimura, 1983).

Thus each culture's categorical perception is possibly different as in the case of colour; and language seems to play a significant role in that difference. The position of Galtung and Nishimura (1983) on the role of language in cognitive style is consistent with that of the theory of cognitive pluralism. There are two notions basic to the theory of cognitive pluralism (John-Steiner, 1995): 1) there are multiple semiotic means; language is the primary, but not the only one, and 2) semiotic means (i.e., patterned human communication behaviour) are based on cultural practices.

In a database search for other studies dealing with the linguistic shaping of thought and using Arab subjects, the following study was found. Lardiere (1992) examined the work of A.H. Bloom (1981) in which he claimed distinct differences between English and Chinese speakers on counterfactual reasoning (the if – then reasoning) are attributable to discrete grammatical differences between the languages. Data from 21 native Arabic speakers show that for one of Bloom's counterfactual tasks, subjects patterned completely opposite to his English speakers and more like the Chinese. Arabic is a language that contains an explicit counterfactual marker. The author concluded that an inclination to entertain counterfactual premises appears to be derived from culture-specific values institutionalized in a community's educational conventions.

The influence of the Arabic language on the directionality of arranging objects, graphic perception and reproductions (e.g., Kugelmass, Lieblich, 1979; Nachshon, 1981; Tversky, Kugelmass & Winter 1991) indicate that right-to-left direction (the way Arabic is

written) was dominant among the Arab speaking groups while the opposite was indicated for those with English as the mother tongue.

The Epistemic Orientation of North American Culture

Long-standing and dominant schools of thought within a cultural setting can be indicative of the dominant epistemic styles in that culture. Dominant philosophical and intellectual trends are expressions of the collective social and political reality and at the same time constitute impacting and conditioning forces that seek pervasiveness and continuity within the particular culture. It is rather a common knowledge in scholarly circles that British schools of thought, namely empiricism and utilitarianism, had a crucial impact on the intellectual and educational development in North America. The eighteenth century British empiricism presented in the works of Locke, Berkeley and Hume together with the nineteenth century utilitarianism of Jeremy Bentham and John Stuart Mill constitute corner stone perspectives in American thinking and are the philosophic prerequisites for American Pragmatism. At the same period a different epistemic and intellectual tradition developed in Europe which came to be referred to in the history of philosophy (Solomon & Higgins, 1996) as "Continental Rationalism" as distinguished from "British Empiricism". The early representatives of this tradition were philosophers such as Descartes, Spinoza and Leibnitz, and the early nineteenth century philosophical outputs of Kant and Hegel. This rationalist approach to philosophical questions was characterized by the quest for a priori and fundamental categories of knowledge and by deductive thinking.

Pragmatism is the kind of thinking that is embodied in the formal philosophy of Charles Peirce and William James during the later part of the nineteenth century and early twentieth, and John Dewey during the first third of the century. Pragmatism is a form of subjective idealism which asserts that only our mind really exists, that the natural and social world exist only in our sensations, ideas, will and emotions. Pragmatism asserts that the successful fulfilment of given aims, purposes, intentions is the only test of values and principles and constitutes the only meaning of their "truth." Accordingly, there is a consequent denial of any objective knowledge of truth and of a priori methods or abstract categories for the prediction or control of phenomena. With the denial of objective measure of truth, the sole criterion becomes success. Pragmatic thinking is a method of getting results regardless of means employed; if the results are advantageous, it is "true" and "good," if not, it is "false" and "bad" (Wells, 1971). Pragmatism according to intellectual historians (e.g., White, 1973) is not merely an academic philosophy; it represents the ideological and epistemological outlook of the dominant social classes in America during most of this century. Thus the radical empiricism and social atomism (individualism) of pragmatism can also be viewed as dominant characteristics of all North American culture. This inductive and concrete empiricism or the devotion to "practicality" has lead to the development of an "American anti-intellectualism" which Hofstadter (1966) interprets:

as a suspicion of intellect itself, it is part of the extensive American devotion to practicality and direct experience which ramifies through almost every area of American Life. With some variations of details suitable to social classes and historical circumstances, the excessive practical bias so often attributed only to business is found almost

everywhere in America ... Practical vigour is a virtue; what has been spiritually crippling in our history is the tendency to make a mystique of practicality (p. 236).

An attempt to identify dominant epistemic orientations of certain cultures as based on their intellectual approaches was presented by Galtung (1981). Staying at the level of macro-cultures, but below the level of civilization, he characterizes the approaches of three occidental cultures: the Saxon, Teutonic and Gallic, and one oriental: the Nipponic (Japanese) macro-cultures or sub-civilizations. Galtung relies on three basic methodological approaches to qualify the typical style of each of the four macro-cultures: a) paradigm analysis, b) description and proposition production, and c) theory formation. The Teutonic (Germanic) ranks the highest in paradigm analysis and theorizing, and in the reliance on deduction. These qualities, to a lesser extent, also characterize the Gallic but are mostly absent from the Saxon (particularly US) and from Nipponic intellectual activity. The Japanese intellectual style is seen at the periphery of the Saxon; both are high on descriptive detail and proposition production, however, the Japanese is less linear and less sequential than the Saxon.

Thus, in the occidental civilization, the most radical epistemic opposition lies between the Germanic and the Anglo-Saxon styles; the former is abstract, theoretical and deductive while the latter is concrete, proposition oriented, and inductive. More dramatically, this epistemic cleavage can be presented as Kant versus Bentham, or by quoting Galtung:

One could even surmise that an average Saxon researcher would fall prey to vertigo if a theoretical pyramid rose five centimetres above the ground...The highest he would venture would be to Merton's proverbial

"theories of the middle-range": a set of small pyramids gathered in the landscape with no super-pyramid overarching them except the basic tenets of Saxon intellectual culture in its idiographic (UK) and nomothetic (US) varieties (p. 828).

The epistemic styles characterizing the North American culture can also be identified in the numerous comparative cross-cultural studies such as those cited in this chapter. The field independent style appears to be the most notable characteristic and to have been the focus of the largest number of studies. Ethnic and cultural groups such as Mexicans tended to become more field independent the longer they lived in North America and with subsequent generations. Although African-Americans consistently indicated lower scores on field independence compared to Anglo-Americans, they were found to be more field independent than Black South Africans. Field independent individuals evidence cognitive and social characteristics that differentiate them from field dependents. These differences include (Saracho & Spodek, 1981): perception of objects as separate from the field; the ability to isolate an item from its field and to attend to it in another context; an independence from authority and tradition; a level of social detachment but with analytic skills; and an orientation towards individual rather than group striving.

Cross-cultural comparative studies also indicated other epistemic characteristics of North American culture. American samples were more sharpeners, preferred visual to verbal cues, were more objective, were less integrative (e.g., in comparison with Middle Eastern groups), and more pragmatic than other cultural samples. These empirical results

are consistent with scholarly observations and inferences that depicted the North American epistemic orientation as empiricistic and analytic.

Conclusion

This chapter described basic literature that distinguishes among cognitive styles, learning styles, thinking styles and psycho-epistemic styles. The psycho-epistemic styles have been shown to be inclusive of cognitive styles; as fundamental to both learning and thinking styles; as more general and more pervasive within personality and within cultural intellectual input than other styles; more parsimonious; and amenable to empirical investigation. Review of cross-cultural research on cognition indicated differences on various dimensions of cognitive style such as field dependency/independency, articulation, category width, and sharpening. General cognitive orientations such as the stress on auditory versus visual sensations, global affectivity as distinguished from discrete objectivity in interpersonal communication were also reported. More general thinking styles were found among various professional and cultural groups. Language was found to exercise a significant impact on various epistemic functions.

Descriptions of the Arab cultural personality and Al-Jabiri's analysis of the Arab intellectual heritage point out to particular epistemic orientations. These epistemic characteristics of globality, abstraction, deduction, dichotomization and categorization are consistent with the Rational epistemic style. These epistemic characteristics of the Arab culture tend to contrast the empiricistic orientation of the North-American; it also appears

to have crucial differences with other cultural orientations despite several common features. The Arab style appears to differ markedly from the Oriental non-linear thinking and expression; from the holistic thinking of Native American cultures; and from the African tolerance for logical inconsistency (as note by Riley, 1992). In its consistent bids for comprehensive and abstract formulations of issues, the Arab 'mind' appears to resemble that of the Germanic (as identified by Gultung, 1981) more than other minds, and despite the less stringent emphasis of the Arab mind on detail and on objective analysis. It is the view of this author that attention to detail and analytic integration can easily be acquired through exposure to scientific methodology but this may not be true for endorsing abstract and comprehensive thinking.

The evidence pointing to the empiricistic, analytic and pragmatic orientation of North American culture tends to suggest a radical epistemic cleavage between Arab and North American cultures. Such evidence encouraged the present attempt at an empirical investigation of this apparent cultural difference by specifically targeting differences on epistemic styles. The availability of two short and psychometrically adequate measures of epistemic styles makes this study feasible.

Chapter III

METHODOLOGY

This chapter presents a description of the research instruments with their related psychometric information, limitations of instruments, procedures followed in gathering the data, sample description, statistical methods used in data analysis, and the major hypotheses.

Instrumentation

Knowledge Accessing Modes Inventory

The Knowledge Accessing Modes Inventory (KAMI) was developed by Rancourt (1988) for the purpose of identifying major ways of knowledge accessing or knowing. The knowledge accessing modes are rooted in psycho-epistemological literature (e.g., Royce, 1973 & 1983) and represent sets of internal rules that are employed in the process of selectively attending to stimuli. The three modes, which are described in more detail in Chapter Two, are: 1. Empirical, which uses sense perceptions as the major criterion for the selective attending to environmental stimuli and the subsequent acquisition of knowledge; 2. Rational, which utilizes a conceptual, ideational, logical-illogical process as the major criterion for the selective attending to environmental stimuli and the subsequent acquisition of knowledge; 3. Noetic, which employs the self-referent quality of personal experience and intuition as the major criterion for the selective attending to environmental stimuli and

the subsequent acquisition of knowledge. Thus, according to Rancourt, knowledge is acquired and validated mostly by induction, deduction or insight.

KAMI assesses the relative strength of the three modes by means of an inventory whereby a subject is presented with a set of twenty sentence beginnings, each with three possible endings. The task for the subject is to rank the three endings for each of the sentences from most applicable to least applicable. Rank 1 is assigned to the ending that is most applicable; rank 2 is assigned to the ending that is second in its applicability to the subject; and rank 3 is assigned to the least applicable ending. Each ending corresponds to a different knowledge accessing mode, thus, the order of ranking gives an indication of the knowledge accessing mode preferred by the subject for each sentence. The score for each mode is determined by the cumulative number of ranks pertaining to the mode after converting them to a standard score that reverses the original order. Thus the KAMI yields a score on each of the three modes of knowledge accessing. The highest value indicates the dominant mode, provided that the score obtained in this mode is at least four points greater than the scores obtained in each of the other two modes. If the scores are closer, then a state of joint dominance is inferred. The second highest score is referred to as the secondary mode, and the lowest score is labelled the minor mode. The ranked order score of the three Modes for each individual is referred to as his or her epistemic Style.

Reliability

Edumetric data on KAMI has shown test-retest reliability of .87, .71 and .81 for the noetic, empirical and rational scales respectively after a 48 month interval indicating that the modes can be considered as stable within the personality system (Forgues, 1987). Internal consistency (split-half) between two constructed halves was found to be .78 for the empirical scale, and .79 for the rational scale (Leino, 1987). Concordance with Royce's *Psycho-Epistemological Profile* (measuring the empirical, rational and metaphoric styles) has resulted in correlations significant at $P < .001$ for each of the three corresponding scales, and with the *Barrett-Lennard Relationship Inventory* was established at .87 for the noetic scale and the following subscales: Regard, Empathy and Congruence (Rancourt, 1983).

Validity

Construct validity obtained from some 55,000 subjects whose specializations were identified further support the theoretical assumptions of the Epistemic Orientation Model. For example, in the field of Education, all three modes are well distributed among school teachers in Canada; approximately forty-five percent indicate a preference for the empirical mode, thirty percent for the noetic mode, and twenty-five percent for the rational mode (Rancourt and Noble, 1991). At the secondary level, 464 epistemic profiles of teachers match the epistemic structure subsumed in the content of their field of specialization. That is, mathematics teachers prefer the use of the rational mode, biology teachers prefer the use of the empirical mode, and language teachers prefer the noetic mode. The dominant mode

of knowing in each field of specialization is also evident in research dealing with cognition and learning styles (e.g., Royce and Powell, 1983).

Concurrent validity received support from the concurrence of similar scales on the *Psycho-Epistemological Profile* (Royce, 1975; Royce & Moss, 1980) with other established measures. For example, with respect to the *Myers-Briggs Type Indicator*, the rational scale correlated positively with thinking and judgment. The Metaphorical scale correlated positively with sensing and thinking (Royce & Moss, 1980). Positive correlations were also obtained with Kolb's *Learning Style Inventory*, but instability in the LSI scores prevented accurate assessment of congruence over time (Niday, 1987). Correlations were found between the three modes of mental representation of Aylwin's (1985) *Modes of Thought Questionnaire* (MOTQ) and the three scales of the KAMI. Positive correlations were found between the MOTQ visual mode and KAMI's noetic scale (Gurney, 1992). Visualization on the *Griffiths Test of Imagery Dominance* and the noetic scale also showed positive correlations (Gurney, 1992) confirming the association between intuitive processing and visualization. Relationships were found between the three scales of KAMI and *Gregorc's Style Delineator* instrument. KAMI's noetic scale was positively correlated with Gregorc's Concrete Random and Abstract Random styles; KAMI's Rational mode with Gregorc's Abstract Sequential style; the Empirical with Gregorc's Concrete Sequential (Leino, 1987).

The KAMI has indicated gender differences in epistemic orientation. Women outnumber men 5 to 1 in terms of their preference for the noetic mode of accessing

knowledge. Men have been found to prefer the Empirical and the Rational more than women although there are no significant differences between men and women when subject matter specialization is considered (Belenky, 1989; Gurney, 1992).

In the field of education all three modes are well distributed among teachers and students. In a sampling of 640 elementary school teachers, scores indicated 45% have a preference for the Empirical Mode, 35% for the Noetic Mode and 20% for the Rational Mode (Rancourt, 1986).

The Gregorc Style Delineator

This inventory was included because, like the KAMI, it is cognitive-centred rather than personality-centred, and measures roughly the same epistemic modes. The inclusion of an ordering dimension to the two main modes: the rational and the concrete, gives the Gregorc Style Delineator (GSD) a somewhat different approach to measure epistemic style. Gregorc's use of word rather than statement ranking in GSD is likely to result in increased confidence in the findings if related scales of both measures produce similar results. A positive correlation between the similar scales of both measures would support previous findings (Leino, 1987) regarding the concurrent validity of the GSD and KAMI.

The Gergorc Style Delineator is designed to reveal two types of mediation abilities or "styles" : perception and ordering. *Perceptual abilities* are the means through which we grasp information. These involve two qualitative processes: **Abstractness** which seeks to

grasp, conceive and mentally represent data through the concepts and subjective thought; and **Concreteness** which seeks to grasp and mentally represent data through the direct use of the physical senses.

Ordering abilities are the ways in which we arrange, systematize, reference, and dispose of information. These represent two qualities: **Sequence** which disposes the mind to grasp and organize information in a linear, step-by-step, methodical, predetermined order, and **Randomness** which disposes the mind to grasp and organize information in a non-linear, galloping, leaping, and multifarious manner.

With the coupling of these qualities, four distinct transactional ability channels emerge. Each of these combinations reveals a particular qualitative orientation to life and affect, not only how we view the world and ourselves, but also how we are perceived by the world. Although each person is seen as equipped with all four qualities, most individuals are predisposed strongly toward one or two channels. The four ability channels are designated as:

Concrete Sequential (CS): The individual is concerned with the practical, is careful with detail, systematic, conservative realist, deliberate and product oriented.

Abstract Sequential (AS): The individual is concerned with ideas, proof, analysis, and is oriented to systematic research and quality of thinking.

Abstract Random (AR): The individual is concerned with ideas but not careful with detail; relies on creative insight in the search of proof rather than on analytical or technical rationality; is person-oriented, emotional and critical.

Concrete Random (CR): The individual is concerned with multi-solution and is not product-oriented or person-oriented; is intuitive, instinctive, impulsive and independent.

Unlike the KAMI, the Gregorc Style Delineator ranks words rather than descriptive phrases. Subjects are asked to rank four words according to their relative importance to them with 4 as the highest rank. The GSD consists of 10 columns each containing 4 words that need to be ranked and comprising a total of forty words. Scores on each dimension are determined by the sum of their related ranks. The proposed scoring range is as follows: High = 27-40 points; Intermediate = 16-26 points; Low = 10-15 points.

Gregorc (1982) bases his preference for a word matrix on research in psychological association tests which reveal that single words can often generate whole complexes that have an attraction and repulsion impact upon an individual within a general domain. Descriptive statements can sometimes be too content specific to attract a person to the intended domain. Despite differences at the initial conceptualization, the style constructs of the KAMI and GSD appear to describe the same cognitive phenomena and have been found to be positively correlated. The Style Delineator's Concrete Random and Abstract

Random were positively correlated with KAMI's Noetic, the Abstract Sequential with KAMI's Rational mode, and the Concrete Sequential with KAMI's Empirical mode (Leino, 1987). The Gregorc Style Delineator will be used as a corroborative test to KAMI.

Reliability

The reliability of the Gregorc Style Delineator (Gregorc, 1982) was assessed in terms of internal consistency using standardized alphas, and in terms of stability using a test-retest correlation coefficients. One hundred ten (110) adults took the Style Delineator on two occasions ranging from six hours to eight weeks apart. Standardized alphas were 0.92 and 0.92 for the Concrete Sequential scale; 0.89 and 0.92 for the Abstract Sequential scale; 0.93 and 0.92 for the Abstract Random scale; and 0.91 and 0.91 for the Concrete Random scale. Correlation coefficients between the first test and its retest were 0.85 for the Concrete Sequential scale; 0.88 for the Abstract Random scale; and 0.87 for the Concrete Random scale.

Validity

The validity of the Gregorc Style Delineator (Gregorc, 1982) was assessed in terms of construct validity by interview, and in terms of predictive validity by examining the correlation between GSD scores and attribute scores, and responses to the descriptions resulting from the GSD (Gregorc, 1982). Interviews with over one hundred (100) individuals who took the GSD indicated that virtually all found their style delineations to be accurate descriptions of them. One hundred ten (110) adults took the GSD on two

occasions and rated attributes which make up descriptions. Correlations between GSD scores and ratings of attributes were 0.68 and 0.70 for the Concrete Sequential scale; 0.68 and 0.76 for the Abstract Sequential scale; 0.61 and 0.60 for the Abstract Random scale; and 0.55 and 0.68 for the Concrete Random scale (Gregorc, 1982).

One hundred twenty-three (123) subjects who took the GSD rated the resulting descriptions of themselves on 1 to 5 scale labelled Strongly Agree, Agree, Unsure, Disagree, and Strongly Disagree. Of the sample, 29% strongly agreed with the description, 57% agreed, 14% were unsure, and none disagreed either partially or strongly (Gregorc, 1982).

A database search on Gregorc Style Delineator revealed 10 publications in the (PsycINFO) and 21 in the educational database (ERIC). Most of the literature dealt with studies applying the GSD with the exception of 4 that addressed its psychometric properties. O'Brien (1990) assessed the construct validity (dimensional) of the GSD through confirmatory analysis using LISREL 7. The four scales met minimal requirements for factor definition. Drummond (1992) investigated the construct validity of the GSD using the Myers-Briggs Type Indicator. Observed differences in learning styles by personality type tended to support the construct validity of GSD. Van Voorhees (1988) administered the GSD to 2060 physicians and found that 63 percent preferred the Concrete Sequential style. Bokoros (1990) reviewed five diverse measures of personality and cognitive style: Myers-Briggs Type Indicator, Learning Style Inventory, Decision Style

Inventory, Gregorc Style Delineator, and Lifescripts. These measures were administered to 143 students and faculty. Results of factor analysis identified three underlying factors: a thinking/ feeling dimension, an information-processing dimension, and an attentional focus dimension.

Limitations of Instruments

All psychometric measures are to some degree problematic, since it is difficult to completely determine what they actually measure. These instruments represent attempts to classify and describe complex mental processes through limited operations. Also, as is the case with all instruments that rely on the medium of language, the present instruments cannot be considered free from a biasing impact of culture on the interpretation of statements and concepts used. The English versions of the measures were given to both samples since the Arab sample was completely bilingual. The use of only an English version of the measures may have contributed to the above cultural bias, but it can be argued that this choice resulted in the elimination of another bias stemming from the translation of instruments. There is an inevitable compromise in a test's reliability and validity as a result of translation to another language. Also the expected bias stemming from a culturally influenced interpretation of English items by the Arab subjects is expected to be minimal due to their intense exposure to North American culture by virtue of being in American universities and by virtue of the openness of the Lebanese society to American cultural media.

The KAMI and the GSD have been shown to be reliable measures with high concurrent and predictive validity. What would seem to contribute to their construct validity is that the constructs they employ such as abstract, concrete, rational, empirical and intuitive are well established in the literature. The cognitive and personality correlates of these constructs are, to a significant extent, agreed upon.

Sample Description

The subjects who participated in the study were taken from the population of undergraduates enrolled in 1997 at four universities: the American University of Beirut and the Lebanese American University, in Beirut, Lebanon; the University of Ottawa and Carleton University, in Ottawa, Canada. The study was conducted after obtaining the permission of the course professor and in addition, in some cases, that of the departmental chairperson or dean. Subjects were invited to participate on a volunteer basis and in accordance with the guidelines set by a university ethics committee (see Appendix J for authorization). Students were orally told that the purpose of the study was to investigate whether students from different fields of specialization and cultural backgrounds differ in their preference for certain thinking styles. They were also told that the study employed two standardized published measures; that it was approved by the ethics committee; and that their responses would be completely anonymous as no names or any other personal identification would be required. The students were also informed of the voluntary nature of the task and told that if they did not wish to participate or wished to stop their participation, they were free to do so. Furthermore the students were told that their

participation in the study could be a pertinent academic experience for them and that specific questions about the study could be answered after the completion of the task.

Classes in six general fields of study (sciences, social sciences, health sciences, business administration, engineering, and fine arts) were targeted and responses were grouped along these general fields according to subjects' declared major. Thus the Sciences group typically included biology, chemistry, biochemistry, and physics majors; Social Sciences group typically included psychology, sociology, criminology, leisure studies, and education majors; Health Sciences group typically included nursing, physiotherapy and environmental medicine major themselves majoring in this field including management and marketing; Engineering group included civil, electrical, mechanical and computer engineering majors; and Fine Arts group included painting, theatre, and interior decoration majors. The English version of the two measures was administered to both samples since the Arab students were completely bilingual.

The Arab Cultural Sample

A total of 844 subjects participated in the study from the two Universities in Lebanon. The responses of 24 subjects were discarded because they either failed to follow the instructions or did not complete all of two tests and the personal data questionnaire. The remaining 820 responses were subjected to sorting according to the criteria of culture adopted in this study. Thus subjects who indicated any of the following three conditions: not having Arabic as mother tongue, having a language other than Arabic as the language

most frequently used, and having lived outside an Arab country over a period of five years-- were removed from the Arab sample. A total of 107 subjects were removed leaving the remaining 713 subjects to constitute the Arab cultural sample. The sample was further reduced to ensure that the subjects had a clear dominance on the KAMI in accordance with the criteria discussed earlier in this chapter. The final Arab sample was 663 students. A breakdown of this sample in terms of gender, age and major fields of specialization is presented in Tables 1 and 2. The largest discipline of students was Business followed by Social science and Engineering. The smallest group was of Fine Arts. The Arab sample was split approximately 50 % females and 50% males. The average age is 22 years for males and 21 years for females.

The Canadian Cultural Sample

A total of 825 subjects participated in the study from the two Canadian universities. The responses of 19 subjects were discarded because they either failed to follow the instructions or did not complete all of the three tasks. The remaining 806 responses were subjected to sorting according to the criteria of cultural belonging adopted for this study. Subjects who indicated any of the following three conditions: not having English as mother tongue; having a language other than English as the language most frequently used; and having lived outside Canada for a period over five years, were not included in the Canadian sample. A total of 223 subjects were removed, leaving 583 to constitute the Canadian cultural sample. This sample was further reduced to have clearly dominant styles specified in KAMI scoring manual, resulting in a final sample of 540 subjects. A breakdown of this

sample in terms of gender and major fields of specialization is presented in Tables 1 and 2. The largest group among the Canadian subjects was Engineering, followed by Business and Social Science. The smallest group was that of Fine Art students. The average age of Canadian subjects was close to 23 years.

Statistical Methods Used in Data Analysis

Descriptive and Inferential statistics (especially tests of association: Pearson's product moment correlation) were used to test the research hypotheses. The KAMI scales group individuals into three dominant epistemic modes : Rational, Empirical and Noetic. The GSD scales were categorized into High, Moderate and Low according to the criteria defined by Gregorc. The major research hypotheses detailed in the next section postulate that there will be differences in these modes and style orientations in the two populations under study. Correlation measures were also used to further confirm relationships with the Gregorc Style Delineator scales.

Major Hypotheses

It was argued in the previous chapter that there are sufficient grounds to justify making the first hypothesis that the Arab population has proportionally more individuals than the Canadian population who prefer the rational epistemic mode. This hypothesis is based on two bodies of research literature. The first refers to cross-cultural research that

Table 1

Frequency distribution of sample of Canadian and Arab students according to discipline and gender.

Discipline	Canadian sample			Arab sample		
	Male	Female	Total	Male	Female	Total
Fine Arts	13	27	40	7	31	38
Science	55	39	94	38	76	114
Business	45	59	104	82	63	145
Health Sciences	16	76	92	57	58	115
Social Sciences	24	79	103	34	90	124
Engineering	81	26	107	113	14	127
Total	234	306	540	331	332	663

Table 2

Descriptive statistics for the samples of Canadian and Arab students.

	Canadian sample			Arab sample		
	Male	Female	Total	Male	Female	Total
n	234	306	540	331	332	663
Mean	22.82	22.85	22.84	22.00	21.09	21.53
SD	5.90	6.97	6.54	5.20	3.39	4.39

examined cognitive differences between cultural groups and found support for a cognitive impact of culture; the second refers to specific research, both empirical and scholarly, that indicated a rational orientation in the performance of certain Arab groups and in the Arab intellectual heritage. These two bodies of literature were reviewed in chapter Two and summarized in chapter One.

Two empirical studies that particularly impart a direct support for this first hypothesis are one by Kuroda and Suzuki (1989) which found out that the Arabic language encourages categorical responses, and one by Zebian (1996) which revealed higher level of integrative thinking among Canadians born in Middle Eastern countries (mainly Arab) as compared with Euro-Canadian groups. At the scholarly research level, Patai (1976) observed a typical resort to categorical and abstract thinking among Arab groups and Al-Jabiri (1984, 1987) revealed consistent trends toward comprehensiveness, abstract ideological thinking, and deduction in Arab schools of thought within a period of nine centuries. Such evidence indicating a tendency for comprehensiveness, integration, categorical and abstract thinking among Arab cultural groups is consistent with a rational epistemic style and firmly grounds the first hypothesis. Rationalism is operationalized in terms of the Rational Mode of the *Knowledge Accessing Modes Inventory* and in terms of the Abstract Sequential scale of the *Gregorc Style Delineator*. Both the R and the AS scales tend to describe the same construct of rationality and both have been found to correlate (Leino, 1987).

The second hypothesis asserts that the Canadian population has proportionally more individuals than the Arab population who prefer the empirical epistemic mode as measured by the Empirical mode of KAMI and by the Concrete Sequential of GSD. This hypothesis was also supported by two bodies of research. The first body of research involves empirical cross-cultural studies that reveal cognitive and epistemic differences between the Anglo-North American culture and a several other cultural groups. These studies which are reviewed in chapter Two and summarized in chapter One reveal that Anglo-North Americans are typically more field independent, more cognitively differentiated, and more analytic than other cultural groups.

The second body of research includes conclusions of analytic examinations of North American intellectual heritage by academic scholars. Pragmatism which is considered to be the dominant intellectual and epistemological tradition in North America, is rooted in eighteenth century British utilitarianism which are distinguished from the continental rational philosophy. (e.g, White, 1973). Pragmatism is seen as an extensive devotion to practicality and direct experience (Hofstadter, 1966) which implies a concrete empiricistic approach that is highly inductive and analytic. Galtung (1981) analyzing the typical epistemic approaches in the intellectual output of certain cultures, found radical epistemic differences between the Anglo-Saxon and Germanic. The latter is abstract, theoretical and deductive while the former is concrete, proposition oriented, and inductive. Thus it is argued that the above noted research bodies provide a strong base for hypothesizing that empiricism is the most salient epistemic characteristic of the Anglo-North American

Culture. Empiricism is operationalized in terms of the Empirical mode of KAMI and in terms of the Concrete Sequential scale of GSD. Both the E and the CS scales tend to describe the same construct of empiricism and both have been found by Leino (1987) to correlate.

Hypotheses dealing with further comparative analyses of the two samples are based more on inferential criteria. The empirical mode tends to focus on segmented aspects of broader cognitive units. The noetic mode, despite its tendency for holistic unification, circumscribes an aspect of a larger cognitive realm and attends to that aspect in isolation. Thus the empirical and the intuitive modes are expected to correlate and accordingly the Canadian population is also expected to evidence a higher proportion of individuals who prefer the intuitive-noetic mode. The intuitive-noetic mode is operationalized in terms of the Concrete Random and the Abstract Random scales of the GSD. The N, CR and AR scales tend to describe the same intuitive-noetic construct and Leino (1987) found N to correlate with CR and AR.

Since the epistemic influence of a culture impacts both genders within a culture, then both gender groups in each sample are expected to reflect the above hypothesized epistemic differences while remaining consistent with gender differences found in previous research. On the whole males were found to be higher on the Rational and Empirical Modes of KAMI and females were found to be higher on the Noetic Mode (Rancourt, 1987c).

Subjects in each field of study are expected to reflect the epistemic orientation particular of their fields of study. Students majoring in certain fields of specialization have been found to have consistent major epistemic modes and styles. For example, studies using KAMI indicated that individuals in biology had an ERN style (Rancourt & Dionne, 1982); REN for chemistry and mathematics (Rancourt, 1987a); ERN for nurses and REN for physicians (Rancourt & Noble, 1991); REN for physiotherapists and hospital administrators (Rancourt & Bellantine, 1990); NRE for fine arts, REN for engineering, REN for administration, RNE for social sciences, and NRE for literature (Rancourt, 1987a).

The two measures (KAMI and GSD) can be compared on the present data and in the light of previous comparisons. Furthermore, information is available in the Arab sample that distinguishes between students who had English and those who had French as the language of instruction in maths and science. These two groups may yield some indication whether the exposure to two different systems of high school education can have an impact on epistemic orientation. Specifically it is hypothesized that:

Research Hypothesis (HR). *The Arab population has proportionally more individuals who prefer the rational epistemic mode than the Canadian population; when the rational epistemic mode is measured*

(1) by scale R of KAMI,

(2) by scale AS-High of GSD, and

(3) jointly by scale R of KAMI and by scale AS-High of GDS

Research Hypothesis (HE). *The Canadian population has proportionally more individuals who prefer the empirical epistemic mode than the Arab population; when the empirical epistemic mode is measured*

(1) by scale E of KAMI

(2) by scale CS-High of GSD, and

(3) jointly by scale E of KAMI and scale CS-High of GSD

Research Hypothesis (HN). *The Canadian population has proportionally more individuals who prefer the noetic-intuitive epistemic mode than the Arab population; when the noetic-intuitive mode is measured*

(1) by scale N of KAMI,

(2) by scale AR-High of GSD,

(3) by scale CR-High of GSD,

(4) jointly by N of KAMI and AR-High of GSD, and

(5) jointly by N of KAMI and CR-High of GSD

Research Hypothesis (HD). *The dominant epistemic mode in each of the fields of specialization in both populations are the same as those found in previous research.*

Specifically, and in accordance with the previous research on KAMI cited above, it is expected that: sciences will have an Empirical dominant mode (typically in applied sciences) and a Rational dominant mode (typically in theoretical sciences); social sciences: a Rational dominant mode (typically when concern is with theory) or a Noetic dominant mode (typically when concern is with applied fields such as social work); health sciences an Empirical or Rational dominant mode; engineering: a Rational dominant mode; business: a Rational dominant mode; and fine arts: a Noetic dominant mode.

Other Comparisons

1. *Comparison between the styles of both measures: the Knowledge Accessing Modes Inventory (KAMI) and the Gregorc Style Delineator (GSD).*
2. *Comparison between subjects who had English and those who had French as the language of instruction for maths and science in high school (Arabic sample only).*

The above two comparisons are tested using product moment correlations on the individual scores between KAMI and GSD scales. The findings are reported with a brief discussion of results in Chapter 4.

Chapter IV

FINDINGS

This chapter contains the description of results, results of hypotheses testing, relationships between KAMI and GSD scales, and other trends in the data.

Description of Results

Subjects were regrouped into one of the three dominant categories on the KAMI scales in accord with the procedure presented in the KAMI manual. The Canadian and the Arab samples are presented separately in Table 3. Overall the Arab sample had a higher proportion (53% vs 39%) of individuals that were grouped as dominant in the Rational mode. The Canadian sample was higher on the Noetic mode (22% vs 16%). The Canadian sample had a higher (38% vs 32%) percentage of individuals on the Empirical mode.

Similarly, the frequency distribution on GSD scales is presented in Table 4. Individuals were scored as High, Medium or Low in accord with the criteria defined by Gregorc, on each of the four scales of GSD. There was a larger proportion of Arabs on the Abstract Sequential AS-High scale, (45% vs. 30%) of individuals when compared with the Canadian sample.

Table 3

Frequency distribution of percentage of Canadian and Arab students on the KAMI scales.

KAMI Scales	Canadian sample				Arab sample			
	Female	Male	Total	Total %	Female	Male	Total	Total %
Rational	105	107	212	39.3%	157	191	348	52.5%
Noetic	89	32	121	22.4%	72	34	106	16.0%
Empirical	112	95	207	38.3%	103	106	209	31.5%
Total	306	234	540	100.0%	332	331	663	100.0%

Table 4

Frequency distribution of samples of Canadian and Arab students on the GSD scales.

GSD Scales	Canadian sample				Arab sample			
	Female	Male	Total	Total %	Female	Male	Total	Total %
Concrete Sequential								
High	160	130	290	53.7%	146	182	328	49.5%
Intermediate	136	101	237	43.9%	177	144	321	48.4%
Low	10	3	13	2.4%	9	5	14	2.1%
Total	306	234	540	100.0%	332	331	663	100.0%
Abstract Sequential								
High	73	91	164	30.4%	133	163	296	44.6%
Intermediate	222	141	363	67.2%	199	166	365	55.1%
Low	11	2	13	2.4%	2	2	2	0.3%
Total	306	234	540	100.0%	332	331	663	100.0%
Abstract Random								
High	166	58	224	41.5%	150	57	207	31.2%
Intermediate	134	152	286	53.0%	178	247	425	64.1%
Low	6	24	30	5.6%	4	27	31	4.7%
Total	306	234	540	100.0%	332	331	663	100.0%
Concrete Random								
High	100	88	188	34.8%	94	115	209	31.5%
Intermediate	187	141	328	60.7%	229	206	435	65.6%
Low	19	5	24	4.4%	9	10	19	2.9%
Total	306	234	540	100.0%	332	331	663	100.0%

The Canadian sample had a larger proportion of individuals on the Concrete Sequential CS-High (54% vs 50%) when compared with the Arab sample. The Canadian sample had larger proportion of individuals on the Abstract Random AR-High (42% vs 31%) and on the Concrete Random CR-High (35% vs 32%) scales. The preceding percentages are graphically presented in Figure 4.

In the following sections, each hypothesis is tested separately and jointly using KAMI and GSD scales. As mentioned in Chapter 3, although the KAMI and GSD measure similar constructs, the correlation coefficients between the KAMI and the GSD scales are relatively low. The relationship between the two measures is presented and interpreted later on in this chapter.

Test of Hypotheses

Research Hypothesis (HR): *The Arab population has proportionally more individuals who prefer the rational epistemic mode than the Canadian population; when the rational epistemic mode is measured alternatively*

(1) by scale R of KAMI,

(2) by scale AS-High of GSD, and

(3) jointly by Scale R of KAMI and by scale AS-High of GSD

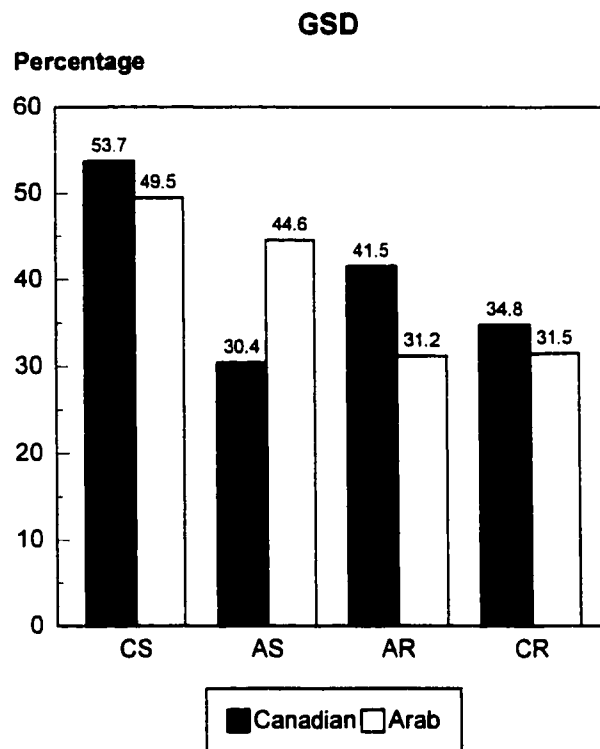
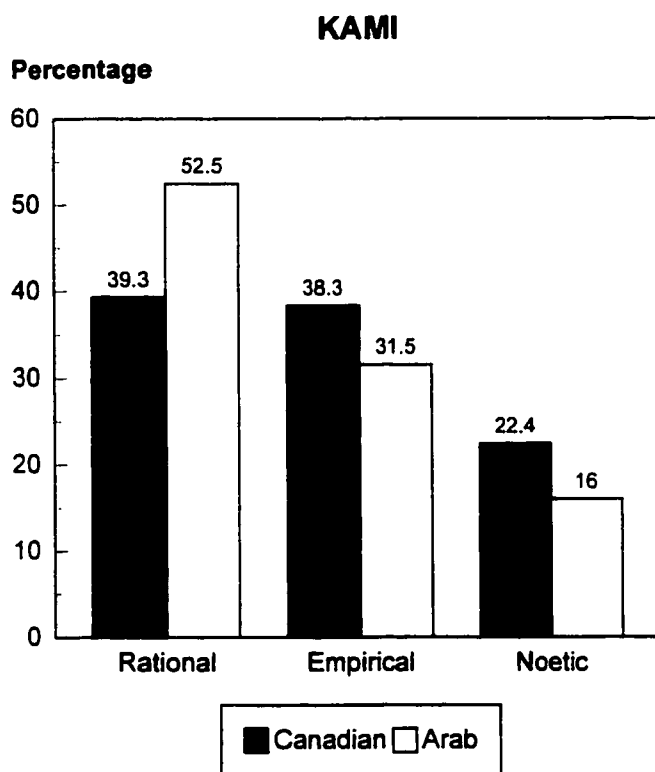


FIGURE 4. Percentage comparison of Canadian and Arab samples on the KAMI and GSD scales.

Rational mode measured by KAMI

In each case, this hypothesis was tested with a normal test on difference between two proportions. The z-test, which is an approximation of Fisher's test on difference between proportions for larger sample size, was used. The corresponding null hypothesis postulates that there is no difference between the two populations' proportions. The alternative hypothesis states that the difference between the proportion of subjects with Rational mode of KAMI in the Arab sample is different from that of the Canadian sample. The results presented in Table 5, confirmatory section, indicate that the null hypothesis is rejected ($Z = 3.04$; $p < 0.01$). In other words, combining these results with the sample observations one concludes that the Arab population has a higher proportion of Rationals than the Canadian population when the mode R is obtained from the KAMI.

Rational mode measured by GSD

In GSD, the Abstract Sequential AS-High scale corresponds to the Rational mode of KAMI. It was expected that the proportion of subjects with AS scale of GSD in the Arab sample would be differ from that of the Canadian sample. In other words, combining these results with the sample observations one concludes that the Arab population has a higher proportion of Rationals ($z=3.06$; $p < 0.01$) than Canadians as measured by the AS-High scale of GSD (see Table 5, line 2, from confirmatory section).

Table 5

Data analysis for Hypothesis (HR) with the Rational mode of KAMI and Abstract Sequential scale of GSD.

Measure	Population 1	n1	P1 %	Population 2	n2	P2 %	(a, b) z
Confirmatory							
R - KAMI	Arabs (A)	663	52.5	Canadians (C)	540	39.8	3.04**
AS - GSD	Arabs (A)	663	44.6	Canadians (C)	540	30.4	3.06**
R and AS - High	Arabs (A)	348	57.5	Canadians (C)	212	35.4	3.28**
R and AS - Int.	Arabs (A)	348	42.2	Canadians (C)	212	64.6	3.76**
Exploratory							
R - KAMI	A - Female	332	47.3	C - Female	306	34.3	2.09**
	A - Female	332	47.3	A - Male	331	57.7	1.94
	C - Female	306	34.3	C - Male	234	45.7	1.70
	C - Male	234	45.7	A - Male	331	57.7	1.99*
AS - GSD	C - Female	306	23.9	C - Male	234	38.9	2.08**
	C - Female	306	23.9	A - Female	332	40.1	2.38**
	A - Female	332	40.1	A - Male	331	49.2	1.58
	C - Male	234	38.9	A - Male	331	49.2	1.59
R and AS - High	A - Female	157	56.1	A - Male	191	58.6	0.37
	C - Female	105	19.0	C - Male	107	51.4	2.59**
	C - Female	105	19.0	A - Female	157	56.1	3.03**
	C - Male	107	51.4	A - Male	191	58.6	0.89
R and AS - Int.	A - Female	157	43.9	A - Male	191	40.8	0.38
	C - Female	105	81.0	C - Male	107	48.6	3.84**
	C - Female	105	81.0	A - Female	157	43.9	4.64**
	C - Male	107	48.6	A - Male	191	58.6	0.87

a) z stands for the z - value obtained from the difference P1 and P2.

b) * p < 0.05 on two-tailed test; ** p < 0.01 on a two-tailed test; other values are not significant.

Rational mode measured jointly by KAMI and GSD

The null hypothesis postulates that there is no difference between the proportion of Canadian and Arab populations who are rational as measured jointly by both R mode of KAMI and Abstract Sequential Scale AS-High of the GSD. The alternative hypothesis states that the proportion of subjects with Rational mode on KAMI and high on Abstract Sequential scale of SD in the Arab sample is different from that of the Canadian sample. In other words, combining these results with the sample observations, one concludes that the Arab population has a higher proportion of Rationals ($z = 3.28$; $p < 0.01$) than the Canadian population as measured jointly by Rational mode of the KAMI and the Abstract Sequential scale AS-High of GSD (see Table 5, line 3, confirmatory section). The Rational mode also could be obtained from the joint measure of R from KAMI and AS-Intermediate from GSD; the testing yields the same conclusions as above ($z = 3.76$; $p < 0.01$, line 4, confirmatory section).

Exploratory analysis with the rational modality

Further comparisons were carried out to determine whether the preceding findings on the Rational mode of KAMI and the AS scale of GSD would also hold for males and females. In Table 3 and 4 data are presented on frequency percentage distributions of males and females falling into each category for KAMI and GSD scales respectively.

From a z-test one concludes that there is no difference between the proportion of males and the proportion of females in the Canadian population on the Rational scale of

KAMI ($z=1.70$; $p>0.05$); no difference between the proportion of males and females in the Arab population on the Rational scale of KAMI ($z=1.94$; $p>0.05$); there is a difference between the proportion of males and females in the Canadian population on the Abstract Sequential scale of GSD ($z=2.08$; $p<0.05$); and no difference between the proportion of each gender in the Arab population on the Abstract Sequential scale of GSD ($z=1.58$; $p>0.05$). In other words, there is no difference between the proportion of males and females on the rational mode in the Canadian and in the Arab population as measured by the R scale of KAMI. An examination of the data, however, does indicate that the proportion of males being categorized as rational tend to be higher than that of females.

With regard to the first exploratory hypothesis, the z-test ($z=2.08$; $p<0.01$) indicates that there is a difference between the proportions of males and females on the Abstract Sequential AS-High scale in the Canadian sample. An examination of data (Table 5, exploratory section) indicates that the proportion of males is higher than that of the females in the Canadian population as measured by the AS scale of the GSD. With regard to the second hypothesis, the z test ($z=1.58$; $P>0.05$) indicates no difference between the proportion of males and females in the Arab population as measured by the AS-High of the GSD.

The comparisons reported in Table 5 indicate that on the Rational mode of KAMI there are differences ($z=1.99$; $p<0.05$) between the proportion of males in the Canadian and males in the Arab populations. Similar findings were also observed between the

proportions of females in the Canadian and Arab populations ($z = 2.09$; $p < 0.01$). Table 5 also reveals a difference ($z = 2.38$; $p < 0.01$) between the proportions of Canadian and Arab females on the Abstract Sequential scale. No difference was found between the proportions of Canadian and Arab males ($z = 1.59$; $P > 0.05$) on this scale.

Conclusions for the rational modality

To summarize, the findings support the hypothesis that a higher proportion of the Arab population prefers the rational epistemic mode when compared with the Canadian population as measured by the Rational mode of KAMI and the Abstract Sequential scale of GSD. The combination of Rational and Abstract Sequential scale of the GSD analysis also indicates that the resulting proportion of Arabs is also significantly higher than that of Canadians.

Further analysis of data along gender differences in each population revealed that on the Rational mode there were no gender differences in either the Canadian or the Arab population. However, on the Abstract Sequential scale there was a difference between the proportion of males and females in the Canadian population. Similar differences along gender were not found in the Arab population. It was observed, however, that a higher proportion of males compared to females had a 'rational' orientation on both the Abstract Sequential scale and Rational mode of KAMI. The next section presents the results of hypothesis relating to the empirical modality.

Hypothesis (HE): *The Canadian population has proportionally more individuals who prefer the empirical epistemic mode than the Arab population; when the empirical epistemic mode is measured alternatively*

(1) by scale E of KAMI,

(2) by scale CS-High of GSD, and

(3) jointly by scale E of KAMI and by scale CS-High of GSD

Empirical mode measured by KAMI

The same testing procedure that was used to test HE was also used to test HR. The hypothesis was tested by conducting a z-test on the difference between proportions of empirical mode dominance in Arab and Canadian populations. The null hypothesis postulates that there is no difference between the Arab and Canadian populations' proportions with the E mode of KAMI. The results presented in Table 6, confirmatory section, indicate that the difference between the proportions of subjects from the Canadian and Arab populations is not significant ($z=1.46$; $P>0.05$). In other words, overall the Arab population does not have a different proportion of empirical individuals than the Canadian population as measured by the E mode of KAMI. (see Table 6, line 1 of confirmatory section).

Table 6

Data analysis for Hypothesis (HE) with the Empirical mode of KAMI and Concrete Sequential scale of GSD.

Measure	Population 1	n1	P1 %	Population 2	n2	P2 %	(a, b) z
Confirmatory							
E - KAMI	Arabs (A)	663	31.5	Canadians (C)	540	38.3	1.46
CS - GSD	Arabs (A)	663	49.5	Canadians (C)	540	53.7	1.05
E and CS - High	Arabs (A)	348	51.7	Canadians (C)	212	40.6	1.53
E and CS - Int.	Arabs (A)	348	46.4	Canadians (C)	212	54.1	1.11
Exploratory							
E - KAMI	A - Female	332	31.0	C - Female	306	36.6	0.86
	A - Female	332	31.0	A - Male	331	32.0	0.16
	C - Female	306	36.6	C - Male	234	40.6	0.59
	C - Male	234	40.6	A - Male	331	32.0	1.41
CS - GSD	C - Female	306	52.3	C - Male	234	55.6	0.56
	C - Female	306	52.3	A - Female	332	44.0	1.45
	A - Female	332	44.0	A - Male	331	55.0	1.98*
	C - Male	234	40.6	A - Male	331	55.0	0.10
E and CS - High	A - Female	103	45.6	A - Male	108	56.5	1.23
	C - Female	112	28.6	C - Male	95	54.7	2.37*
	C - Female	112	28.6	A - Female	103	45.6	1.54
	C - Male	103	54.7	A - Male	108	56.5	0.30
E and CS - Int.	A - Female	103	52.4	A - Male	108	39.8	1.16
	C - Female	112	63.4	C - Male	95	43.2	2.07*
	C - Female	112	63.4	A - Female	103	52.4	1.23
	C - Male	103	43.2	A - Male	108	56.5	0.24

a) z stands for the z - value obtained from the difference P1 and P2.

b) * p < 0.05 on two-tailed test; ** p < 0.01 on a two-tailed test; other values are not significant.

Empirical mode measured by GSD

The Concrete Sequential scale on the GSD corresponds to the Empirical mode of KAMI. The z-test ($z = 1.05$; $P > 0.05$) failed to detect a difference between the populations of Canadian and Arab individuals who prefer the Empirical modality (Table 6, line 2, confirmatory section).

Empirical mode measured jointly by KAMI and GSD

The null hypothesis postulates that there is no difference between the proportion of Canadians and Arabs who prefer the empirical modality as measured jointly by E mode of KAMI and Concrete Sequential AS-High Scale of the GSD. The null hypothesis states that there is no difference between the proportion of subjects who prefer the Empirical mode as measured by KAMI and by Concrete Sequential CS-High of GSD in the Canadian population and those in the Arab population. The results presented in Table 6, confirmatory section, indicate no difference ($z = 1.53$; $P > 0.05$) between the proportions of Canadians and Arabs. An examination of data, however, does indicate that there is a trend of a higher proportion of Canadian (52 % vs 41%) with an empirical orientation.

In the confirmatory section of Table 6 one notes that on the empirical mode and Concrete Sequential CS-Intermediate there is no significant difference ($z = 1.11$; $P > 0.05$). However, as expected (see Table 6) the proportion of Canadians who prefer the E mode is higher (54% vs 46%) than that of the Arabs.

Exploratory analysis with the empirical modality

Further comparisons were carried out to determine whether the preceding findings on the Empirical mode of KAMI and the Concrete Sequential scale of GSD would also hold for males and females. In Table 6, exploratory section, z-test values are presented for testing hypotheses of equality between males and females on the E mode of KAMI and CS scale of GSD.

The null hypotheses postulate that there is no difference between the proportion of each gender in the Canadian population on the Empirical mode of KAMI; no difference between the proportion of each gender in the Arab population on the Empirical mode of KAMI; no difference between the proportions of each gender in the Canadian population on the Concrete Sequential CS-High scale of GSD; and no difference between the proportions of males and females in the Arab population on the Concrete Sequential CS-High scale of GSD.

The z-test results (see Table 6, exploratory section) indicate that on the E mode there is no difference between the proportion of males and females within the Canadian population ($z=0.59$; $P > 0.05$). The same finding holds for the Arab sample as well ($z=0.16$; $P > 0.05$). In other words, there is no difference between the proportions of males and females on the empirical mode in the Canadian and Arab population as measured by the E mode of KAMI. An examination of the data, however, indicates that a slightly higher proportion of males (41% on the E mode and 56% on the CS scale) tend to be

more empirically oriented than for females (37% on the E mode and 52% on the CS scale).

On the Concrete Sequential scale, the results of the above four exploratory hypotheses are depicted in Table 6, exploratory section. A z-test ($z=0.56$; $P>0.05$) indicates that there is no difference between the proportion of Canadian males and females on the Concrete Sequential scale. A z-test ($z=1.98$; $p<0.05$) indicates that the proportion of Arab males is different than that of the Arab females as measured by the CS scale of the GSD. An examination of data further indicates that both Arab and Canadian populations have a larger proportion of males than females who are 'empirical' as measured by the Concrete Sequential scale.

Other comparisons reported in Table 6 indicate that on the E mode of KAMI there is no difference ($z= 0.86$; $P>0.05$) between the proportion of Arab and Canadian females. Similar findings were also observed for Canadian and Arab males ($z = 1.41$; $P>0.05$). In Table 6, one observes that there are no differences between Canadian males and females, Arab males and females, Canadian females and Arab females, and Canadian males and Arab males.

The analysis of KAMI's Empirical mode and GSD's Concrete Sequential scale combined, indicates that in the E mode and CS-High group, males had a higher proportion of empirical orientation than the females in both populations thus supporting the

theoretical expectation. In the case of E mode and the CS-Intermediate combined, a higher proportion of females were 'empirical' than males in the Arab ($z = 1.16$; $p > 0.05$) and Canadian ($z = 2.07$; $p < 0.05$) populations. These proportions, that is, with E mode and CS-High as well as with CS-Intermediate were not statistically significant, however.

Conclusions for the empirical modality

To summarize, the findings do not support the hypothesis that a higher proportion of the Canadian population prefer the empirical epistemic mode when compared with the Arab population as measured by the Empirical mode of KAMI and the Concrete Sequential scale of GSD. However, upon examination of the data one observes a trend that there is a higher proportion of Canadians tend to be empirical when compared to Arabs. Furthermore, males tend to be higher than females on the empirical orientation measures. The combined analysis of Empirical and CS-High group indicates, contrary to expectations, that the proportion of Arabs is higher than that of the Canadians but in the Intermediate CS group one observes a higher percentage of Canadians than Arabs. These differences were not significant.

On the Concrete Sequential scale, no differences were detected between the proportion of males and females in the population. However, there were differences between the Arab males and females. In the next section results of hypotheses relating to noetic modality are presented.

Hypothesis (HN): *The Canadian population has proportionally more individuals who prefer the noetic-intuitive epistemic mode than the Arab population; when the noetic-intuitive epistemic mode is measured alternatively*

(1) by scale N of KAMI,

(2) by scale AR-High of GSD,

(3) by scale CR-High of GSD,

(4) jointly by N of KAMI and AR-High of GSD, and

(5) jointly by N of KAMI and CR-High of GSD

Noetic mode measured by KAMI

This hypothesis, like the previous two, was tested by conducting a z-test on the difference between proportions. The null hypothesis states that the difference between the proportion of subjects with the Noetic mode of KAMI in the Arab population is not different from that of the proportion of subjects in the Canadian population. The results presented in Table 7, confirmatory section indicate no difference between the two populations proportions ($z = 1.23$; $P > 0.05$) when N is measured by KAMI. The sample observations indicate that although the proportion of Canadians (22%) tend to be higher than the proportion of Arab population (16%) this difference cannot be extended to the populations.

Table 7

Data analysis for Hypothesis (HN) with the Noetic mode of KAMI and Abstract Random scale of GSD.

Measure	Population 1	n1	P1 %	Population 2	n2	P2 %	(a, b) z
Confirmatory							
N - KAMI	Arabs (A)	663	16	Canadians (C)	540	22.4	1.23
AR - GSD	Arabs (A)	663	31.2	Canadians (C)	540	41.5	2.22**
N and AR - High	Arabs (A)	106	60.4	Canadians (C)	121	26.4	3.17**
N and AR - Int.	Arabs (A)	106	38.7	Canadians (C)	121	73.6	3.74**
Exploratory							
N - KAMI	A - Female	332	21.7	C - Female	306	29.1	1.07
	A - Female	332	21.7	A - Male	331	10.3	1.50
	C - Female	306	29.1	C - Male	234	13.7	1.79
	C - Male	234	13.7	A - Male	331	10.3	0.43
AR - GSD	C - Female	306	29.1	C - Male	234	24.8	3.92**
	C - Female	234	13.7	A - Female	332	45.2	1.61
	A - Female	306	54.2	A - Male	331	17.2	3.88**
	C - Male	306	54.2	A - Male	331	17.2	1.01
N and AR - High	A - Female	72	65.3	A - Male	34	50.0	1.10
	C - Female	89	18.0	C - Male	32	50.0	2.05**
	C - Female	89	18.0	A - Female	72	65.28	3.35**
	C - Male	32	50.0	A - Male	34	50.00	0.00
N and AR - Int.	A - Female	72	33.3	A - Male	34	50.00	1.08
	C - Female	89	82.0	C - Male	32	50.00	2.63**
	C - Female	89	82.0	A - Female	72	33.33	4.23**
	C - Male	32	50.0	A - Male	34	50.00	0.00

a) z stands for the z - value obtained from the difference P1 and P2.

b) * p < 0.05 on two-tailed test; ** p < 0.01 on a two-tailed test; other values are not significant.

Noetic mode measured by Abstract Random of GSD

On the GSD, the scales corresponding to the N mode of KAMI are Abstract Random and Concrete Random. As expected there was a difference between the proportions of individuals in the Arab and the Canadian populations ($z=2.22$; $P < 0.01$), on the Abstract Random scale (see Table 7, confirmatory section). Thus, the z-test results combined with the sample observation indicate that a higher proportion of Canadians (42%) favour the noetic mode as measured by AR-High scale of GSD when compared with the corresponding proportion of Arabs (31%).

Noetic mode measured by Concrete Random of GSD

On the GSD, the other scale corresponding to the N mode of KAMI is Concrete Random. In confirmatory section of Table 8, one notes that the null hypothesis of no difference between the proportion of Arab and Canadians on the Concrete Random scale was not rejected ($z= 0.70$; $P>0.05$). The z-test along with the sample observation indicates no difference between the two populations although a higher proportion of the Canadian population (35%) favour the noetic mode as measured by the Concrete Random CR-High scale of GSD when compared with the corresponding scale of Arabs (32%).

Noetic mode measured jointly by KAMI and by Abstract Random of GSD

The null hypothesis postulates that there is no difference between the proportion of Canadian and Arab populations who are noetic as measured jointly by the N mode of KAMI and the Abstract Random AR-High Scale of the GSD. The alternative hypothesis

is bi-directional. The results presented in the confirmatory section of Table 7 indicate a clear difference ($z= 3.17$; $P< 0.01$). Thus this finding together with sample observations (60% vs 26%) indicate that the Arab population has a higher proportion of individuals who prefer the noetic mode than the Canadian population. This finding implies that the comparison of those with the Noetic mode and those who rank high on the Abstract Random scale of GSD is in the opposite direction; that is, the Arabs have a higher proportion of noetic individuals than the Canadians.

Measuring the noetic modality jointly by the N mode of KAMI and the Abstract Random AR-Intermediate a difference between the two populations ($z=3.74$; $p< 0.01$) is observed. This difference is in the expected direction. Together with sample observations one concludes that there is a higher proportion of noetic Canadians (74% vs 39%) compared to noetic Arabs.

Noetic mode measured jointly by KAMI and Concrete Random by GSD

The null hypothesis also postulated that there is no difference between the proportion of Canadian and Arab populations who are noetic as measured jointly by the N scale of KAMI and the Concrete Random CR-High Scale of GSD. The alternative hypothesis states a bi-directional difference. The null hypothesis is rejected ($z= 2.92$; $p<0.01$) and one concludes there is a difference between the proportions of Canadian noetics (15%) and Arab noetics (52%). This finding is in the opposite direction to the expected results (see Table 8, confirmatory section).

Table 8

Data analysis for Hypothesis (HN) with the Noetic mode of KAMI and Concrete Random scale of GSD.

Measure	Population 1	n1	P1 %	Population 2	n2	P2 %	(a, b) z
Confirmatory							
N - KAMI	Arabs (A)	663	16	Canadians (C)	540	22.4	1.23
CR - GSD	Arabs (A)	663	31.5	Canadians (C)	540	34.8	0.70
N and CR - High	Arabs (A)	106	51.9	Canadians (C)	121	14.9	2.92*
N and CR - Int.	Arabs (A)	106	45.3	Canadians (C)	121	78.5	3.88**
Exploratory							
N - KAMI	A - Female	332	21.7	C - Female	306	29.1	1.07
	A - Female	332	21.7	A - Male	331	10.3	1.50
	C - Female	306	29.1	C - Male	234	13.7	1.79
	C - Male	234	13.7	A - Male	331	10.3	0.43
CR - GSD	C - Female	306	32.7	C - Male	234	37.6	0.71
	C - Female	306	32.7	A - Female	332	34.6	0.66
	A - Female	332	34.6	A - Male	331	34.7	1.00
	C - Male	234	37.6	A - Male	331	34.7	0.42
N and CR - High	A - Female	72	48.6	A - Male	34	58.8	0.73
	C - Female	89	0.0	C - Male	32	56.3	0.00
	C - Female	89	0.0	A - Female	72	50.0	0.00
	C - Male	32	56.3	A - Male	34	58.8	0.16
N and CR - Int.	A - Female	72	50.0	A - Male	34	35.3	0.89
	C - Female	89	92.1	C - Male	32	40.6	4.20**
	C - Female	89	92.1	A - Female	72	50.0	4.76**
	C - Male	32	40.6	A - Male	34	35.3	0.27

a) z stands for the z - value obtained from the difference P1 and P2.

b) * p < 0.05 on two-tailed test; ** p < 0.01 on a two-tailed test; other values are not significant.

Using the same testing procedure as above but where the noetic mode is measured by the N of KAMI and the CR-Intermediate of GSD revealed that the proportion of Canadian noetics (79%) is higher than that Arab (45%) noetics ($z=3.88$, $P<0.01$). This finding is in the expected direction.

Exploratory analysis with the noetic modality

Further comparisons were carried out to determine whether the preceding findings on the Noetic mode of KAMI and the AR and CR scales of GSD would also hold for each gender. In the exploratory sections of Tables 7 and 8 data are presented on frequency distribution, males and females percentages grouped into the Noetic mode of KAMI, and on AR and CR scales of GSD respectively as well as the z-test results.

The null hypothesis postulates that there is no gender difference between the proportions of Canadian noetics; no gender difference between the proportions of Arab noetics; no gender difference between the proportion of each gender in the Canadian population on the Abstract Random scale of the GSD; no difference between the proportion of the Arab population on the Abstract Random scale of the GSD; no difference between the proportion of each gender in the Canadian population on the Concrete Random scale of the GSD; and no difference between the proportion of each gender in the Arab population on the Concrete Random scale of GSD.

The z-test results (see Table 7, exploratory section) indicate that on the N mode there is no difference between the proportion of males and females within the Canadian population ($z = 1.79$; $P > 0.05$). The same finding holds for the Arab sample as well ($z = 1.50$; $P > 0.05$). An examination of the data, however, indicates that a slightly higher proportion of females (29% and 22% on the N mode of KAMI and 54% and 45% of the AR scale) tend to be noetic than males (14% and 10% on the N mode and 25% and 17 % on the AR scale) in both the Canadian and Arab populations respectively (see Table 7).

On the Abstract Random scale, the z-test ($z = 3.92$; $p < 0.01$) indicates that there is a difference between the proportions of Canadian males and the proportions of females on the Abstract Random scale. An examination of data (Table 7) indicates that the proportion of females is Higher than that of the males in the Canadian population. The z test ($z = 3.88$; $p < 0.01$) indicates that there is a difference between the proportion of males and that of females in the Arab population as measured by the Abstract Random AR-High scale of the GSD.

On the Concrete Random scale, the z-test ($z = 0.71$; $P > 0.05$) indicates that there is no difference between the proportion of Canadian males and females on the Concrete Random scale. An examination of data (Table 8, exploratory section) indicates that the proportion of males is higher than that of females in both the Canadian and Arab populations as measured by the Concrete Random scale of the GSD. The z-test ($z = 1.00$; $P > 0.05$) indicates that there is no significant difference between the proportion of males and

proportion of females in the Arab population as measured by the CR-High of the GSD. An examination of data (Table 8) indicates that the proportion of males (38% and 35%) is Higher than that of the females (33% and 28%) in both the Canadian and Arab population proportions as measured by the CS-High scale of the GSD.

Other comparisons reported in Tables 7 and 8 indicate that on the N mode of KAMI there are no differences between the proportions of Canadian and Arab males. Similar findings were also observed for Canadian and Arab females ($z = 1.07$; $P > 0.05$). In Table 8, one observes that there is no difference between the proportions of Canadian and Arab males and females on the Concrete Random scale.

The combined analysis of Neotic and Abstract Random scales indicate (Table 7) that in the AR-High group there are little gender differences between males and females in the Canadian sample. In the AR-Intermediate group there is a higher proportion of females compared to males in the Canadian sample. In the Arab sample, the percentage of females is higher in both the High and Intermediate groups of the Abstract Random and Noetic modes.

The combined analysis of Noetic mode and Concrete Random scale indicates (Table 8) that in both the High and Intermediate groups there is a higher proportion of females than males in both populations. This finding is also consistent with expectations.

Conclusions for the noetic modality

To summarize, the findings partially support the hypothesis that a higher proportion of Canadian population prefers the noetic-intuitive epistemic mode when compared with the Arab population as measured by the Noetic mode of KAMI, the Concrete Random and the Abstract Random scales of GSD. Differences between the Canadians and Arabs were supported by the Abstract Random scale. Overall, the findings were in the direction postulated in the hypothesis. However, reverse findings were revealed by additional cross-tabulation analysis of data. Arabs have a higher proportion of Noetic mode subjects who are Abstract Random AR-High and Concrete Random CR-High than Canadians thus indicating a higher noetic orientation for the Arabs. In contrast, when a similar comparison is made with the Intermediate group on both AR and CR scales, differences were found in the expected direction.

Further analysis of data along gender differences in each population reveals that with the Noetic mode, there were no gender differences in either the Canadian or the Arab population. Females tend to have a higher proportion of 'noetic' orientation than males with the N mode and AR scales. On the Concrete Random scale, little differences were found between the proportion of males and females in the Canadian population. It was observed, however, that a higher proportion of females as compared to males were 'noetic' oriented. The next section presents the results relating to KAMI modes and fields of study.

Hypothesis (HD): *The dominant epistemic modes in each of the fields of specialization in both populations will be consistent with those indicated in previous research on KAMI. Specifically, engineering majors are expected to have a dominant Rational mode; science majors an Empirical or Rational dominant mode; health science majors an Empirical or Rational dominant mode; business majors a Rational dominant mode; social science majors a Rational or Noetic dominant mode; and fine arts majors a Noetic dominant mode.*

The hypotheses related to each discipline were tested using KAMI since prior data (cited in Chapter 2 and 3) are available to substantiate the direction of results. No such data are available on the GSD. Data from the GSD are also presented for exploratory purposes. In Table 9, the percentage of distribution of KAMI dominant styles across each discipline are presented. The frequency distribution on GSD is presented in Appendix D for each discipline. The data from the Gregorc's Style Delineator is used to further corroborate the findings from KAMI. The results are presented for each discipline separately.

Engineering

The dominant mode expected (Rancourt, 1987a) was Rational with an REN epistemic style orientation. Data confirmed this expectation. Almost half of the

Table 9

Percentage of Canadian and Arab sample by discipline and KAMI style.

Discipline	Style	Canadian sample				Arab sample			
		Male	Female	Total	n	Male	Female	Total	n
Engineering									
	E dominant	35.51%	6.54%	42.06%	45	33.86%	4.72%	38.58%	49
	N dominant	6.54%	3.74%	10.28%	11	9.45%	1.57%	11.02%	14
	R dominant	33.64%	14.02%	47.66%	51	45.67%	4.72%	50.39%	64
	Sub-total	75.70%	24.30%	100.00%	107	88.98%	11.02%	100.00%	127
Science									
	E dominant	21.28%	12.77%	34.04%	32	7.02%	17.54%	24.56%	28
	N dominant	6.38%	13.83%	20.21%	19	4.39%	10.53%	14.91%	17
	R dominant	30.85%	14.89%	45.74%	43	21.93%	38.60%	60.53%	69
	Sub-total	58.51%	41.49%	100.00%	94	33.33%	66.67%	100.00%	114
Health Science									
	E dominant	8.70%	38.04%	46.74%	43	15.65%	14.78%	30.43%	35
	N dominant	1.09%	10.87%	11.96%	11	4.35%	9.57%	13.91%	16
	R dominant	7.61%	33.70%	41.30%	38	29.57%	26.09%	55.65%	64
	Sub-total	17.39%	82.61%	100.00%	92	49.57%	50.43%	100.00%	115
Business									
	E dominant	15.38%	25.96%	41.35%	43	13.79%	15.86%	29.66%	43
	N dominant	7.69%	9.62%	17.31%	18	4.83%	6.21%	11.03%	16
	R dominant	20.19%	21.15%	41.35%	43	37.93%	21.38%	59.31%	86
	Sub-total	43.27%	56.73%	100.00%	104	56.55%	43.45%	100.00%	145
Social Science									
	E dominant	9.71%	28.16%	37.86%	39	11.29%	21.77%	33.06%	41
	N dominant	5.83%	33.01%	38.83%	40	3.23%	24.19%	27.42%	34
	R dominant	7.77%	15.53%	23.30%	24	12.90%	26.61%	39.52%	49
	Sub-total	23.30%	76.70%	100.00%	103	27.42%	72.58%	100.00%	124
Fine Arts									
	E dominant	12.50%	10.00%	22.50%	9	7.89%	26.32%	34.21%	13
	N dominant	10.00%	42.50%	52.50%	21	2.63%	21.05%	23.68%	9
	R dominant	10.00%	15.00%	25.00%	10	7.89%	34.21%	42.11%	16
	Sub-total	32.50%	67.50%	100.00%	40	18.42%	81.58%	100.00%	38
Total					540	663			

Engineering group in the Canadian and Arab samples had the Rational dominant style (see Table 9). There are more males than females in the Engineering discipline in both populations. Thirty-five percent of the Canadian and 40% of the Arab population were in the AS-High scale of GSD; the Abstract Sequential scale measures a similar constructs as the Rational mode of KAMI. The majority of the population were in the AS-Intermediate level (Appendix D).

Science

The dominant mode expected (Rancourt & Dionne, 1982; Rancourt, 1987a) was Empirical or Rational with an ERN or REN epistemic style orientation. The majority of individuals in both the Canadian and Arab samples indicated a Rational mode followed by Empirical mode. On the GSD scale a majority (54%) of the Canadian subjects were in the CS-High group and so did approximately 46% of the Arab population. The Concrete Sequential scale corresponds to the Empirical mode on KAMI.

Health science

The dominant mode expected (Rancourt & Ballentine, 1990; Rancourt & Noble, 1991; Park, 1997) was Empirical or Rational with an REN or ERN epistemic style orientation. In the Arab sample, the dominant mode was the Rational mode followed by the Empirical mode; for the Canadian, the dominant mode was the Empirical followed by the Rational. On the GSD, a majority (55%) of Canadians and 48% of Arabs were in the

CS-High group. As far as the Abstract Sequential scale is concerned, like the Rational scale, Arabs had proportionally higher scores than Canadians.

Business

The dominant mode expected (Rancourt, 1987a) was Rational with an REN epistemic style orientation. Data in Table 9 confirms this expectation. In the Arab sample approximately 59% of the sample displayed a Rational dominant mode. In the Canadian sample, 41% of the subjects showed preference for the Rational mode. As far as the GSD scale is concerned, the majority of the Arab population were in the Abstract Sequential AS-High group. Approximately 32% of the Canadian population were in the AS-High group. The evidence from the GSD corroborates findings from the R mode of KAMI.

Social Science

The dominant mode expected (Rancourt, 1987a) was the Noetic or Rational. In the Canadian sample, approximately 39% showed preference for the Noetic mode, and the epistemic style orientation was NER. The Arab sample had a dominant Rational mode (40%) with an REN style orientation. An examination of data on GSD scales indicate that a majority of Canadians (54%) were in the CS-High group while less than half (46%) of Arabs were in the Concrete Sequential CS-High group.

Fine Arts

The dominant mode expected (Rancourt, 1987a) was Noetic. In the Canadian sample, about 53% of the subjects had Noetic dominant mode and an NRE style orientation, whereas only 24% of the Arab sample preferred the Noetic mode. The epistemic style orientation for the Arab sample was REN. In both populations, however, a very high proportion of females indicated a dominant Noetic mode. A majority of the Canadian subjects (65%) were in the AR and in the CR (63%) groups. Similarly, a majority of the Arab population (53%) were in CR and 42% in the AR group. The findings from the GSD sub-scales AR-High and CR-High corroborate evidence from the KAMI Noetic mode.

The following sections present results of two exploratory relationships.

Other Comparisons

1. *The relationship between the Knowledge Accessing Modes Inventory (KAMI) and the Gregorc Style Declinator (GSD).*

In chapter 3, it was indicated that a correlation was found between Rancourt's KAMI modes and Gregorc's Style Declinator scales suggesting that their scales measure the same constructs (Leino, 1987). Leino found a positive correlation between KAMI's Rational mode and GSD's Abstract Sequential; between KAMI's Empirical mode and GSD's Concrete Sequential; and between KAMI's Noetic mode and GSD's Abstract Random and Concrete Random. In this study, individual KAMI scores, that is, R, N and

E were correlated with GSD's AR, CR, CS and AS scores. Data presented in Appendix E indicate a concurrence with Leino's findings. Significant correlations were observed between the Rational and Abstract Sequential ($r = 0.41$, Arab; $r = 0.39$, Canadian); between the Empirical and Concrete Sequential ($r = 0.21$, Arab; $r = 0.21$, Canadian); between the Noetic and Abstract Random ($r = 0.51$, Canadian; $r = 0.41$, Arab); and between the Noetic and Concrete Random ($r = 0.32$, Canadian; $r = 0.29$, Arab). The correlation coefficients between KAMI and GSD scales indicate there is some similarity between the constructs of the two instruments. For instance, the highest correlation 0.51 between AR and the N mode was observed in the Canadian sample, thereby implying that only 25 % of the variance is explained between the two measures and that other factors may explain the rest of the variance. This is one of the reasons that for each hypothesis a separate analysis was carried out using each instrument.

Based on the analysis reported earlier in this chapter, the Abstract Random scale of GSD appears to be more closely related to the noetic scale of KAMI than the Concrete Random scale of the GSD. In addition, the Rational mode of KAMI is associated with the Abstract Sequential scale of GSD. Limited evidence was observed for the Empirical mode of KAMI and the Concrete Sequential scale of GSD. The relationships between the two could be examined further in future research.

Further analysis was conducted to determine whether this relationship holds for each gender. The correlation matrices are presented in Appendix F. The present analysis

further confirms and contributes to the understanding of relationships between the constructs underlying KAMI and GSD scales.

2. A comparison between subjects who had English and those who had French as the language of instruction for maths and science in high school (Arab sample only).

There were no statistically significant differences between Arab subjects who had English versus French as the language of instruction in high school. The correlation and mean differences were examined on the KAMI and GSD scales. These data are reported in the Appendix G.

Reported in this chapter were data and an analyses of results from the present study that sought to measure and compare the epistemic orientation of Canadian and Arab samples. Further discussion of results, as well as suggestions for further research, is presented in the next chapter.

Chapter V

DISCUSSION OF RESULTS

The results are consistent with the substantial body of research (reviewed in chapter two) which found that there are differences in cognitive and epistemic styles among different cultural groups. Such differences have been partially attributed to the influence of culture defined as a learning medium combining cognitive forms, language and structure (e.g., Galtung & Nishimura, 1983). The epistemic differences found in this study may also be partially attributed to such cultural background.

The **first research hypothesis (HR)** postulated that the Arab population has proportionally more individuals who prefer the rational epistemic mode than the Canadian population; when the rational epistemic mode is measured alternatively 1) by scale R of KAMI, 2) by scale AS-High of GSD, and 3) jointly by scale R of KAMI and by scale AS-High of GSD. The published scholarly research (e.g., Al-Jabiri, 1984, 1987) and the limited number of empirical studies (e.g., Zebian, 1996) which indicate a rational epistemic orientation of the Arab culture have received confirmation by the results of the present study. Significant differences were found on the rational scales of KAMI and GSD as well as on their combination. No gender difference was observed on the Rational mode. A gender difference was found on the Abstract Sequential scale only in the Canadian group. Thus, with minimal gender differences the findings support the hypothesized cultural background with respect to the rational modality. The interpretation of the results in terms of the rational modality

constructs would indicate that the Arab cultural population, in comparison with the Canadian, tends to prefer an epistemic orientation that is: abstract, comprehensive, deductive, concerned with logical proof, with conceptual integration, and with quality of thinking. These qualities are logically inferred from the overall profile or epistemic orientation and are not based on specific criteria since no item analysis was undertaken. This finding of a profile difference between the two cultural groups will justify an item analysis in future studies that seek further exploration of this cultural difference.

Thus the above finding corroborates the scholarly inferences and the insightful comments that point out to a preference for a rational epistemic style in various forms of Arab cultural expression. Accordingly, this finding, by indicating a higher rational orientation among Arabs, tends to challenge the notion of a universal epistemic dichotomy between a Western and a non-Western 'mind.' This generalized difference has been often presented on the basis of cognitive differences typically observed in comparative research dealing with Oriental, Native Americans and African groups in contrast with Western groups. For example, Anderson (1988) outlines a dichotomy between a rational, empirical, and analytic Western 'mind' and a metaphorical, holistic, and relational non-Western 'mind.' The present finding of Arabs being more stylistically rational than Canadians tends to contradict such general dichotomy.

The above-generalized epistemic dichotomy between West and non-West is also challenged by a fundamental epistemic cleavage between the Germanic and Anglo-Saxon

intellectual traditions as outlined by Galtung (1981. Chapter Two above). Galtung's cleavage also suggests that the Arab 'mind' is epistemically closer to or more compatible with the Germanic 'mind' than with the Anglo-Saxon 'mind.' Furthermore, the Arab tendency for expression of attitude and affect (e.g., as observed by Patai, 1976) may represent a form of emotionality that is incompatible with rationalism as a pragmatic approach for achieving positive practical results but not incompatible with rationalism as an epistemic approach. Thus, with the increasing incorporation of the scientific method in Arab intellectual output as a result of increase in higher education, it is plausible that the epistemic orientation of the Arab 'mind' will shift towards the Teutonic-Germanic orientation as described by Galtung (1981).

The **second research hypothesis (HE)** postulated that the Canadian population has proportionally more individuals who prefer the empirical epistemic mode than the Arab population; when the empirical epistemic mode is measured alternatively 1) by scale E of KAMI, 2) by scale CS-High of GSD, and 3) jointly by E scale of KAMI and by scale CS-High of GSD. The hypothesized empirical orientation of the Anglo-Canadian culture was based on cross-cultural studies such as those reported in chapter two; on the history of philosophical traditions (e.g., White, 1973; Hofstadter, 1966); and on comparisons at the level of methodological approaches dealing with paradigm analysis, proposition production, and theory formation presented by Galtung (1981) and outlined in chapter Two. There were no significant differences on measures of the empirical modality as measured by the Empirical mode of KAMI, the Concrete Sequential scale of GSD, and by

the combination of both. The data, however, were consistently in the expected direction. The interpretation of the results in terms of the empirical modality constructs indicate that the Canadian and the Arab population do not differ in their preference for an epistemic orientation that is concerned with tangible, concrete and practical details, and is analytic, inductive, systematic, realistic, and product oriented. These qualities are inferred from the general epistemic orientation and are not based on specific criteria.

The **third research hypothesis (HN)** postulated that the Canadian population has proportionally more individuals who prefer the noetic-intuitive epistemic mode than the Arab population; when the noetic-intuitive mode is measured alternatively 1) by scale N of KAMI, 2) by scale AR-High of GSD, 3) by scale CR-High of GSD, 4) jointly by N of KAMI and AR-High of GSD, and 5) jointly by N of KAMI and CR-High of GSD. This hypothesis was based on the logical inference that the rational mode, in its tendency to integrate parts or sub-units into a unified whole, is basically antithetical to the other two modes: the empirical and the intuitive. It may be reasonable to suggest that both the empirical and the intuitive modes are similar in that they segment (although in different ways) larger perceivable wholes and accordingly are expected to be less antithetical to each other than to the rational mode. But the cognitive segments (units) arrived at by means of the empirical mode continue to seek linkages mainly through the continuum modality, whereas the cognitive segments of the noetic mode are more self-contained and independent of other parts than the empirical. Accordingly, the noetic is expected to assume a more antithetical position than the empirical with respect to the abstract integrating Rational.

The data (see Appendix E) indicates that the negative correlation between KAMI's R and N modes ($r = -0.68$ for Arabs and -0.71 for Canadians) tends to be higher than between the Rational mode and the Empirical mode ($r = -0.37$ for Arabs; and -0.28 for the Canadians). This antithetical relationship between modes also received support from the uneven distribution of the six KAMI styles (see Appendix H) and from further data exploration reported in this chapter. Thus the third hypothesis of a correlation between the empirical and the noetic orientation can be based on logical and on some empirical grounds.

The third research hypothesis received support from the Abstract Random scale, from Noetic mode and Abstract Random AR-Intermediate combined, and from the Noetic mode and the Concrete Random CR-Intermediate combined. The third hypothesis was not supported (negatively correlated) by the combination of N and AR-High measures; by the combination of N and CR-High measures; and by a separate analysis on the Noetic mode and on the Concrete Random. No gender differences were observed. These results indicate that the Canadian population, in comparison with the Arab population, have a preference for intuitive, insightful, holistic, non-discursive, and non-referential styles of information processing. These qualities are inferred from the general epistemic orientation and are not based on specific criteria.

The finding that the Arab population was lower on the noetic-intuitive preference and higher on the rational may indicate that the Arab globalistic tendency reported in the

literature is an aspect of abstract rationalism rather than a form of intuitive holism. The analysis of the Arab schools of thought by Al-Jabiri (1984,1987) clearly points to a tendency for comprehensiveness which attempts to take into account the multiple and the global aspects of an issue. This tendency for comprehensiveness is stylistic and epistemic; it presupposes an abstract rational modality that seeks integration regardless of how successful is the final integration. This bid for comprehensive integration is cognitively different from intuitive holism that directly perceives things as unified. This latter holism (snapshot of reality) is also oriented toward segmentation, and it is on this basis it was hypothesized (and partially supported in the results of the third research hypothesis) that a high noetic orientation is a correlate of empiricism rather than of rationalism. Conversely, the former bid for abstract comprehensiveness is oriented toward increasing integration and accordingly warrants the term globality to distinguish it from intuitive holism. Miller (1991) used the term holistic and global as synonymous and referring to more preliminary cognitive processing that distinguishes them from synthetic/integrated processing belonging to higher levels of objective and organized thought (see Chapter Two). The distinction between a global and a holistic tendency will help identify two different bids for integration: one is abstract and one is intuitive. For example, this distinction will allow us to differentiate the holistic epistemic orientation of the Native American from the globalistic orientation of the Arab. Thus, future research may investigate further the distinction between global and holistic processing.

The fourth research hypothesis (HD) postulated that the dominant epistemic modes in each of the fields of specialization in both populations will be consistent with those indicated in previous research on KAMI. This hypothesis was based on research findings (cited in Chapter Two and Three) indicating that fields of specialization influence epistemic orientation in a consistent manner. The relationship between the field of study and epistemic style was not expected to neutralize the impact of culture since modal dominance also involves degree. For example, engineering students in both populations were expected to have a rational dominant mode however, and in keeping with the first hypothesis, Arab engineers were expected to be proportionally more rational than the Canadian engineers. Results indicated that the dominant epistemic modes in the fields of specialization were consistent with previous research.

Both populations indicated that the highest occurring dominant mode was the Rational with the Empirical as the secondary mode (REN); unlike some previous research (e.g., Rancourt, 1986) which showed the Empirical to be the dominant mode. The same accent on the Rational also characterized a field of specialization (the sciences) that previous research found to alternate between the Rational mode and Empirical mode. In both populations, science, engineering and business showed a dominant Rational mode. Health sciences were dominant on the Empirical in the Canadian population and dominant on the Rational in the Arab population. Social sciences were dominant on the Noetic in the Canadian population and dominant on the Rational in the Arab population. Fine arts were dominant on the Noetic in the Canadian population and dominant on the Rational in

the Arab population. An exploratory analysis on the GSD revealed that Concrete Sequential was the dominant mode in sciences, engineering, business and health sciences followed by Abstract Random. In social sciences, Abstract Random was dominant in the Canadian population and Concrete Sequential was dominant in the Arab. In fine arts, Abstract Random was dominant in the Canadian population and Concrete Random was dominant in the Arab population. It appears that Abstract Sequential and Concrete Sequential are both confounded in corresponding to the Rational mode on KAMI, which may be explainable by the positive correlation between AS and CS scales ($r = 0.17$ for Arabs and $r = 0.27$ for Canadians; Appendix E). In the case of disciplines, the Concrete Sequential is more representative of KAMI's Rational mode than the Abstract Sequential.

The gender profile was also consistent with previous studies on KAMI indicating that, on the whole, males were more dominant on the Rational and Empirical modes, with females more dominant on the Noetic mode. On the GSD, males had larger proportions on the Abstract Sequential and Concrete Sequential than females. Females had larger proportions of subjects on the Abstract Random than males. No significant gender differences were observed on the Concrete Random. The Abstract Random appears to be more representative of KAMI's Noetic mode than the Concrete Random.

The first comparison dealt with the scales of the two measures: KAMI and GSD. Statistically significant correlations were found between the Rational and the Abstract

Sequential ($r=0.41$, Arab; $r=0.39$, Canadian); between the Empirical and the Concrete Sequential ($r=0.21$, Arab; $r=0.21$, Canadian); between the Noetic and Abstract Random ($r=0.41$, Arab; $r=0.51$, Canadian); and between Noetic and Concrete Random ($r=0.29$, Arab; $r=0.32$, Canadian). This correlation between scales that seek to measure the same or similar constructs indicates that the two measures do concur, to a certain extent. The variance between the two instruments may be due to the fact that they measure the construct using different types of items. For instance, the KAMI scales require ranking of sentences while GSD scales require the ranking of words. The concurrent validity of the two tests also supports their construct validity which adds confidence to the findings.

The second comparison was pertinent to the Arab population only and was between subjects who had French and those who had English as the language of instruction for maths and science in high school. Results revealed no significant differences. The difference between the two types of high schools in Lebanon can be assumed to go beyond the language of instruction and reflect other culturally influenced teaching approaches that differ in the French and American systems of education. The lack of significant difference between these two populations may indicate that the epistemic impact of the original cultural background (the Arabic in this case) is not neutralized or significantly altered by the type of additional language and other educational traditions. This finding can be interpreted as an indication that once the cultural background is established early in life, it becomes ingrained, perseverant and resistant to subsequent or peripheral epistemic influences.

Modal Constraint

Previous as well as the present analyses of data on the KAMI provide information regarding the relative distribution of the modes in certain groups such as various professional disciplines and gender. However, it appears that no attempt has been made to examine the distribution of the three epistemic modes *within individuals*. The results of this study relative to third research hypothesis shed some light on possible mode dynamics within the individual.

In keeping with the above mentioned antithetical relationship between Rational and the Noetic, it is expected that the N and the R modes are less likely to be found as first or as second mode to each other. Thus the style NRE and RNE are expected to be minimal or least likely to occur. The frequency distribution of KAMI styles in the present study (Appendix H) indicates that this is indeed the case. In the Canadian sample, RNE and NRE had the lowest frequency among the six styles (7.9 % and 8.1 %). In the Arab sample, NRE was the lowest (6.6 %) and RNE was the second lowest (12.5 %). In comparison, REN was 40% for the Arab sample and 32% for the Canadian; ERN was 23% and 26% respectively. This distribution of styles gave further support for hypothesizing that those highest on R (Arabs) will be lowest on N.

The finding that the RNE and NRE styles tend to have the lowest occurrence indicates that style arrangement may not be "free floating" and dependent on idiosyncratic random mental dispositions. The low incidence of the NRE and RNE styles also supports

the assumption suggested previously in this study of an antithetical relationship between the Rational and the two other modes with the Noetic being the extreme opposite of R. This constraining relationship among modes is referred to as *modal constraint* and is expected to be more manifest with extreme modal dominance. The present data presents another indicator of the operation of such modal dynamics with extreme modal dominance. The combination of Noetic dominance on KAMI with those who rank High on the Abstract Random and the combination of Noetic dominance on KAMI and those who rank High on Concrete Random of GSD produced results that were in the opposite direction postulated. That is, the Arab population have a higher proportion of noetic-intuitive orientation than the Canadians. But with the combination of Noetic with Intermediate Abstract Random and with Intermediate Concrete Random, the difference was the exact opposite of the above and in the expected direction. That is, Canadians have a higher proportion of noetic-intuitive orientation than Arabs when measured with the KAMI's Noetic and Intermediate-AR and with KAMI's Noetic and Intermediate-CR scale of GSD. Thus, it may not be sufficient to qualify epistemic modes as dominant or not; we may need to determine the degree or range of dominance. In the same manner, we may need to determine the degree of minimality at the low end. These findings are consistent with the operation of the dialectical principle of quantity-to-quality conversion in fundamental thinking processes. Similar investigations may further clarify such non-linear relationships.

In keeping with the above dialectical relationship, it is expected that with extreme modal dominance, modal constraint will be most expressed. Thus with extreme dominant R and N, the distribution of the RNE and NRE styles will be lower than is the case with normal populations. With extreme dominant E, the style ERN is expected to be further minimized than is the case in normal populations. The minimalization of the R mode by an extremely high E is based on the reasoning proposed earlier that the Empirical mode is closer to the Noetic than it is to the Rational. Thus with extreme modal dominance of E, the style ERN, which is relatively high in normal distributions, is expected to decrease while the relatively less frequent ENR style (50% less than ERN in the general distribution of study sample) is expected to increase. It is suggested that this dialectical relationship between basic epistemic modes might be investigated fully in subsequent research. For example, it may be hypothesized that, in cases of extreme reliance on one mode (extreme modal constrain), the most frequent style arrangement will be REN, NER and ENR, and the least frequent styles will be RNE, NRE and ERN.

A preliminary attempt to explore the above hypothesis was made using the present data. The two samples were combined (N=1203) and the highest 10% of subjects on each dominant mode were analyzed for style arrangement. Minimal and maximal occurrence of styles was assessed within each mode only and not within the whole distribution. Results are presented in Appendix I.

With respect to the hypothesized maximal occurrence of styles REN, NER, and ENR, within the upper 10% of each mode, the data revealed that within the R mode REN was the style highest occurring at 80%. Within the N mode, NER was the style highest occurring at 66%. Within the E mode, style ENR was the second occurring style at 27%. With respect to the hypothesized minimal occurrence and of styles: RNE, NRE, and ERN, the style RNE was the least occurring at 2.3%. Within the N mode, NRE was the second occurring style at 30%. Within the E mode, the style ERN was the highest (69%) occurring style and contrary to expectations. With the exception of the empirical dominant styles (ERN & ENR), the results indicated a general support of the patterns of modal arrangements with extreme modal dominance.

Data was also obtained for the lowest 10 % of the scores of each mode. For the Rational mode, NER was the highest occurring mode at 55%. For the Noetic mode, REN was the highest occurring at 74%. For the Empirical mode, RNE was the highest occurring at 46%. Thus the most occurring styles at the bottom 10% of the mode scores are: NER, REN, and RNE. With the exception of RNE the style arrangement at the lower is the same as that on the high end. This finding lends support to the hypothesis of a dialectical non-linear interaction patterns of modes. From the same perspective, it could also be expected that intermediary scores may reveal different dynamics from the two extremes. The only exception to the hypothesized interaction on both extreme ends was associated with the Empirical mode; it does not seem to follow the model of the antithetical constraints among the modes. It may well be that there is a problem at the

construct validity of the E scale in that it is not sufficiently distinguished from the Rational mode.

A Summary of the Contributions of the Study

1. The results of this study have supported previous findings which indicated that cultural background is a factor in epistemic style differences among sociocultural groups. Also it can be deductively inferred that cultural background can influence the cognitive and intellectual functioning of individuals belonging to these cultural groups. Unlike many previous cross-cultural studies that investigated specific cognitive styles, the present research, by investigating epistemic styles, allowed for an examination of broader cognitive characteristics that can qualify thinking across cultural groups.
2. The strong support by the data for a rational epistemic orientation (general profile) of Arabs tends to confirm scholarly insights and research suggesting the existence of a strong tendencies for abstraction, categorization, comprehensiveness, deduction and integration in Arab thinking.
3. The finding of a strong rational epistemic orientation in the Arab subjects contradicts the notion of a uniform difference between a rational, empirical and analytic "Western mind" and a metaphorical, holistic and relational "non-Western

mind." Thus there can be radical epistemic differences within non-Western as well as within Western cultural populations.

4. The differences found between the two groups may also shed some light on the perseverance of a cultural epistemic orientation in the face of increasing cross-cultural impacting and fertilization. In the present study, despite an obvious cultural impacting or fertilization (American universities in an Arab cultural environment), the Arab cultural background appears to have held its epistemic ground. An epistemic difference appears to have persevered among the Arab students despite the impact of a Western system of education and despite an intense Western cultural influence. This tends to indicate that a cultural background can have an epistemic momentum.
5. The higher rationality of the Arab population may indicate that the observed globality of the Arab culture is more of an abstract form of holism than an intuitive one. This finding which was discussed in Chapter two and earlier in this chapter, points to the need to distinguish between global and holistic processing.
6. The data pertinent to the fourth research hypothesis indicated that the epistemic orientations of disciplines are similar across cultures. This finding would suggest that the uniform structures of a discipline tend to attract and mould epistemic styles in a universal manner. Gender differences also appears to be similar in both

groups which may suggest universal epistemic characteristics that are particular to gender. This profile similarity in disciplines and gender is accommodated to the cross-cultural epistemic differences at the level of degree or accent.

7. The finding of positive correlations between the scales of the Knowledge Accessing Modes Inventory and the Gregorc Style Delineator further supports their use as viable measures for epistemic styles.
8. This study has made it clear that epistemic styles can be very useful in the analysis of the epistemic orientations of schools of thought such as those found in the Arab intellectual heritage. Had Al-Jabiri made use of epistemic styles in his analysis, his depiction of the epistemic features of the 'Arab mind' would have been easier to identify and easier to classify and categorize.
9. Finally, the above-discussed hypothesis and findings regarding modal constraint can lead to further theoretical development of the Epistemic Orientation Model.

Limitations of the Study

The main limitation of this research is that the instruments essentially measure preferences rather than actual performance. Regardless of their impressive predictive validity, the epistemic modes as assessed by the measures, are preferences; they may not necessarily characterize the execution of cognitive tasks or of problem solving. Further

research investigation of this topic may need to rely on measures designed for the assessment of task performance or of products of actual performance.

An example of a possible task performance measure is the *Paragraph Completion Test* (PCT) (Schroder, Driver & Streufert, 1967) devised to measure individual differences in cognitive simplicity versus complexity. Subjects are instructed to complete a sentence stem. The completed paragraphs are then scored on a simplicity-complexity scale. The scale levels are determined by a quantitative assessment of differentiating versus integrating statements. The scoring system was later used to score a variety of archival material such as letters, addresses, political policy speeches with the aim of investigating how cognitive complexity (integrative complexity) varies with external conditions (e.g., Suedfeld & Tetlock, 1977; Suedfeld, Black, Ballard & Baker-Brown, 1990). The PCT scoring system may be also modified to identify abstract, global, deductive and inductive statements and to compute their occurrence. Accordingly, a cross cultural comparison of epistemic styles can be measured by a quantifiable assessment of written paragraphs by subjects in response to specific questions. Such task related comparisons can be used to confirm and further explore the findings of this study.

If future studies chose to employ the measures used in this study or similar ones, it is recommended that an item analysis be also carried out. Item analysis makes it possible to zero more directly on the items responsible for the variance and accordingly allow for additional and more precise qualification of the stylistic differences. The findings of this

study have provided bases to justify carrying out an extensive item analysis as well as other investigations of the epistemic implications of cultural background.

The study indicated epistemic style differences between two cultural groups. The Arabic speaking group was referred to throughout this dissertation as the Arab sample. The question whether the background of the Arab sample is representative of a pan-Arab culture may need to be addressed although it may not be possible to settle such a question in any decisive manner on the basis of available empirical research. When Al-Jabiri (1984, 1987) speaks of the 'Arab mind,' he refers to the epistemic qualities of all the classical intellectual output written in Arabic, including that of North Africa. The Lebanese cultural setting from which the sample was taken may not reflect all the cultural features of the countries of Arabic-speaking North Africa or those of the Arabian peninsula. However, the Lebanese cultural setting can be seen as an extension of that of the north eastern region of the Arab World or what is also referred to as the Levant and greater Mesopotamia. Thus it may be reasonable to assume that the cultural background of the Arab sample is the culture of the north eastern Arab region and perhaps, to a lesser extent, that of a pan-Arab culture. The fact that students were living in the relatively open society of Lebanon and enrolled in local American universities may not be sufficient to radically extract them from their larger cultural background.

Implications of the Study

The results of the present study support the conclusion of the many studies reviewed in Chapter Two that culture can influence the way we access and organize information. In the context of the present study the findings may indicate that a cultural background can influence the preference for certain epistemic modes relative to others which, in turn, influences how individuals, reared in that culture, selectively access information and address issues. It would seem sensible to take such a cultural epistemic orientation into consideration when dealing with educational material and teaching styles and strategies in cross-cultural contexts. There are several areas where the awareness of an epistemic orientation of a cultural group at a macro level might have direct educational implications at the micro level:

1. Developing curricula intended for non-North American cultural populations. For example, the differential reliance on analogy and metaphor, on a comprehensive global or theoretical model, or on naked factual information at the level of organizing, introducing and presenting the material, may be guided by an awareness of an epistemic orientation of the targeted population of potential learners.
2. Understanding and evaluating the expression and performance of foreign students. An awareness of a generalized epistemic orientation will foster a more objective

understanding and evaluation of foreign students' performance and the appreciation of alternative ways of thinking.

3. Sensitizing teachers and professors going to work in other countries to the epistemic impact of their teaching style. For example, a concrete pragmatic approach to social problems that circumvents social values and broader sociopolitical or ideological implications may not be well-received in an Arab university.
4. Delivery of educational and training programs that originate in one cultural milieu and are subsequently translated and adopted by another. For example, whenever North American programs are adopted by Arab groups, the method of delivery could be adapted to a rational epistemic style. Accordingly, it may be a good idea to commence with an initial global picture, which establishes the "ground" before moving to the "figure," and which uses facts to establish general assumptions and work deductively from those assumptions.
5. The general implications of styles on education such as in relation to student learning and thinking strategies, vocational selection, and placement were addressed by (e.g., Messick, 1984; Sternberg & Grigorenko, 1997) and noted in chapter two. Epistemic styles can also have learning and adjustment implications at the workplace. A particular work setting where epistemic styles can have significant implications is that of research departments dealing with social

problems and employing the disciplines of social sciences. The dominant epistemic style of a researcher can become a crucial factor in the manner a problem is conceptualized, in the selection of methodological approaches, in devising intervention strategies, and in the interpersonal conflicts that ensue. Therefore, in the interest of minimizing bias and conflict, it becomes necessary to make researchers aware of their epistemic orientations and of the intellectual and interpersonal implications of these orientations.

REFERENCES

- Abramson, L. Seligman, M. & Teasdale, J. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology*, 87, 32-48.
- Adorno, T., Frenkel-Brunswik, E., Levingson, D., and Sanford, R. (1950). *The authoritarian personality*. New York: Harper and Row.
- Agnew, N. & Brown, J. (1989). Foundations of Models of Knowing: Constructing Reality. *Canadian Psychological Journal*, 9, 152-167 & 168-189.
- Al-Jabiri, Mohammad A. (1984). *The formation of the Arab mind*. Beirut: Markiz-Dirasat-el-Wahda-al Arabiah (in Arabic).
- Al-Jabiri, Mohammad A. (1987). *The structure of the Arab mind*. Beirut: Markiz-Dirasat-el-Wahda-al Arabiah (in Arabic).
- Al-Jabiri, Mohammad A. (1990). *The Arab political mind*. Beirut: Markiz-Dirasat-el-Wahda-al Arabiah (in Arabic).
- Allport, G. & Pettigrew, T. (1957). Cultural influences on the perception of movement: The trapezoidal illusion among Zulus. *Journal of Abnormal Social Psychology*, 55, 1, 104-113.
- Anderson, J. (1988). Cognitive styles and multicultural populations. *Journal of Teacher Education*, 39, 1, 2-9.
- Aylwin, S. (1985). *Structure in thought and feeling*. New York: Methuen.
- Au, Kit-Fong. (1984). Chinese and English Counterfactuals: The Sapir-Whorf hypothesis revisited. *Cognition*, 17, 275-287.
- Au, T. K. (1984). Counterfactuals: In reply to Alfred Bloom. *Cognition*, 17, 288-302.
- Barakat, H. (1993). *The Arab world: Society, culture and state*. Berkeley, CA: University of California Press.
- Belenky, M. (1986). *Women's ways of knowing: The development of self, voice and mind*. New York: Basic Books.
- Bieri, J., Atkins, A., Briar, S., Leaman, R., Miller, H., & Tripodi, T. (1966). *Clinical and social judgment: The discrimination of behavioral information*. New York: Wiley.

- Belcher, T. (1981). Towards a definition of disciplinary cultures. *Studies in Higher Education*, 6, 2, 105-122.
- Bloom, A. H. (1981). *The Linguistic shaping of thought: A study in the impact of language on thinking in China and the West*. Hillsdale, NJ: Lawrence Erlbaum.
- Block, J., Block J. H. and Harrington D. (1974). Some misgivings about the Matching Familiar Figures Test as a measure of reflection-impulsivity. *Developmental Psychology*, 10, 611-632.
- Bokoros, M. (1990). *Common cognitive personality factors in non-clinical measures*. Paper presented at the 98th annual convention of the American Psychological Association, August 10-14. Boston, MA.
- Brody, N. (1972). *Personality Research and Theory*. New York: Academic Press.
- Bruner, J. (1956). A Cognitive Theory of Personality. *Contemporary Psychology*, 1, 355-357.
- Bruner, J. (1960). *The process of education*. New York: Vintage Books.
- Bruner, J., Goodnow, J., & Austin (1956). *A Study of Thinking*. New York: Wiley.
- Bruner, J. & Tajfel, H. (1961). Cognitive risk and environmental change. *Journal of Abnormal and Social Psychology*, 62, 231-241.
- Bunder, W. (1962). Intolerance of Ambiguity as a Personality Variable. *Journal of Personality*, 30, 29-50.
- Bruner, J. (1966). *Studies in cognitive growth*. New York: John Wiley.
- Carland, J. (1987). An investigation into distinctions between cognitive styles of business and non-business students. *Journal of Education for Business*, 63, 2, 68-71.
- Chao, L. (1996). Category Width and sharpening versus leveling cognitive styles of Chinese and American University students. *Perceptual and Motor Skills*, 82, 3, 1183-1186.
- Curry, L. (1983). *An organization of learning styles theory and constructs*. A paper presented at the annual meeting of American Educational Research Association, Montreal, Canada (ERIC Document Reproduction Service No. ED 235185).

- D'Andrade, R. (1987). A Folk Model of the Mind. In D. Holland and N. Quinn (Eds.), *Culture Models in Language and Thought*. Cambridge: Cambridge University Press.
- Drummond, Robert & Stoddard, Ann. (1992). Learning style and personality type. *Perceptual and Motor Skills*, 75, 99-104.
- Dunn, R. & Dunn, K. (1978). *Teaching students through their individual learning styles*. Reston, VA: Reston Publishing.
- Dunn, R., Dunn, K. & Price, C. (1979). Identifying individual learning styles. In *Student learning styles: Diagnosing and prescribing programs* (pp. 39-54). Reston, VA: National Association of Secondary School Principals.
- Entwistle, N. & Wilson J. (1977). *Degrees of Excellence: The Academic Achievement Game*. London: Hadder and Stoughton.
- Fischer, B. & Fischer L. (1979). Styles in teaching and learning. *Educational Leadership*, 36, 4, 245-254.
- Fitzgerald,, C. & Kirby, L. (1996). *Developing leaders: Research and applications in psychological type and leadership development*. Palo Alto, CA: Davis-Black Publishing.
- Flory, J. (1986). *Identification of gifted children among American Indian population: An inservice model*. (Paper, EDRS Microfiche, C-11).
- Forgues, O. (1987). *Les styles psycho-épistémique et les attitude des enseignants à l'égard des ordinateurs*. Thèse de doctorat, Université de Toronto, Canada.
- Fox, H. (1996). *Never the Twain shall meet: International students writing for a U.S. university audience*. Paper presented at the annual meeting of the conference of College Composition and Communication. Milwauki, WI. (ERIC Document Reproduction Service No. Ed 400540).
- Fromm, E. (1955). *The sane society*. New York: Holt, Rinehart & Winston.
- Furnham, A. (1995). The relationship of personality and intelligence to cognitive learning style and achievement. In D. Saklofske and M. Zeidner (Eds.), *International Handbook of personality and intelligence*. New York: Plenum Press.

- Furnham, A. Sadka, V. & Brewin, C. (1992). The development of occupational attributional style questionnaire. *Journal of Organizational Behavior*, 13, 27-39.
- Galtung, J., & Nishimura, F. (1983). Structure, culture and languages: An essay comparing the Indo-European, Chinese and Japanese languages. *Social Science Information*, 22, 6, 895-925.
- Galtung, J. (1981). Structure, culture, and intellectual style: An essay comparing Saxon, Teutonic, Gallic, and Nipponic approaches. *Social Science Information*, 20, 6, 817-856.
- Gardner, H. (1983). *Frames of the mind: The theory of multiple intelligences*. New York: Basic Books.
- Gardner, R. W. (1953). Cognitive Styles in Categorizing Behavior. *Journal of Personality*, 22, 214-233.
- Gardner, R., Holzman, P., Klein, G., Linton, H., & Spence, D. (1959). Cognitive control: A study of individual consistencies in cognitive behavior. *Psychological Issues*, 1, 4 (whole issue).
- Gardner, R., Jackson, D. & Messick, S. (1960). Personality Organization in Cognitive Controls and Intellectual Abilities. *Psychological Issues*, 2, 8 (whole issue).
- Gardner, R. and Long R. (1962). Cognitive controls of attention and inhibition: A study of individual consistencies. *British Journal of Psychology*, 53, 381-388.
- Gardner, R. and Moriarty, A. (1968). *Personality development at preadolescence*. Seattle: University of Washington Press.
- Glick, Joseph. (1985). Culture and cognition revisited. In E. Neimark, R. Delisi & J. Newman (Eds.), *Moderators of Competence*. Hillsdale, NJ: Lawrence Erlbaum.
- Globerson, T. & Zelniker, T. (1989). *Cognitive Style and Cognitive Development*. Norwood, New Jersey: Ablex.
- Goldstein, K. M. & Blackman, S. (1978). *Cognitive Style*. New York: John Wiley.
- Goldstein, K. (1940). *Human nature in the light of psychopathology*. Cambridge, Mass.: Harvard University Press.
- Goldstein, K. & Scherer, M. (1941). Abstract and concrete behavior: An experimental study with special tests. *Psychological Monographs*, 53, 1-239.

- Greertz, C. (1968). Religion as a Cultural System. In D. Cutter (Ed.), *The Religious Situation*. Boston: Beacon Press.
- Gregorc, Anthony F. (1982). *An adult's guide to style*. Maynard, MA: Gabriel Systems, Inc.
- Gregorc, A. (1984) Style as a symptom: A phenomenological perspective. *Theory Into Practice*, 23, 51-55.
- Gregorc, A. (1985). *Inside styles: Beyond the basics*. Maynard, MA: Gabriel Systems.
- Grigorenko, E. & Sternberg R. J. (1995). Thinking styles. In D. Saklofske & M. Zeidner (Eds.), *International Handbook of Personality and Intelligence*. New York: Plenum Press.
- Grigorenko, E. & Sternberg, R. (1997). Styles of thinking, abilities, and academic performance. *Exceptional Children*, 63, 295-312.
- Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.
- Gurney, P. (1992). *On the association between modes of mental representation and mathematics experience in pre-service education students*. Unpublished doctoral dissertation, University of Ottawa, Canada.
- Harrison, C. & Bramson, P. (1985). *Styles of thinking I.Q.: Administration and interpretation manual*. Berkeley, CA: Bramson-Parlett.
- Hart, L. (1983). *Human Brain and Human Learning*. New York: Longman.
- Harvey, O. J. (1963). Authoritarianism and conceptual functioning in varied conditions. *Journal of Personality*, 31, 462-470.
- Harvey, O., Hunt, D. & Schroder, H. (1961). *Conceptual Systems and Personality Organization*. New York: Wiley.
- Henderson, J., & Nutt, P. (1980). The influence of decision style on marketing behavior. *Management Science*, 26, 371-386.
- Henson, K. & Borthwick, P. (1984). Matching styles: A historical look. *Theory Into Practice*, 23, 3-9.
- Hjartarson, F. (1995). *Epistemological foundations of native education according to Algonquian elders*. Unpublished doctoral dissertation, University of Ottawa.

- Hofstadter, R. (1966). *Anti-intellectualism in American life*. New York: Alfred Knopf.
- Holzeman, P. S. and Gardner R. W. (1960). Leveling-sharpening and memory organization. *Journal of Abnormal and Social Psychology*, 61, 176-180.
- Huang, J. & Sisco, B. (1994). Thinking styles of Chinese and American adult students in higher education: A comparative study. *Psychological Reports*, 74, 2, 475-480.
- Huang, J. & Chao, L. (1995). Chinese and American Students' perceptual styles of field-independence. *Perceptual and Motor Skills*, 80, 1, 232-234.
- Hudson, L. (1973). *Originality*. London: Oxford University Press.
- Huelsman J. (1983). *An explanatory study of the interrelationships of preferred learning styles, psychological types, and other selected characteristics of practicing teachers*. Unpublished doctoral dissertation, Ohio State University, Columbus.
- Hunt, D. (1987). *Beginning with Ourselves*. Cambridge, MA: Brookline Books.
- Hyman, R. & Rosoff, B. (1984). Matching learning and teaching styles: The jug and what's in it. *Theory and Practice*, 23, 1, 35-43.
- John-Steiner, V. (1995). Cognitive pluralism: A sociocultural approach. *Mind Culture and Activity: An International Journal*, 2,1, 2-11.
- Joyce, B. & Hodges, R. (1966). Instructional flexibility training. *Journal of Teacher Education*, 17, 409-416
- Jung, C. (1927). *Psychological Types*. New York: Harcourt.
- Kagan, J. (1965). Individual differences in resolution of response uncertainty. *Journal of Personality and Social Psychology*, 2, 154-160.
- Kagan, J. (1966). Reflection-impulsivity: The generality and dynamics of conceptual tempo. *Journal of Abnormal Psychology*, 71, 17-27.
- Kagan, J. & Kogan, N. (1970). Individual variation in cognitive process. In P.H. Mussen (Ed.), *Carmichael's manual of child psychology*: vol.1. New York: Wiley.
- Kagan, J., Moss, H., & Sigel, I. (1963). Psychological significance of styles of conceptualization. *Monographs of the Society of Research in Child Development*, 28, 86, 73-112.

- Kearsley, J. (1975). *A simulated model of psycho-epistemology*. Center for Advanced Study in Theoretical Psychology, University of Alberta, Edmonton, Alberta. (Paper 189 A-75).
- Keefe, J. (1979). Learning style: An overview. In *Student learning styles: Diagnosing and prescribing programs* (pp. 1-17). Reston, VA: National Association of Secondary School Principals.
- Kelly, J. (1955). *The Psychology of Personal Constructs*. New York: Norton.
- Kimura, D. (1992). Sex differences in the brain. *Scientific American*, September issue, 119-125.
- Kirby, P. (1979). Learning style: An overview. In *Student Learning Styles: Diagnosing and prescribing programs*. Reston, VA: National Association of Secondary School Principals.
- Klein, G. (1954). Need and regulation. In M. R. Jones (Ed.), *Nebraska Symposium on Motivation*. Lincoln: University of Nebraska Press.
- Klein, G. (1970). *Perception, motives and personality*. New York: Knopf.
- Klein, G., Gardner, R., & Schlesinger, H. (1962). Tolerance for unrealistic experiences: A study of the generality of cognitive control. *British Journal of Psychology*, 53, 41-55.
- Kogan, N. (1971). Educational implications of cognitive styles. In G. S. Lesser (Ed.), *Psychology and educational practice*. Glenview, Illinois: Scott Foresman.
- Kogan, N. (1976). *Cognitive styles in infancy and early childhood*. Hillsdale, NJ: Lawrence Erlbaum.
- Kogan, N. (1980). A style of life, a life style: Review of cognitive styles in personal and cultural adaptation. *Contemporary Psychology*, 25, 595-598.
- Kolb, D. (1976). *Learning style inventory: Technical manual*. Boston: McBer.
- Kuchinskas, G. (1979). Whose cognitive style makes the difference? *Educational Leadership*, 36, 4, 269-271.

- Kugelmass, S., Lieblich, A. (1979). Of learning to read on directionality in perception: A further cross-cultural analysis. *Human Development*, 22, 6, 406-415.
- Kuhn, T. (1970). *The structure of scientific revolutions* (2nd ed.). Chicago: University of Chicago Press.
- Kunihiro, Masao (1976). The Japanese language and intellectual communication. *The Japan Interpreter*, 10, 3, 267-283.
- Kuroda, Y., Hayashi, C., & Suzuki, T. (1986) The role of language in cross-national surveys: American and Japanese respondents. *Applied Stochastic Models and Data Analysis*, 1, 43-59.
- Kuroda, Y., & Suzuki, T. (1989). Language and attitude: A study in Arabic, English and Japanese on the role of language in cross-cultural thinking. In D. M. Topping, D. C. Crowell & V. N. Kobayashi (Eds.), *Thinking across cultures*. Hillsdale, NJ: Lawrence Erlbaum Publishers.
- Landfield, A. (1977). Interpretive man: The enlarged self-image. In A. W. Landfield (Ed.), *Nebraska Symposium on Motivation*, Vol. 24. Lincoln: University of Nebraska Press.
- Lardiere, Donna (1992). On the linguistic shaping of thought: Another response to Alfred Bloom. *Language in Society*, 21,2, 231-251.
- Lauzon, Y. & Rancourt, R. (1992). Students' ways of knowing and their use of vocabulary. In K. Burkhart (Ed.), *Universal knowledge tools and their applications*. Toronto: Ryerson Polytechnical University Press.
- Lawrence, G. (1982). *People types and tiger stripes: A practical guide to learning styles*. Gainesville, Fla: Centre for Applications of Psychological Types Inc.
- Leino, J. (1987). *On knowledge accessing modes*. Helsinki: University of Helsinki Press.
- Leith, G. (1970). *Personality and Teaching Methods*. London: Association of Educational Psychologists.
- Liu, L.G. (1989). Reasoning and representation across cultures: A comparison of Chinese and American thinking. In D. M. Topping, D. C. Crowell & V. N. Kobayashi (Eds.), *Thinking across cultures*. Hillsdale, NJ: Lawrence Erlbaum Publishers.

- Lukehart, J. K. (1996). *Cross-cultural study of verbal-spatial preferences*. Unpublished doctoral dissertation, Oregon State University, Oregon.
- MacLeod, C., Jackson, R., & Palmer, J. (1986). On the relation between spatial ability and field dependence. *Intelligence*, 10, 141-151.
- Mahoney, M. (1977). Reflections on the cognitive-learning trend in psychotherapy. *American Psychologist*, 32, 5-13.
- Mathews, B. (1977). Voice of Africa in the diaspora. *New Directions*, 4, 16-19.
- McKenny, J. & Keen, P. (1974). How managers' minds work. *Harvard Business Review*, 51, 79-90.
- Mercer, N. (1990). Context, continuity and communication in learning. In F. Potter (Ed.), *Reading, learning and media education*. Oxford: Basil Blackwell.
- Mercer, N. (1992). Culture, context and the construction of knowledge in the classroom. In P. Light & G. Butterworth (Eds.), *Context and cognition*. New York: Harvester.
- Messick, S. (1973). Multivariate models of cognition and personality: The need for both process and structure in psychological theory and measurement. In J. R. Royce (Ed.), *Multivariate analysis and psychological theory*. New York: Academic Press.
- Messick, S. (1976). Personality consistencies in cognition and creativity. In S. Messick and Associates (Eds.), *Individuality in learning*. San Francisco: Jossey-Bass.
- Messick, S. (1984). The nature of cognitive styles: Problems and promise in educational practice. *Educational Psychologist*, 19, 2, 59-74.
- Messick, S., & Kogan, N. (1965). Category width and quantitative aptitude. *Perceptual and Motor Skills*, 20, 493-497.
- Miller, A. (1987). Cognitive style: An integrated model. *Educational Psychology*, 7, 4, 251-265.
- Miller, A. (1991). *Personality types: A modern synthesis*. Calgary: University of Calgary Press.
- More, A. J. (1993). *Adopting teaching to the learning styles of Native Indian students*. (Paper, Microfiche, ED 366493).

- Mos, L., Wardell, D., and Royce J. R. (1974). A factor analysis of some measures of cognitive style. *Multivariate Behavioral Research*, 9, 47-57.
- Moughrabi, F. M. (1978). The Arab basic personality: A critical survey of the literature. *International Journal of Middle East Studies*, 9, 99-112.
- Myers, I. (1980). *Gifts differing*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, I & McCaulley, M. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Nachshon, I. (1981). Cross-cultural differences in directionality. *International Journal of Psychology*, 16, 3, 199-211.
- Nagy, Z. (1988). Cognitive styles: *Cross-cultural comparison and acculturation*. Unpublished doctoral dissertation, Long Island University, Brooklyn Center.
- Nakamuro, Ho (1981). *Ways of thinking of eastern peoples*. Honolulu: Hawaii University Press.
- Natzel, S. G. (1997). Cultural variations in style: Field dependence vs field independence. *School Psychology International*, 18, 2, 155-164.
- Niday, P. (1987). *Analysis of learning styles of head nurses and staff nurses*. Unpublished doctoral dissertation, Century University, California.
- O'Brien, T. (1990). Construct validation of the Gregorc Style Delineator: An application of LISREL 7. *Educational and Psychological Measurement*, Vol.50, 631-636.
- Pai, Y. (1973). *Teaching, learning and the mind*. Boston: Houghton Mifflin.
- Park, J. (1997). *Knowledge accessing mode and conflict*. Unpublished master's thesis, Seoul National University, Korea.
- Patai, R. (1983). *The Arab Mind*. New York: Charles Scribner.
- Pettigrew, T. (1958). The measurement of correlates of category width as a cognitive variable. *Journal of Personality*, 26, 532-544.
- Phenix, P. (1964). *Realms of meaning*. New York: McGraw-Hill.

- Pine, L. (1982). Curriculum development and instructional planning within an epistemological-psychological framework: A theoretical synthesis. *Journal of Curriculum Theorizing*, 1, 4, 88-105.
- Powell, A. & Royce, J. R. (1977). A brief overview of multi-factor systems theory of individuality. Center for Advanced Study in Theoretical Psychology, University of Alberta.
- Pribram, K. (1971). *Languages of the Brain*. New Jersey: Englewood Cliffs: Prentice-Hall.
- Quinn, N. & Holland, D. (1987). Culture and cognition. In D. Holland and N. Quinn (Eds.), *Culture models in language and thought*. Cambridge: Cambridge University Press.
- Rai, P. & Prakash J. (1987). Cognitive style as related to sex and educational stream choice. *Indian Journal of Current Psychological Research*, 2, 74-78.
- Ramirez, M. & Prince-Williams, D. (1971). *The relationship of culture to educational attainment*. Rice University Center for Research in Social Change and Economic Development, Huston, Texas (paper).
- Ramirez, M. & Prince-Williams, D. (1974). Cognitive styles of children of three ethnic groups in the United States. *Journal of Cross-Cultural Psychology*, 5, 2, 212-219.
- Rancourt, R. (1983). Epistemology: A forgotten factor in the learning-teaching process. *Journal of Visual-Verbal Language* 3, 2.
- Rancourt, R. (1984). *Brain, cognition and education*. Ministry of Education of Ontario, Toronto. Report, pp. 140.
- Rancourt, R. (1986a). *The validation of an inventory to assess knowledge accessing modes in education*. Proceedings of the 6th International Seminar in Teacher Education. Regina, University of Regina.
- Rancourt, R. (1986b). *Knowledge Accessing Modes Inventory*. Gloucester, Ontario: Impact Publishing.
- Rancourt, R. (1987a). *An empirical investigation of the preferred knowledge accessing modes of practitioners of various disciplines*. Proceedings of the International Society for General Systems Research. Toronto: Ryerson Press.

- Rancourt, R. (1987b). *Epistemic styles of air traffic controllers*. Federal Ministry of Transport, Ottawa (report).
- Rancourt, R. (1987c). Gender differences, knowledge accessing modes and attitudes of learners toward secondary school fine arts, mathematics and science. Paper presented at the *International Seminar in Teacher Education*, April 12. University of Maastricht, Maastricht, Netherlands.
- Rancourt, R. (1988). *KAMI: A consultant's guide to style interpretation*. Gloucester, Ontario: Impact Publishing.
- Rancourt, R. & Ballantine, C. (1990). An analysis of the epistemic orientation of first- and third-year students in a physiotherapy program. *Physiotherapy Canada*, 42, 241-245.
- Rancourt, R. & Deschenes, L. (1990). *Une étude comparative de l'orientation épistémique d'adolescents francophones en mathématiques, en sciences, et dans les beaux-arts: Regards sur le jeune Franco-Ontarien*. Centre Franco-Ontarien de ressources pédagogiques, Ottawa.
- Rancourt, R. & Dionne, J.- P. (1982). *A study of the teaching and learning, styles in Ontario schools*. Ministry of Education Publications, Toronto.
- Rancourt, R. & Noble, K. (1991). Administration and interdisciplinary conflict in nursing. *Nursing Administration Quarterly*, 5, 36-42.
- Rancourt, R. & Noble, K. (1996 in preparation). A study of epistemic orientation of subject major congruence. *Canadian Journal of Higher Education*.
- Rancourt, R. & Searle, R. Q. (1990). Golfers do it with style: Epistemic orientations of golf instructors and students. In A. J. Cochran (Ed.), *Science and Golf*. Glasgow: E & F. Spoon.
- Rancourt, R., & Searle, R. (1994). Teaching methods and epistemic styles of golf instructors. In A. J. Cochran & M. R. Farally (Eds.), *Science and golf II*. Glasgow: E.& F. Spoon.
- Reid, B. & Valsiner, J. (1986). Consistency, praise and love: Folk theories of American parents. *Ethos*, 14, 1-25.
- Reynolds, C., Riegel, T. & Torrance, E. (1977). Bibliography on R/L hemisphere function. *Gifted Child Quarterly*, 28, 121-126.

- Riding, R., & Cheema, I. (1991). Cognitive styles: An overview and integration. *Educational Psychology*, 11, 193-215.
- Riley, D. (1992). *The African student in American university*. Paper. EDRS, Microfiche, ED363190.
- Ritter, G. M. (1995). *Cognitive style, meaning and intercultural communicators*. Unpublished master's thesis, University of Houston, Texas.
- Rokeach, M. (1960a). *The open and closed mind*. New York: Basic Books.
- Rokeach, M. (1960b). Political and Religious Dogmatism: An Alternative to the Authoritarian Personality. *Psychological Monographs*, 70, 8 (whole issue).
- Royce, J. R. (1964). *The encapsulated man*. Toronto: Van Nostrand.
- Royce, J. R. (1973a). The Conceptual framework for a multi-factor theory of individuality. In J. Royce (Ed.), *Multivariate analysis and psychological theory*. New York: Academic Press.
- Royce, J. R. (1973b). *Epistemic styles, individuality and world-view*. Paper presented at NATO, Advanced Study Institute on Information Sciences Conference, August. Aberystwyth, Wales, U.K.
- Royce, J. R. (1975). *Manual for the Psycho-Epistemological Profile*. Edmonton, Alberta: Center for Advanced Study in Theoretical Psychology, University of Alberta.
- Royce, J. R. & Buss, A. R. (1976). The role of general systems and information theory in multi-factor individuality theory. *Canadian Psychological Review*, 3, 17-21.
- Royce, J. R. & Moss, L. P. (1980). *Manual for the Psycho-Epistemological Profile*. Centre for Advanced Study in Theoretical Psychology, University of Alberta.
- Royce, J. R. & Powell, A. (1983). *Theory of personality and individual differences, factors, systems and processes*. Englewoods Cliffs, New Jersey: Prentice-Hall.
- Ryckman, D., Peckham, P., Mizokawa, D. & Sprague, D. (1990). The survey of achievement responsibility: Reliability and validity data on an academic attribution scale. *Journal of Personality Assessment*, 54, 265-275.
- Samples, B. (1976). *Metaphoric mind*. Reading, Mass.: Addison-Wesley.

- Saracho, O. & Spodek, B. (1981). Teachers' cognitive styles: Educational implications. *The Educational Forum*, 45, 153-159.
- Saracho, O. (1983). Cultural differences in cognitive style of Mexican American students. *Journal of the Association for the Study of Perception*, 18, 1, 3-10.
- Scheffler, I. (1965). *Conditions of knowledge: An introduction to epistemology and education*. Chicago: Scott Foresman.
- Scheffler, I. (1967). *Science and subjectivity*. New York: Bobbs-Merill.
- Schlesinger, H. (1954). Cognitive attitudes in relation to susceptibility to interference. *Journal of Personality*, 22, 354-374.
- Schroder, H., Driver, M., and Streufert S. (1967). *Human information processing*. New York: Holt, Rinehart & Winston.
- Schwab, J. (1969). The Practical: A language for curriculum. *School Review*, 78, 1-23.
- Sewall, T. (1986). *The measurement of learning style: A critique of four assessment tools*. Green Bay Assessment Center, Wisconsin University (paper).
- Shade, B. (1997). African-American cognitive patterns: A review of research . In B. Shade (Ed.), *Culture, style and the educative process: Making schools work for racially diverse students*. Springfield, Illinois: Charles C. Thomas Publisher.
- Shapiro, D. (1965). *Neurotic styles*. New York: Basic Books.
- Shouksmith, G. (1970). *Intelligence, creativity and cognitive style*. New York: Wiley.
- Smith, W. (1967). The development of an inventory to measure ways of knowing. *Psychological Reports*, 21, 529-535.
- Solomon, R. & Higgins K. (1996). *A short history of philosophy*. New York: Oxford University Press.
- Spiro, R., Feltovich, P. & Coulson, R. (1996). Two epistemic world-views: Prefigurative schemas and learning in complex domains. *Applied Cognitive Psychology*, 10, 51-61.
- Sternberg, R. J. (1988). Mental self-government: A theory of intellectual styles and their development. *Human Development*, 31, 197-224.

- Sternberg, R. J. (1990). Thinking styles: Key to understanding student performance. *Phi Delta Kappan*, 71, 366-368.
- Sternberg, R. J. (1996a). Thinking styles: Theory and assessment at the interface between intelligence and personality. In R. J. Sternberg and P. Ruzgis (Eds.), *Intelligence and personality*, (pp. 169-187), New York: Cambridge University Press.
- Sternberg, R. J. (1996b). Styles of thinking. In P. Baltes & U. Staudinger (Eds.), *Integrative minds: Life-span perspectives on social foundation of cognition*. Cambridge: Cambridge University Press.
- Sternberg, R. J. (1997). *Thinking styles*. New York: Simon and Schuster.
- Sternberg, R. J. & Grigorenko, E. L. (1997). Are cognitive styles still in style. *American Psychologist*, 52, 7, 700-712.
- Sternberg, R. J. & Grigorenko, E. (1993). Thinking styles and the gifted. *Roeper Review*, 16, 2, 122-130.
- Sternberg, R. J. & Grigorenko, E. (1995). Styles of thinking in the school. *European Journal of Higher Ability*, 6, 201-219.
- Sternberg R. J. & Wagner R. (1991). *MSG Thinking Style Inventory manual*. Unpublished test manual.
- Stewart, K. & Felicetti, L. (1992). Learning styles of marketing majors. *Educational Research Quarterly*, 15, 2, 15-23.
- Suedfeld, P. (1971). Information processing as a personality model. In H. M. Schroder & P. Suedfeld (Eds.), *Personality theory and information processing*. New York: Roland.
- Suedfeld, P. (1985). American Psychological Association presidential address: The relation of integrative complexity to historical, professional, and personal factors. *Journal of Personality and Social Psychology*, 6, 1643-1651.
- Suedfeld, P., Black, S., Ballard, E. & Baker-Brown, G. (1990). Canadian federal elections: Motive profiles and integrative complexity in political speeches and popular media. *Canadian Journal of Behavioral Science*, 22, 1, 26-36.
- Suedfeld, P. & Tetlock, P. (1977). Integrative complexity of communications in international crisis. *Journal of Conflict Resolution*, 21, 169-184.

- Super, C. & Harkness, S. (1986). The developmental niche: A conceptualization of the interface of child and culture. *International Journal of Behavioral Development*, 9, 546-569.
- Sutter, E. G. & Reid, J. B. (1969). Learner variables and interpersonal conditions in computer-assisted instruction. *Journal of Educational Psychology*, 60, 3, 153-157.
- Tetlock, P. (1983). Cognitive style and political ideology. *Journal of Personality and Social Psychology*, 1, 118-126.
- Tversky, B., Kugelmass, S., Winter, A., (1991). Cross-cultural and developmental trends in graphic productions. *Cognitive Psychology*, 23, 4, 515-527.
- Van Voorhees, C. (1988). Learning style and continuing medical education. *Journal of Continuing Education in the Health Professions*, 8, 4, 257-265.
- Vernon, M. D. (1962). *The psychology of perception*. Baltimore: Penguin.
- Vygotsky, L. (1978). *Mind in Society*. London: Harvard University Press.
- Waber, D. (1989). The biological boundaries of cognitive styles: A neuropsychological analysis. In T. Globerson & T. Zelniker (Eds.), *Cognitive style and cognitive development*. Norwood: Ablex Publishing.
- Wachtel, P. L. (1968). Style and capacity in analytic functioning. *Journal of Personality*, 36, 202-212.
- Wallach, M. A. (1971). *The intelligence / creativity distinction*. New York: General Learning Press.
- Wardell, D. & Royce, J. R. (1978). Toward a multi-factor theory of styles and their relationship to cognition and affect. *Journal of Personality*, 46, 474-505.
- Wells, H. (1971). *Pragmatism: Philosophy of imperialism*. New York: Books For Libraries Press.
- White, J. (1970). Guidance for Black psychologists. *The Black Scholar*, 1, 5, 52-57.
- White, N. (1973). *Pragmatism and the American mind: Essays and reviews in philosophy and intellectual history*. New York: Oxford University Press.

- Whorf, R. L. (1956). A Linguistic consideration of thinking in primitive societies. In J. B. Carroll (Ed.), *Language, thought and reality*. (pp. 65-86). Boston: MIT.
- Willis, M. G. (1989). Learning styles of African-American children: A review of the literature on interventions. *Journal of Black Psychology*, 16, 1, 47-65.
- Witkin, H. (1974). *A cognitive-style perspective on evaluation and guidance*. Proceedings of the 1973 conference on testing problems: Measurement for self-understanding and personal development. Princeton NJ: Educational Testing Service.
- Witkin, H. (1976). Cognitive style in academic performance and in teacher student relations. In S. Messick (Ed.), *Individuality in learning*. San Francisco, CA: Jossey-Bass.
- Witkin, H., Dyk, R., Faterson, H., Goodenough, D. & Karp, S. (1962). *Psychological Differentiation*. New York: Wiley.
- Witkin, H. & Goodenough, D. (1981). *Cognitive styles: Essence and origins of field dependence and field independence*. New York: International University Press.
- Yassin, El-Sayyid, (1981). *Al-Shaksiyya al-Arabiyya* (The Arab personality). Beirut: Dar Attanweer.
- Zebian, S. (1996). *Integrative and differentiated cognitive style: Comparisons in multidimensional sorting, embedded and object sorting*. Unpublished master's thesis, University of Western Ontario, Canada.

APPENDICES

KNOWLEDGE ACCESSING MODES INVENTORY (KAMI)



Instructions: On this K.A.M.I. response sheet, you are to describe the way you see yourself most of the time and in most situations. For each question, three statements are offered. The statement that comes closest to describing you is rated , your first choice in other words. Of the remaining two statements, the one that comes closest to describing you is rated , your second choice. And of the three statements, the one that is the least descriptive of you is rated , your third choice.

Remember, the inventory is neither a personality test nor a test of mental abilities. There are no right or wrong answers.

Example:

The most important factor for successful learning is:

- | | |
|--------------------------------|--------------------------|
| <input type="text" value="1"/> | a) good teaching |
| <input type="text" value="2"/> | b) appropriate materials |
| <input type="text" value="3"/> | c) motivation |

GREGORC STYLE DELINEATOR™ RESEARCH INSTRUMENT

DIRECTIONS

Before starting with the word matrix on the next page, carefully read all seven of the following directions and suggestions:

1. **Reference Point.** You must assess the relative value of the words in each group using your SELF as a reference point; that is, who you are deep down. NOT who you are at home, at work, at school or who you would like to be or feel you ought to be. **THE REAL YOU MUST BE THE REFERENCE POINT.**

2. **Words.** The words used in the *Gregorc Style Delineator* matrix are not parallel in construction nor are they all adjectives or all nouns. This was done on purpose. Just react to the words as they are presented.

3. **Rank.** Rank in order the ten sets of four words. Put a "4" in the box above the word in each set which is the best and most powerful descriptor of your SELF. Give a "3" to the word which is the next most like you, a "2" to the next and a "1" to the word which is the least descriptive of your SELF. Each word in a set must have a ranking of 4, 3, 2 or 1. No two words in a set can have the same rank.

4 = **MOST** descriptive of you
1 = **LEAST** descriptive of you

4. **React.** To rank the words in a set, react to your *first impression*. There are no "right" or "wrong" answers. The real, deep-down you is best revealed through a first impression. Go with it. Analyzing each group will obscure the qualities of SELF sought by the Delineator.

5. **Proceed.** Continue to rank all ten vertical columns of words, one set at a time.

6. **Time.** Recommended time for word ranking: 4 minutes.

7. **Start.** Turn the page and start now.

Example

	X
a.	4 sun
b.	2 moon
c.	3 stars
d.	1 clouds

1. Your age: Years _____ Months _____
2. Your sex: Male _____ Female _____
3. Your major: _____
4. Years completed:
(at university) _____
5. Country of birth: _____
6. Your native language:
(mother tongue) _____
7. Language most frequently
used now: _____
8. If born in Canada, have
you lived outside Canada
for long periods of time
(over 3 years)? Yes _____ No _____
9. If you answered "Yes"
to #8, how long was the
period? _____
10. In which country was the
period spent? _____
11. If born outside Canada, how
many years have you been
living in Canada? _____
12. What is your intended
career? _____
13. What other languages
(besides your mother-
tongue) do you speak? _____

Frequency distribution. Percentages for GSD scales by discipline and sex.

GSD Scales	Canadian sample						Arab sample						Canadian sample						Arab sample											
	Male %			Female %			Male %			Female %			Male %			Female %			Male %			Female %								
	Total %						Total %						Total %						Total %											
Engineering	Social sciences																								Health Sciences					
Concrete Sequential	High	48.6%	18.7%	67.3%	52.6%	4.7%	57.5%	38.8%	12.6%	52.4%	15.3%	30.6%	46.0%	7.6%	47.6%	55.4%	28.6%	18.3%	47.6%	9.0%	32.6%	42.4%	20.0%	31.3%	51.3%					
	Moderate	26.2%	5.6%	31.8%	33.9%	6.3%	40.2%	35.9%	10.7%	46.6%	11.3%	38.7%	50.0%	9.0%	32.6%	2.2%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Low	0.0%	0.0%	0.0%	2.4%	0.0%	2.4%	0.0%	0.0%	1.0%	0.8%	3.2%	4.0%	0.0%	2.2%	100.0%	49.6%	50.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Total	75.7%	24.3%	100.0%	89.0%	11.0%	100.0%	76.7%	23.3%	100.0%	27.4%	72.6%	100.0%	17.4%	82.6%	100.0%	49.6%	50.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Abstract Sequential	High	24.3%	11.2%	35.5%	34.6%	5.5%	40.2%	13.6%	9.7%	23.3%	12.1%	26.6%	38.7%	8.7%	20.7%	28.3%	27.0%	20.0%	47.0%	7.0%	57.6%	65.2%	22.6%	30.4%	53.0%					
	Moderate	51.4%	13.1%	64.5%	54.3%	5.5%	59.6%	81.2%	13.6%	74.6%	14.5%	46.0%	60.5%	1.9%	4.3%	5.4%	0.0%	0.0%	0.0%	4.3%	5.4%	0.0%	0.0%	0.0%	0.0%					
	Low	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	1.9%	0.8%	0.0%	0.8%	1.1%	82.6%	100.0%	49.6%	50.4%	100.0%	17.4%	82.6%	100.0%	49.6%	50.4%	100.0%					
	Total	75.7%	24.3%	100.0%	89.0%	11.0%	100.0%	76.7%	23.3%	100.0%	27.4%	72.6%	100.0%	17.4%	82.6%	100.0%	49.6%	50.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Abstract Random	High	16.6%	8.4%	25.2%	15.0%	0.6%	15.7%	45.6%	8.7%	54.4%	7.3%	36.3%	43.3%	6.5%	45.7%	52.2%	7.8%	23.5%	31.3%	47.7%	47.7%	13.1%	38.1%	65.2%						
	Moderate	47.7%	14.0%	61.7%	67.7%	10.2%	78.0%	31.1%	13.6%	44.7%	16.1%	36.3%	52.4%	8.6%	35.6%	45.7%	38.1%	26.1%	65.2%	2.6%	0.9%	3.9%	100.0%	100.0%						
	Low	11.2%	1.9%	13.1%	8.3%	0.0%	8.3%	0.0%	1.0%	1.0%	4.0%	0.0%	4.0%	1.1%	1.1%	2.2%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%						
	Total	75.7%	24.3%	100.0%	89.0%	11.0%	100.0%	76.7%	23.3%	100.0%	27.4%	72.6%	100.0%	17.4%	82.6%	100.0%	49.6%	50.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Concrete Random	High	26.6%	3.7%	33.8%	37.0%	6.3%	43.3%	27.2%	8.7%	35.9%	9.7%	19.4%	28.0%	4.3%	25.0%	29.3%	13.0%	16.5%	29.6%	29.6%	5.4%	5.4%	2.6%	0.9%	3.9%					
	Moderate	45.8%	17.6%	63.6%	48.6%	4.7%	53.5%	43.7%	14.6%	58.3%	17.7%	51.6%	69.4%	1.6%	5.4%	5.4%	2.6%	0.9%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Low	0.0%	2.8%	2.8%	3.1%	0.0%	3.1%	5.8%	0.0%	5.8%	0.0%	1.6%	1.6%	0.0%	5.4%	5.4%	2.6%	0.9%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%						
	Total	75.7%	24.3%	100.0%	89.0%	11.0%	100.0%	76.7%	23.3%	100.0%	27.4%	72.6%	100.0%	17.4%	82.6%	100.0%	49.6%	50.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Fine Arts	Science																								Business					
Concrete Sequential	High	5.0%	7.5%	12.5%	2.6%	18.4%	21.1%	34.0%	20.2%	54.3%	14.8%	30.7%	45.6%	23.1%	31.7%	54.8%	30.3%	26.9%	57.2%	25.0%	24.0%	44.2%	25.5%	15.2%	40.7%					
	Moderate	25.0%	52.5%	77.5%	15.8%	57.9%	73.7%	1.1%	18.1%	19.1%	18.4%	36.0%	64.4%	20.2%	24.0%	44.2%	25.5%	15.2%	40.7%	25.0%	1.0%	1.0%	0.7%	1.4%	2.1%					
	Low	2.5%	7.5%	10.0%	0.0%	5.3%	5.3%	23.4%	3.2%	26.6%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Total	32.5%	67.5%	100.0%	18.4%	81.6%	100.0%	58.5%	41.5%	100.0%	33.3%	66.7%	100.0%	43.3%	56.7%	100.0%	56.8%	43.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Abstract Sequential	High	15.0%	2.5%	17.5%	2.6%	15.8%	18.4%	28.7%	8.5%	37.2%	16.4%	27.2%	45.6%	13.5%	18.3%	31.7%	35.2%	22.8%	57.8%	17.5%	72.5%	89.0%	21.4%	42.1%	62.1%					
	Moderate	17.5%	55.0%	72.5%	15.8%	65.6%	81.6%	1.1%	2.1%	14.0%	38.5%	53.5%	0.9%	28.8%	0.0%	29.8%	0.0%	20.7%	42.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Low	0.0%	10.0%	10.0%	0.0%	0.0%	0.0%	28.7%	31.9%	60.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Total	32.5%	67.5%	100.0%	18.4%	81.6%	100.0%	58.5%	41.5%	100.0%	33.3%	66.7%	100.0%	43.3%	56.7%	100.0%	56.8%	43.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Abstract Random	High	15.0%	50.0%	65.0%	2.6%	39.5%	42.1%	9.6%	25.5%	35.1%	7.0%	34.2%	41.2%	8.7%	23.1%	31.7%	7.6%	15.9%	23.4%	15.0%	17.5%	35.0%	6.2%	32.4%	44.1%					
	Moderate	17.5%	17.5%	35.0%	15.8%	42.1%	57.9%	41.5%	16.0%	57.4%	24.6%	31.6%	56.1%	31.7%	30.6%	62.5%	42.8%	1.4%	44.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Low	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.4%	0.0%	7.4%	1.8%	0.0%	2.6%	2.9%	2.9%	5.8%	42.8%	1.4%	44.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Total	32.5%	67.5%	100.0%	18.4%	81.6%	100.0%	58.5%	41.5%	100.0%	33.3%	66.7%	100.0%	43.3%	56.7%	100.0%	56.8%	43.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
Concrete Random	High	15.0%	47.5%	62.5%	10.5%	42.1%	52.6%	22.3%	13.8%	36.2%	10.5%	14.9%	25.4%	15.4%	12.5%	27.9%	17.2%	6.9%	24.1%	15.0%	20.0%	35.0%	7.9%	34.5%	72.4%					
	Moderate	15.0%	20.0%	35.0%	7.9%	39.5%	47.4%	33.0%	27.7%	60.6%	21.5%	2.6%	24.6%	28.9%	39.4%	60.3%	37.9%	34.5%	72.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Low	2.5%	0.0%	2.5%	3.2%	0.0%	0.0%	3.2%	0.0%	3.2%	0.0%	48.1%	50.0%	1.0%	4.8%	5.8%	1.4%	2.1%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					
	Total	32.5%	67.5%	100.0%	18.4%	81.6%	100.0%	58.5%	41.5%	100.0%	33.3%	66.7%	100.0%	43.3%	56.7%	100.0%	56.8%	43.4%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					

Appendix E

Correlation Matrices between KAMI and GSD Scales for Arab and Canadian samples.

Scales	Rational	Empirical	Noetic	CS	AS	AR	CR	Age
Arab sample (N=663)								
Rational	1.00							
Empirical	-0.37**	1.00						
Noetic	-0.68**	-0.43**	1.00					
Concrete Sequential (CS)	0.24*	0.21*	-0.40**	1.00				
Abstract Sequential (AS)	0.41**	-0.05	-0.36**	0.17*	1.00			
Abstract Random (AR)	-0.33**	-0.12	0.41**	-0.57**	-0.53**	1.00		
Concrete Random (CR)	-0.26**	-0.04	0.29**	-0.56**	-0.51**	0.00	1.00	
Age	0.02	0.04	-0.06	0.03	0.02	-0.05	0.01	1.00

Canadian sample (N=540)								
Scales								
Rational	1.00							
Empirical	-0.28**	1.00						
Noetic	-0.71**	-0.47**	1.00					
Concrete Sequential (CS)	0.33**	0.21*	-0.45**	1.00				
Abstract Sequential (AS)	0.39**	0.10	-0.43**	0.27**	1.00			
Abstract Random (AR)	-0.41**	-0.19*	0.51**	-0.60**	-0.61**	1.00		
Concrete Random (CR)	-0.26**	-0.11	0.32**	-0.67**	-0.52**	0.14	1.00	
Age	0.07	-0.01	-0.06	-0.03	-0.07	0.01	0.07	1.00

NB. * Significant at 5% level; ** Significant at 1% level.

Correlation matrices. Relationships between KAMI and GSD Scales by gender.

Scales	Rational	Empirical	Noetic	CS	AS	AR	CR	Age
Canadian Female (N=306)								
Rational	1.00							
Empirical	-0.30	1.00						
Noetic	-0.71	-0.46	1.00					
Concrete Sequential (CS)	0.34	0.28	-0.53	1.00				
Abstract Sequential (AS)	0.38	0.11	-0.43	0.27	1.00			
Abstract Random (AR)	-0.39	-0.18	0.50	-0.59	-0.59	1.00		
Concrete Random (CR)	-0.31	-0.21	0.45	-0.71	-0.57	0.21	1.00	
Age	0.06	-0.00	-0.06	-0.03	-0.07	-0.01	0.09	1.00
Canadian Male (N=234)								
Rational	1.00							
Empirical	-0.32	1.00						
Noetic	-0.68	-0.47	1.00					
Concrete Sequential	0.28	0.10	-0.33	1.00				
Abstract Sequential	0.34	0.04	-0.34	0.25	1.00			
Abstract Random	-0.36	-0.14	0.44	-0.63	-0.58	1.00		
Concrete Random	-0.22	-0.00	0.20	-0.63	-0.53	0.13	1.00	
Age	0.11	-0.02	-0.09	-0.02	-0.05	0.02	0.04	1.00
Arab Female (N=332)								
Rational	1.00							
Empirical	-0.39	1.00						
Noetic	-0.71	-0.38	1.00					
Concrete Sequential	0.19	0.19	-0.33	1.00				
Abstract Sequential	0.45	-0.12	-0.36	0.12	1.00			
Abstract Random	-0.29	-0.03	0.31	-0.54	-0.52	1.00		
Concrete Random	-0.32	-0.06	0.36	-0.59	-0.52	0.06	1.00	
Age	-0.04	-0.00	0.04	0.03	-0.09	-0.02	0.07	1.00
Arab Male (N=331)								
Rational	1.00							
Empirical	-0.41	1.00						
Noetic	-0.62	-0.47	1.00					
Concrete Sequential	0.24	0.21	-0.41	1.00				
Abstract Sequential	0.33	-0.00	-0.32	0.19	1.00			
Abstract Random	-0.29	-0.16	0.41	-0.56	-0.53	1.00		
Concrete Random	-0.23	-0.06	0.26	-0.55	-0.52	-0.01	1.00	
Age	0.03	0.06	-0.08	0.01	0.07	-0.02	-0.05	1.00

NB.: Coefficient values of 0.19 or greater are significant at ($p < .05$) level.

Mean, Standard deviation and Correlation matrices. KAMI and GSD scales for Arab sample by second language of high school and gender.

Scales	Rational	Empirical	Noetic	CS	AS	AR	CR	Age
Arab Females English Education (N= 213)								
Mean	63.38	61.66	54.95	25.27	25.39	25.56	23.78	21.15
Standard Deviation	10.20	7.83	10.54	4.63	4.27	4.37	4.77	4.09
Rational	1.00							
Empirical	-0.34	1.00						
Noetic	-0.71	-0.42	1.00					
Concrete Sequential (CS)	0.24	0.23	-0.40	1.00				
Abstract Sequential (AS)	0.47	-0.16	-0.33	0.18	1.00			
Abstract Random (AR)	-0.33	-0.06	0.36	-0.59	-0.52	1.00		
Concrete Random (CR)	-0.35	-0.02	0.35	-0.58	-0.59	0.12	1.00	
Age	-0.03	-0.00	0.03	0.06	-0.13	-0.04	0.09	-0.03
Arab Females French Education (N= 119)								
Mean	62.50	60.61	56.89	25.65	25.64	25.00	23.70	21.08
Standard Deviation	11.15	8.44	10.64	5.06	4.04	4.58	4.71	1.82
Rational	1.00							
Empirical	-0.48	1.00						
Noetic	-0.70	-0.29	1.00					
Concrete Sequential (CS)	0.12	0.13	-0.23	1.00				
Abstract Sequential (AS)	0.44	-0.03	-0.45	0.01	1.00			
Abstract Random (AR)	-0.23	0.01	0.24	-0.47	-0.51	1.00		
Concrete Random (CR)	-0.27	-0.12	0.39	-0.61	-0.38	-0.03	1.00	
Age	-0.07	-0.01	0.08	-0.09	0.04	0.02	0.03	-0.07
Arab Males English Education (N = 218)								
Mean	66.90	62.61	50.49	26.89	26.74	22.12	24.24	21.94
Standard Deviation	9.56	8.64	10.07	4.50	4.07	4.87	4.83	5.41
Rational	1.00							
Empirical	-0.41	1.00						
Noetic	-0.61	-0.46	1.00					
Concrete Sequential (CS)	0.24	0.22	-0.42	1.00				
Abstract Sequential (AS)	0.27	0.05	-0.31	0.21	1.00			
Abstract Random (AR)	-0.21	-0.17	0.35	-0.53	-0.54	1.00		
Concrete Random (CR)	-0.25	-0.07	0.30	-0.55	-0.52	-0.04	1.00	
Age	0.04	0.06	-0.09	0.00	0.10	-0.03	-0.06	0.04
Arab Males French Education (N= 113)								
Mean	66.81	62.89	50.30	27.34	26.03	22.22	24.41	21.72
Standard Deviation	9.87	8.40	10.26	4.87	4.01	4.92	4.59	1.65
Rational	1.00							
Empirical	-0.39	1.00						
Noetic	-0.63	-0.47	1.00					
Concrete Sequential (CS)	0.24	0.19	-0.39	1.00				
Abstract Sequential (AS)	0.45	-0.10	-0.34	0.17	1.00			
Abstract Random (AR)	-0.43	-0.12	0.51	-0.62	-0.51	1.00		
Concrete Random (CR)	-0.20	0.01	0.18	-0.57	-0.51	0.06	1.00	
Age	0.02	0.15	-0.14	0.08	-0.09	-0.01	0.01	0.02

NB.: Coefficient values of 0.19 or greater are significant at ($p < .05$) level.

Frequency distribution of the Arab and Canadian samples stratified according to KAMI styles.

Arab sample					
KAMI Style	Female	Male	Total	Style %	Dominant style %
ERN	62	81	143	22.70%	31.59%
ENR	35	21	56	8.89%	
NER	44	12	56	8.89%	15.56%
NRE	24	18	42	6.67%	
REN	112	142	254	40.32%	52.86%
RNE	38	41	79	12.54%	
Total	315	315	630	100.00%	
Canadian sample					
	Female	Male	Total	Total %	
ERN	60	71	131	25.44%	38.25%
ENR	44	22	66	12.82%	
NER	54	18	72	13.98%	22.14%
NRE	30	13	42	8.16%	
REN	73	90	163	31.65%	39.61%
RNE	27	14	41	7.96%	
Total	288	227	515	100.00%	

Note: The sample is slightly reduced because some did not fall into any above dominant styles.

Distribution of top 10 and bottom 10 percent on each mode.

Rational mode

<u>Top 10%</u>			<u>Bottom 10%</u>		
	N	Percent			
REN	106	79.70%	ENR	46	44.66%
RNE	3	2.26%	NER	57	55.34%
RE/N	24	18.05%			
Total	133	100.00%	N	103	100.00%

Empirical mode

ENR	35	27.13%	ENR	3	2.61%
ERN	89	68.99%	NER	9	7.83%
ER/N	2	1.55%	NRE	45	39.13%
REN	3	2.33%	REN	5	4.35%
			RNE	53	46.09%
Total	129	100.00%	Total	115	100.00%

Noetic mode

NRE	38	29.69%	REN	106	73.61%
NER	85	66.41%	RNE	2	1.39%
NR/E	2	1.56%	NER	1	0.69%
ENR	1	0.78%	ENR	35	24.31%
RNE	2	1.56%			
Total	128	100.00%	Total	144	100.00%



Université d'Ottawa • University of Ottawa

Faculté d'éducation

Faculty of Education

January 24th 1997

Mr. Alexander Abdenur,
P.O. Box 201
Station B
Ottawa Ont., K1P 6C4

Mr. Abdenur,

The Ethics committee has received your answer to its concerns, and therefore gives your research project "The Impact of Cultural Background on Epistemic Orientation" full approval for the duration of one year.

With regards and best wishes of success,

A handwritten signature in dark ink, appearing to read 'Aline Giroux'.

Aline Giroux, chair.