INVESTIGATING THE LEARNING STYLES OF FIRST YEAR STUDENTS USING HONEY AND MUMFORD'S LEARNING STYLES QUESTIONNAIRE

BY

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ABSTRACT

This research project investigated the measurement of learning styles utilising a particular learning styles instrument. The learning styles instrument that was employed was Honey & Mumford's Learning Styles Questionnaire. The project sought to enquire whether this questionnaire can be usefully applied at an institution of tertiary education in South Africa such as the University of the Witwatersrand. Student reactions to Honey & Mumford's Learning Styles Questionnaire suggest that in a South African context it may not be an appropriate instrument to measure learning styles.

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CHAPTER 1 INTRODUCTION

At the University of the Witwatersrand the "Perception of Wits" report suggested that academic excellence should also subsume excellence in teaching, and that the teaching aim of the university should be to acknowledge the grossly inadequate educational preparation suffered by a large sector of the community and that without compromising degree standards the University should aim to offer the necessary assistance to all students to enable them to realise their full academic potential.

As part of the process towards improving teaching and learning more research has to be carried out on learning at the University level. This involves asking questions about students, teaching and the environment in which students and teachers interact. Some of the questions that need to be raised are inter alia:

1. How do students learn?
2. Why do students learn in a particular way?
3. What effect does the environment in which students and teachers find themselves have on their respective learning and teaching dispositions?
4. How can we best measure the way students learn?

This research project teases out some of the issues related to these questions as part of the process towards ensuring that the university redirects its attention towards teaching and learning.

One direction which research into teaching and learning has taken has been investigations into learning styles. At its simplest level, this research has focussed on the learner's preferred way of doing things that relate to learning. Common to such research has been the administration of learning styles

inventories/questionnaires. This type of research is based upon the assumption that learning styles can be determined using learning styles inventories/questionnaires and that the information which such research yields can inform the direction and therefore the quality of instruction.

This research project used the learning styles questionnaire developed by Honey & Mumford and investigated whether it can be applied at an institution of tertiary education in South Africa, viz., the University of the Witwatersrand. Further to this, the research project attempted to determine whether Honey & Mumford's Learning Styles Questionnaire measures all the variables associated with the concept learning styles.

This was done, firstly, by administering Honey & Mumford's Learning Styles Questionnaire (1982) to students enrolled for Sociology I and Chemistry I during 1988 at the University of the Witwatersrand. Secondly, a select sample of students enrolled for these courses were interviewed in semi-structured, in-depth interviews. In addition, a questionnaire was also administered to a random sample of the same student population.

For the purposes of this research project the following working definitions of the concepts have been adopted:

> Styles - styles refers to pervasive qualities that persist even though situational conditions may change (Conti & Welborn, 1986:20). However it must be understood that styles are dynamic, they change over time though there are certain enduring traits that persist. "Style" also describes the operational behaviour associated with an individual's educational philosophy. Thus teaching styles would refer to a set of identifiable classroom behaviours of the teacher even though the content of what is being taught may change.

Learning Styles - According to Keefe (1985:138) learning style, recognised by observing a student's overt behaviour, indicates how a student learns best. "Styles" for Keefe (ibid.), reflect genetic coding, personality development, and environmental adaptation. They are relatively persistent qualities in the behaviour of individual learners. Similarly Dixon (1985: 16), following Kolb, argues that learning style refers to the individual's preferred way of grasping and transforming information. She further argues that an individual has a predominant learning style though that same individual may possess more than one learning style. As she (ibid.) says:

> Any individual may have preferences for group work, auditory input, a holistic rather than a serial presentation of information. Matching instruction to multiple variables becomes much more than matching to only one variable.

Learning styles then for the purposes of this research is taken to refer to the following:

a) an individual's preferred way of doing things that relate to learning;
b) that which is constituted by cognitive, physiological and environmental elements; and
c) that which is constituted by a predominant way of learning but does not consist of only one way of learning.

The overall aim of this research project is to investigate whether Honey & Mumford's Learning Styles Questionnaire can be applied usefully at the University of the Witwatersrand and to uncover the implications thereof.

The specific aims and objectives of this study are:

a) to provide a comprehensive review of the literature relevant to the field of learning styles;
b) to use Honey & Mumford's Learning Styles Questionnaire to determine the learning styles of two groups of students from the University of the Witwatersrand and to obtain a distribution of learning styles across the sample;

c) to critically examine the content and structure of Honey & Mumford's Learning Styles Questionnaire by:

   i) soliciting students opinion, and

   ii) conducting an item analysis of students' responses to Honey & Mumford's Learning Styles Questionnaire;

d) to relate the results obtained from students' classification of their learning style with that of their results obtained from their responses to the questionnaire; and

e) to suggest future research directions based on the results obtained.

CHAPTER 2 LEARNING STYLES : A LITERATURE SURVEY

Learning style research starts off with the commonly accepted assumption that all people do not learn in the same way. From this basis various researchers have attempted to measure and classify such individual learning differences. With differing emphases the focus of learning style research has always been on how students learn.

2.1. WHAT IS LEARNING STYLE?

> Every complex problem has a simple obvious solution that is wrong. (Menken p.23)

One of the first issues that confronts researchers working in the field of student learning styles is the varied and sometimes contradictory definitions of the concept. Various researchers have defined learning style differently and as a consequence measure it differently. This fact led Brenenstuhl and Catalanello (1979:29) to state that "one problem with research in learning style is that no one has clearly defined the basic elements underlying learning styles".

For Dunn et al (1979:41) learning style is "the manner in which at least 18 different elements from different stimuli affect a persons ability to absorb and retain." These 18 elements are: sound, light, temperature, design, motivation, persistence, responsibility, need for structure, working alone, working with another student, working with many students, working with a team of students, working with an adult, working with some combination of adult and peers, perceptual strengths, intake, time of day, and, need for mobility. The problem with such a definition is

that it does not explain how these elements interact. How Dunn et al decided on these 18 elements and 4 stimuli require clarification. More significantly, the manner in which cognitive processes which are ways of processing information, interact with these 4 stimuli needs to be examined. Hyman & Roshoff (1984) argue that such a definition is based on a particular learning theory evidenced by the metaphor it uses. The words "absorb" and "retain" suggest the sponge metaphor in which one physical object sucks up into its pores (absorbs) a liquid material (information) and keeps it inside (retains) without changing or using the material substantially. What is lacking in Dunn et als' conceptualisation is that it does not tell how a student learns or what is involved in students' learning but only how certain elements affect an individual's ability to store and retain information. This flaw is serious because it does not explain the processes involved in student learning.

Hunt (1979) proposes a narrower definition of learning. Hunt (1979:27) describes learning styles in terms of those educational conditions under which a student is most likely to learn. He then narrows his definition even further by dealing with how much structure a student needs at a conceptual level. In short, in defining learning style in this narrow way, Hunt attempts to deal with the degree of conceptual complexity with which a student processes information about people, things and events. Hyman & Roshoff (1984) state that the problem with this definition is that it is not clear how, from a paper-and-pencil test which lasts for 2 minutes and in which students write 2 or 3 sentences on 6 or 8 topics, it is possible to measure the conceptual complexity inherent in determining learning styles. They (ibid)

suggest that conceptual level for Hunt is a euphemism for "the degree of order I think I need in order to learn best". Hyman & Roshoff (1984) state that one would imagine that conceptual level would deal with thinking and concepts rather than with the amount of structure needed in order to learn. In fact, Hunt's learning style definition does not indicate how a student learns. It only indicates how much structure a student requires.

Gregorc (1979a:19) states that "learning style, from a phenomenological viewpoint, consists of distinctive and observable behaviours that provide clues about the mediation abilities of individuals." Gregorc (1984) believes styles to be qualities of mind that people possess in dealing with reality. Hyman & Roshoff (1984) state that Gregorc with his "behaviours" is giving clues about the ability to mediate, which is a cognitive ability. He leaves us in need of clarification of the term "mediation abilities". Furthermore they (ibid) state that Gregorc confuses learning style with cognitive style.

Schmeck bases his definition of learning style on Craik & Lockhart's model of information processing. Schmeck (1983:233-234) writes, "a learning style is a predisposition on the part of some students to adopt a particular learning strategy regardless of the specific demands of the learning tasks. A style is simply a strategy that is used with some cross-situational consistency". (my emphasis) The problem with this definition is that it posits a "in-the-final-instance" argument. Schmeck essentially argues that in the end students will adopt a particular learning strategy immaterial of the task at hand. Schmeck does not explain why this should be the case.

Kolb (1984) defines learning style as the individual's preferred way of grasping and transforming information. He argues that each individual possesses a unique learning style with characteristic strengths and weaknesses. Learning style for Kolb is an attempt to resolve certain conflicts experienced in everyday existence. As Kolb (1976:4) put it:

> as a result of our hereditary equipment, our particular past life experience, and the demands of our present environment, most people develop learning styles that emphasise some learning abilities over others. Through socialisation experiences in the family, school and work we come to resolve the conflict between being active and reflective and between being immediate and analytical in characteristic ways

The weakness of Kolb's definition is that he relates learning styles to ability. The problem with this understanding is that ability is a value-laden concept in educational psychology. Furthermore if learning style is one's learning ability how can one measure learning ability through a learning styles instrument? Kolb's definition of the concept learning style is vague and consequently this makes measurement difficult.

Keefe (1982) sees learning style as a compcsite of cognitive, affective and physiological factors. As Keefe(1982:44) put it:

> learning style is the composite of characteristic cognitive, affective and physiological factors that serve a relatively stable indicators of how a learner perceives, interacts with and responds to the learning environment. It is demonstrated by the pattern of behaviour and performance by which an individual approaches educational experience

Hyman & Roshoff (1984) argue that while Keefe does have a broader definition than most of the concept learning style, his definition does not offer any specificity about learning behaviour nor does it provide any operational way to define these

learning behaviours.

Pask (1976b) concurs with Entwistle & Ramsden (1983:26) that the general tendency to adopt a particular strategy is referred to as learning style. Entwistle, Hanley & Hounsell (1979:369) define learning style as follows:

> it seems important to distinguish between strategy and style, where strategy is a description of the way a student chooses to tackle a specific learning task in the light of perceived demands, and style is a broader characterisation of a students preferred way of tackling learning tasks generally

The problem with this definition is that how does one measure a learning strategy using a learning styles instrument?

2.2. Is Learning Style Constant?

Another crucial aspect to consider with the concept learning style is whether learning style is constant or context-specific, that is, whether learning style is changeable. Dunn (1982:145), Hyman & Roshoff (1985:41), Perry (in Chickering 1981:103) and Schmeck (in Dillon & Schmeck 1983:235) believe that while learning style for a given period is constant, it cannot be assumed that an individual's learning style will not change. Elton & Laurillard (1979:398) and Martin & Saljo (1976b:125) believe that learning style is dependent on the learning context and is therefore not consistent. Laurillard (1979:408) put it as follows:

> it would therefore be hazardous for an investigation of learning to proceed on the assumption that learning is a process that is independent of other factors, or that the student possesses inherent invariant styles of learning

Authors adopting the latter position believe that it is senseless to prepare generalised descriptions and measures of learning

style and suggest that learning style should rather be understood within the context in which it takes place. This is one of the major issues that this research project has highlighted.

2.3. HOW DO WE MEASURE LEARNING STYLE?

There seem to be two orientations in determining learning styles (cf. 2.4.& 2.5.); the first one being in-depth interviews in either an experimental or natural setting and the second, by far the most common, being self-report inventories. This project concerns itself with the latter.

Dunn (1983:62) argues that " ... at college, secondary, and elementary levels students can identify their learning styles using self-report inventories". Grasha (1984) has doubts about the value of self-report inventories because they are: ambiguous, grounded more in attitudes than in behaviour and, difficulty to apply to instructional environments.

The ambiguity arises from the frame of reference for the instruments. Often it is too general; people being asked to respond to questions set in the frame of reference of "your life" or "all of your classes taken together". People do not share the same life experiences and their perception of their classes in general differ. Another source of ambiguity is people's attitude towards giving socially desirable responses. Very few people are prepared to admit that they are competitive or that they do not understand a question. Another closely related issue is that self-report inventories may be revealing more about what people would like to believe they do rather than what they actually do. Furthermore, Grasha (ibid) says that the correlation evidence

presented to support the reliability and validity of such instruments is low or moderate. He suggests that one way to combat this is to use observational methods similar to the in-depth interviews mentioned above. In this way one can determine how a person acquires information and skills.

Grasha (1984) and Dunn (1984) on surveying research into learning styles stated that such research has reached a point where educators and social scientists are behaving like the blind man describing an elephant, each investigator answers the same question "What is an elephant?" but in very different ways. The next part of the chapter will consider how some of the learning styles researchers have attempted to answer the above questions.

2.4. Research Into Learning Styles

Broadly speaking, researchers concentrating on learning styles can be categorised into two groups, the first group consists of researchers working on the European continent and the second of those working in America. Both groups draw upon their own experiences and measure learning style differently. (cf. Notes 1)

The work of all learning style researchers have as their point of departure the investigation of Pask and the Gothenburg group in the mid- to late-1970's.

2.4.1. Pask.

Pask (1976a, 1976b; Pask et al 1977, Pask & Scott, 1972) conducted his research into the learning situati within the framework of experimental research, whereby control and

experimental groups were set up with pre- and post-test measures used to determine differences in learning strategies. Pask (ibid) claimed that there were two general categories of learning strategy which could be identified in cognitive tasks:

> Serialists learn, remember and recapitulate a body of information in terms of string-like cognitive structure where items are related by simple data links...
> Holists on the other hand, learn, remember and recapitulate as a whole

Pask (ibid) suggested that holism and serialism were extreme manifestations of more fundamental processes which he called learning styles. For Pask learning styles are based on the cross-situational consistency of the above-mentioned learning strategies. Thus, people who consistently use a holist learning strategy exhibit a comprehension learning style. Comprehension learners have a wider focus of attention and try to build up a big picture before attempting to find where the details fit. Persons using a serialist learning strategy exhibit an accompanying operation learning style. Learners using operational learning focus on details and progress linearly from one topic to another.

Pask (1976b) notes that learners rigidly adhering to either comprehension or operation learning are likely to fit into the learning pathologies of either globetrotting or improvidence respectively. The pathology of globetrotting involves forming conclusions on the basis of insufficient evidence, oversimplifying and overgeneralising. Improvidence is associated with a failure to either use analogies or build overall maps.

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understanding one needs to employ both learning strategies. A student employing both learning strategies is characterised by Pask et al (1977) as one exhibiting a versatile learning style. The versatile student uses a higher-order metacognitive strategy based on both the serialist and holist learning strategies, alternately employing analogy to get an overall model and then testing its applicability by examining details. Pask et al (1977) describe a versatile learner as follows:

> A student who is versatile is not prone to vacuous globe-trotting, he does indeed build up descriptions of what may be known by a rich use of analogical reasoning, but subjects the hypothesis to test and operationally verifies the validity of an analogy and the limits of its applicability

2.4.2. The Gothenburg Group

One of the major research projects to have a significant influence on research into student learning styles has been the work of Marton and his colleagues (19/6a; 1976b; Svenssson, 1977; Fransson, 1977) in Sweden. In the literature these researchers are known as the Gothenburg group and the emphasis of their research has been on the "what and how" of learning rather than on the "how much".

Their research was based on extensive interviews with students combining a qualitative analysis of students' introspection with the systematic approach used in experimental methods of research. Their samples consist mainly of first year-students drawn from departments in the social sciences.

Marton & Saljo (1976a, 1976b) used interviews to find out what students do when they read a text. Students were asked to read a text and were thereafter asked questions relating to the text.

Marton & Saljo attempted to establish the outcome (what students had learned), the intention (what students expected to get from their learning), and, the approach (how students go about the actual process of reading an article) with regards to the reading of texts by students. From these interviews they distinguished two different approaches to learning called the deep- and surface-level approaches:

> In the case of surface-level processing the student directs his attention towards learning the text itself (the sign) i.e. he has a "reproductive" conception of learning which means that he is more or less forced to keep to a rote-learning strategy.
> In the case of deep-level processing on the other hand, the student is directed towards comprehending what the author wants to say about, for instance, a certain scientific problem or principle

The outcome associated with deep-level processing is, according to Saljo & Marton (ibid), conclusion-orientated and is characterised by an attempt to understand. Surface-level processing is characterised by an attempt to memorise and is description-oriented. With surface processing a student focuses on specific facts and pieces together rote-learned, disconnected information. Saljo & Marton (ibid) argue that those who adopt a surface approach will fail to grasp the meaning of a text while a deep approach results in comprehension.

Similarly Svennson (1977) noted deep- and surface-level approaches in students' normal studying and found superior examination performance by those who were using a deep-level approach. Also, Fransson (1977) demonstrated that students are more likely to use a shallow-level approach when the contents of an article is not of interest to them, and in any situation which raises their level of anxiety. In another research project,

Dahlgren & Marton (1978) examined the level of understanding of economic concepts demonstrated by students majoring in economics. They found a very low level of understanding and concluded that the stresses of the curriculum, and the use of examinations that reward memorisation were responsible.

In all their work, the Gothenburg researchers emphasise the impact of contextual demands such as content, instructions and tests on a student's learning. A student is not deep or shallow, the students' approach to reading within a given context is classified as such. The Gothenburg researchers argued for a research perspective that viewed learning from within the students' own perspective.

The research of Pask and the Gothenburg group on learning styles and approaches was taken up in two long term research programmes in Australia and England using the questionnaire method of data-gathering.

2.4.3. Entwistle

Entwistle began his programme in 1968 with the aim of identifying objectives of higher education and isolating student personality and motivational differences that would predict academic performance. Study methods and motivations were originally developed by Entwistle and Wilson and were subsequently revised. The most recent version of the Lancaster inventory produced by Entwistle, Hanley & Ratcliffe (1979) has been influenced by the work of Pask, Marton and Biggs.

The "Approaches to Studying Inventory" as it is called, isolated

three major orientations towards studying by students. These are: meaning, which is the search for personal understanding; reproducing, which is memorisation; and achieving, which is directed solely towards obtaining high grades. Each of these three orientations are characterised by extrinsic or intrinsic motivation: meaning-oriented students are characterised by intrinsic sources of motivation while reproducing- and achieving-oriented students possess extrinsic sources of motivation.

Each of these orientations predispose students to adopt a particular approach to studying. The student seeking meaning will use a deep-level approach or a holist strategy. The person prone to reproducing will adopt a surface-level approach or a serialist strategy. Students with an achieving orientation will use any approach or strategy towards their studies as long as it ensures high grades. Table 1 below summarises the categories identified by the Lancaster inventory (1979, p.376).

TABLE 1 SUMMARY OF ENTWISTLE'S APPROACHES TO STUDYING INVENTORY

Factor	Orientation and intension	Motivation (personality type)	Approach or style	Process		Outcome
				Stage I	Stage II	
I	Understanding	Intrinsic (Autonomous and syllabus-free)	Deep approach/ versatile	All four processes below used appropriately to reach understanding		Deep level of understanding
			Comprehension learning	Building overall description of content area	Reorganising incoming information to relate to previous knowledge or experience and establishing personal meaning	Incomplete understanding attributable to global styling
II	Reproducing	Extrinsic and fear of failure (Anxious and syllabus-bound)	Operation learning	Selected attention to evidence and ideas in the argument	Relating evidence to conclusion and maintaining a critical, objective stance	Incomplete understanding attributable to lack of evidence
			Surface approach	Memorisation	Overlearning	Surface level of understanding
III	Achieving high grades	Need for success (Stable, self-confident, and ruthless)	Organised/ achievement orientated	Any combination of the six above processes considered appropriate to perceived task requirements and criteria of assessment		High grades with or without understanding

2.4.4. BIGGS

Biggs (1976) carried out research similar to Entwistle's aimed at the development of an inventory for measuring learning styles. His original inventory (1970) was called the Study Behaviour Questionnaire but it has been revised and is now called the Study Processes Questionnaire (1979).

Biggs (1979) identifies three factors in assessing learning styles and these include both cognitive and motivational components. The first, utilising, includes a fact-role cognitive strategy and an extrinsic, fear of failure motivational component. Schmeck (1983) argues that the utilising individual would, presumably, be a shallow-level processor.

The second factor, internalising, contains a meaning-assimilation cognitive component and need for achievement as a source of motivation. Schmeck (1983) states that the internalising individual would be a deep-level processor.

The last factor, achieving, has study skill and organisation as cognitive components and need for achievement as a source of motivation.

Biggs (1979) also developed an outcome based measure called the Structure of the Observed Learning Outcome (SOLO). An individual's SOLO level is determined by presenting individuals with a display of information (e.g. a paragraph) and a rather open-ended question to which they respond in writing. The essay answers are then scored by trained raters using the scoring system developed by Biggs.

The SOLO taxonomy, according to Biggs (ibid), consists of five levels of response. The five levels are:

1. Pre-structural. At this level the response has no logical relationship to the text and is characterised by incomprehension.
2. Uni-structural. There is only one relevant item from the text.

   Multi-structural. There are several relevant items but these items are only clues that agree with a chosen conclusion.
4. Relational. Most of the relevant data is used and there is a firm conclusion.
5. Extended abstract. The content is seen only as one instance of a general case.

Biggs studied the relationship between his Study Processes Questionnaire and SOLO. He found partial support for his prediction that utilising students develop a shallower level of understanding. Students with an achieving orientation demonstrated a shallow learning outcome under conditions that encouraged a deep-level approach.

2.4.5. Laurillard

Research in Europe conducted by Entwistle & Ramsden (1983); Laurillard (1979); Ramsden (1979) and Svensson (1977) has emphasised the context in which learning takes place as an important element influencing learning and learning styles.

In a study of undergraduate students who attended, on average, 3 x 1-hour sessions to talk individually about some learning

tasks they were doing as part of their course, Laurillard (1979) determined that students did not possess fixed learning styles but rather used a variety of approaches. Laurillard concluded from these interviews

(a) that students cannot be characterised in terms of dichotomised descriptions of learning (i.e. deep or surface);

(b) this is because they are responsive to the environment and their approach to learning is determined by their interpretation of that environment

Other European researchers concerned with student learning and learning styles include Rossum & Schenk (1984), Gibbs et al. (1982), Hattie & Fitzgerald (1983) and Thomas & Bain (1982).

2.5. Learning Styles Research In America

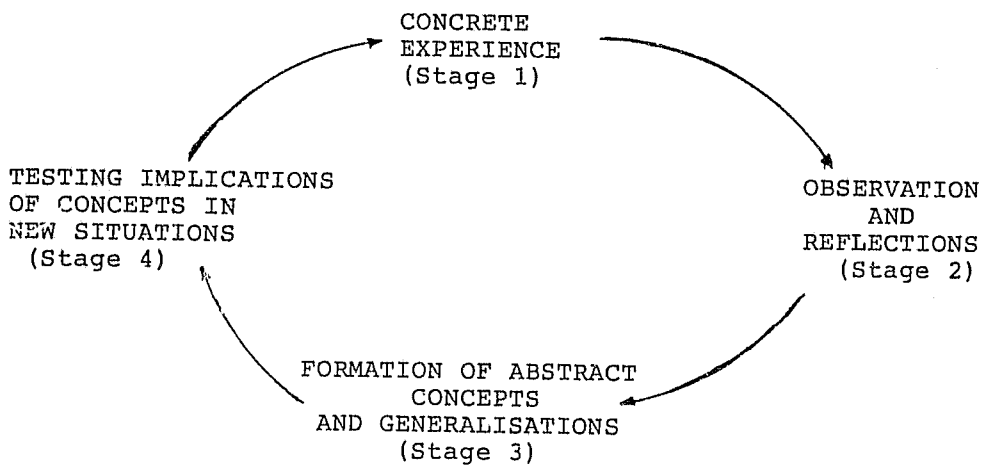
During the late 1970's interest was re-awakened in C.G. Jung's theories of psychological types. In Jung's scheme, psychological type is descriptive of what is now called learning style. It was Jung's ideas on perception and judgement together with the pragmatic pedagogical concerns of the European researchers that were to lay the basis for the creation of inventories in North America. These drew upon varied psychological theories as is evident in Schmeck's Inventory of Learning Processes which is modeled upon Craik and Lockhart's levels of processing approach to Kolb's Experiential Learning Model. These were used by teachers and researchers to assess student preference for difficult teaching methods, predict academic performance and career choice, measure problem solving ability, and determine preference for abstract or concrete course content. These

instruments gained popularity due to their relative brevity and ease of interpretation. One of the first of these inventories was created by Kolb.

2.5.1. Kolb - Learning Style Inventory (LSI)

The LSI is based on Kolb's Experiential Learning Model. Kolb's (1976 p.2) learning model is based on a description of the learning style, how experience is translated into concepts, which in turn are used as guides in the choice of new experience. Learning is viewed as a four stage cycle. Immediate concrete experience (Stage 1) is the basis for observation and reflection (Stage 2).
These observations are assimilated into a theory from which new implications for action can be deduced (Stage 3). These implications or hypotheses then serve as guides in acting to create new experiences (Stage 4).

FIGURE 1 KOLB'S REPRESENTATION OF A EXPERIENTIAL LEARNING MODEL



Kolb contends that an individual's learning style is related to the individual's personal development and growth. Kolb in his

model suggests that people go through three growth processes:

(i) acquisition;

(ii) specialization; and

(iii) integration.

Acquisition is the stage during which an individual acquires basic learning abilities. Specialisation is when an individual emphasises a particular learning style leading to increased competence in the vocational and personal spheres of an individual's life. Integration is the third phase where there is a reassertion of learning styles that have been minimised in the early years.

Kolb (1976:5) regards his LSI as a " ... simple, self-description inventory, designed to measure an individual's strength and weaknesses as a learner". . The words that are included in Kolb's LSI were chosen from a larger list that was given to a panel who were familiar with the inventory. In the LSI there are nine sets of 4 words that an individual is asked to rank order. These sets of words describe different learning abilities. The LSI yields six scores. Four of the six scores are accounted for by one score each for concrete experience (CE); reflective observation (RO); abstract conceptualisation (AC); and active experimentation (AE). These four scales are derived at by adding the rank values assigned to six of the nine words. The other two scores are combination scores, one that indicates the extent to which the individual emphasises abstractness over concreteness (AC - CE) and one that indicates the individual's emphasis of activity over reflection (AE - RO). By means of

plotting the point of intersection of the two combination scores on a Learning Style Grid, an individual is placed in one of the 4 quadrants, each of which represents one of the four dominant learning styles identified by Kolb. These dominant learning styles are accommodator, diverger, assimilator and converger. The four learning styles and their characteristics and dominan· features are presented in the table below.

TABLE 2 LEARNING STYLE CHARACTERISTICS

TYPE	CHARACTERISTICS	DOMINANT FEATURES	MAJORS
Accommodator	- greatest strength lies in doing things & becoming involved in new experiences - more of a risk taker - excels in adapting him/herself to specific situation	CE & AE	Business Education
Assimilators	- greatest strength lies in the ability to create theoretical models - excels in inductive reasoning - concerned with the practical use of theories	AC & RO	Economic Mathematics Chemistry
Convergers	- greatest strength lie in the application of ideas - tend to do best when there is a single correct answer to a problem - focuses knowledge on specific problems	AC & AE	 Engineers
Divergers	- greatest strength lies in in imaginative ability - excels in viewing concrete situations from many perspectives - has broad cultural interest	CE & RO	History English Political Science

Research using Kolb's LSI has been carried out by Mark & Menson (1982) in a Portfolio Development Course, by Biberman & Buchanan

(1986) across Business and other academic majors and by Garvey, Bootman & McGhan (1984) amongst Pharmacy students. They have all agreed that the LSI has been both useful and valid. Modifications to Kolb's LSI has also been attempted. Marshall & Sheritt (1985) have attempted to develop an alternate form of the LSI called the Learning Styles Questionnaire.

2.5.2. R.R. SCHMECK, F. RIBICH & N. RAMANAIAH - INVENTORY OF LEARNING PROCESSESS (ILP)

Schmeck and his co-workers (Schmeck & Grove, 1979; Schmeck & Ribich, 1978, Schmeck et al., 1977) developed their ILP with the intention of studying the behavioral and conceptual processes which students engage in while attempting to learn new material.

Schmeck and his co-workers developed the inventory by extrapolating from theories of human learning and then producing items which describe study processes. Schmeck (1983) believes learning styles to be a predisposition on the part of some students to adopt the same learning strategy regardless of the specific demands of the learning task. He further states that learning strategy is a pattern of information processing activities used to prepare for an anticipated test of memory. This understanding of learning, learning styles and learning strategy is based on Craik & Lockhart's (1972) concept of levels of processing. This concept includes the assumption that memory is the result of traces left behind by information processing. These authors further state that processing activities vary along a continuum from shallow (in which the physical stimulus is the sole object of attention) to deep (in which meanings and conceptions are processed). Craik & Lockhart assumed that deeper

processing laid down more enduring memory traces.

The ILP items were developed by three experts in the field of human learning and memory. These experts first prepared a list of the processes uncovered by research or advocated by major theories in the areas of human learning and memory. Thereafter these experts drew up behavioral descriptions of these processes. Following these procedures 121 items were initially chosen. This was later reduced to 62 items after factor analysis. The 62 items can be grouped in four scales which represent learning and learning activities of university students (Schmeck in NASSP, 1982; Schmeck in Dillon & Schmeck, 1983; Schmeck & Phillips, 1982; and Schmeck et al. 1977).

The four scales are :

1. Deep Processing - This was known initially as synthesis-analysis and comprises 18 items. (Schmeck in Dillon & Schmeck, 1983:245). Schmeck (ibid:247-248) states that deep processing is an information process of verbal classification and categorical comparison.
2. Elaborative Processing - This scale comprises 14 items from the ILP. It means the extent to which students translate new information into their own terminology, generate concrete examples from their own lives, relate new information to their own experience, and use visual imagery to encode new ideas. (Schmeck in Schmeck & Dillon, 1983:248).
3. Fact Retention - This scale comprises only 7 items. Learners who obtain high scores on this scale carefully

process details and specific pieces of new information. (Schmeck et al. 1977:418,428). Entwistle & Ramsden (1983:94-95) are critical of items in this scale because they believe it does not focus on how learners process information but rather on outcomes rated by learners themselves. They term this the self-rating of outcome.

4. Methodical Study - This scale consists of 12 items. Learners who score high scores on this scale claim to study more often and more carefully than other students, and follow what are termed "how to study" approaches (Schmeck in Schmeck & Dillon, 1983:249)

The ILP is essentially made up of 62 true-false statements. The scores for each scale consist simply of the total number of items keyed in any direction. Schmeck & Phillips (1982) state that the test-retest reliability of Deep Processing is 0.88; of Elaborative Processing, 0.80; of Fact Retention, 0.79; and of Study Methods, 0.83.

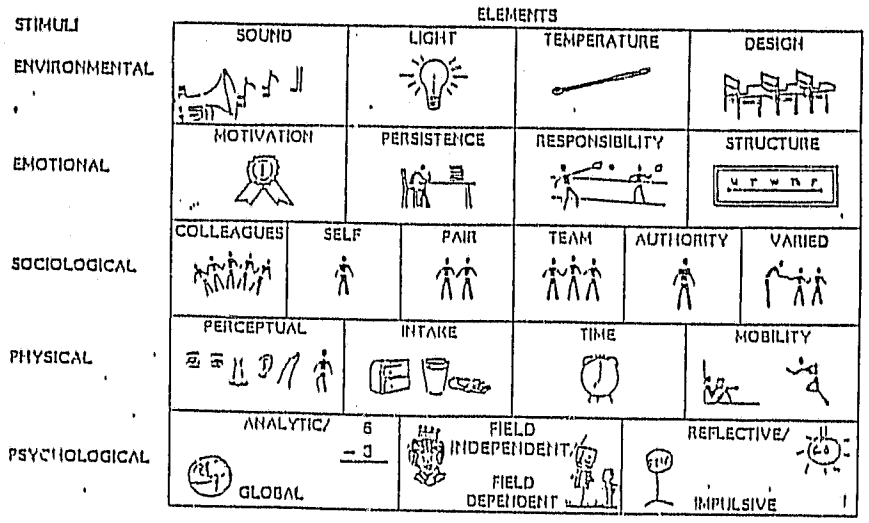
The ILP was also used by Watkin & Hattie (1981) in Australia. Ribich & Schmeck (1979) conducted a study using Kolb's LSI, Biggs' SPQ and their ILP and attempted to determine the extent of correlation. They argued that overlapping between the three inventories was small to moderate and that what overlap existed was due to a common factor related to the depth of processing conception of memory. Schmeck (in Schmeck & Dillon, 1983:233 -276) provides a useful review of the work done using the ILP. Lockhart & Schmeck (1983) also used the ILP to design and revise a course in research design.

2.5.3. DUNN, R; DUNN, K; & PRICE, G - LEARNING STYLE INVENTORY (LSI)

Dunn (1984:12) understands learning style to be the way in which each person absorbs and retains information and/or skills. Regardless of how that person is described, it is dramatically different for each person. Dunn & Freeley (1984) define their research into learning styles as falling within the scope of examining the conditions under which students begin processing information. They are thus not so much concerned with the manner of processing information but rather with the conditions under which such processing takes place. The conditions they refer to are emotional, sociological, physical, psychological and environmental. They see learning as a combination of these elements.

These five basic stimuli together with the various elements can be represented as in the figure below (Dunn, 1984:11; Dunn, & Price in NASSP, 1982:42).

FIGURE 2 THE ELEMENTS OF DUNN ET AL'S LSI



Dunn, Dunn & Price (1981:1) describe the LSI "... as (the) first

comprehensive approach to the diagnosis of an individual's learning style for grade 3 through 12". This instrument is an important and useful first step towards diagnosing the conditions under which an individual is most likely to learn, achieve, create or solve problems.

Work on the LSI began in the period 1968-69 and underwent modifications due to the efforts of Price who did a content analysis of the LSI in 1974. The LSI according to Dunn, Dunn & Freeley (1984:4-5) analyses the conditions under which students in grades 3-12 prefer to learn through an assessment of each of the 18 elements of style described earlier. The LSI uses dichotomous items and can be completed in about 30 to 40 minutes. It reports a consistency key to reveal the accuracy with which each respondent has answered its questions. The scores of the LSI are computed by Price systems in the USA.

Kirby (in Dunn, Dunn & Freeley, 1984:5) states that the LSI has "established impressive reliability and face and construct validity". Examinations conducted by the National Centre for Research also evidenced the predictive validity of the LSI. Price (in Dunn & Dunn, 1984:390) states that a factor analysis of the LSI based on 1 000 subjects in grades one through 12 accounted for 68 percent of variance on the LSI.

Dunn et al. (1981:1) believe that the LSI "... will aid in prescribing the type of environment, activities, social grouping, and motivation factors that would maximise his or her (the learner) learning". Cavanaugh (1981 and in NASSP, 1982) reports that the LSI is useful in improving the quality of

instruction at the school level.

While the LSI is useful for detailing the conditions under which learning takes place, it does not explicate the processes involved in learning. It does not identify for example student motivation, organisation or perceptions of learning tasks.

2.6. HONEY & MUMFORD'S LEARNING STYLES QUESTIONNAIRE (LSQ)

Honey & Mumford's (1982) LSQ was essentially devised for their work in management education. Their inventory emerged as a result of their attempts at developing more effective managers. Honey & Mumford (1982:1) define learning essentially as involving two related processes: knowing something you did not know before and being able to do something you were not able to do before.

Their LSQ was developed in order to promote effective learning by the understanding and use of individual learning styles. They (ibid:2) however maintain that learning styles must be understood in the total learning context and that learning styles and learning are influenced by the environment within which learning takes place.

The theoretical background from which they draw their work is based on Kolb. As Peter Honey (1983:108) puts it :

> As a trainer I soldiered on in my amateurish way for many years before coming across Kolb & Fry's "Learning Styles Inventory" which suggested that people develop preferences for different learning styles in just the same way that they develop any other sort of style - management, leadership, negotiation, etc.

However, while they found the circular learning theory of Kolb acceptable they encountered problems with the prediction and

face-validity of Kolb's LSI. Honey & Mumford (1982:4) stated: "The LSI is based on 36 words (not sentences) which do not describe managerial activities; as a basis for the attribution of styles we found them less persuasive both to us and managers. Nor did we find his description of the four styles ... either congruent with our own experiences, or meaningful to many of the managers with whom we dealt."

While they maintain Kolb's 4-stage process of learning, they differ from Kolb in two ways. Firstly, they base their 80 items around recognisable statements of managerial behavior. Secondly, they believe the answers scored from the LSQ are a starting point and not a finishing point (Honey & Mumford, 1982 :4-5). They maintain that their preference is to focus on observable behavior rather than on the psychological basis for that behavior.

The problem with such an understanding is that they posit a divide between observable behaviour and the psychological basis for such behaviour. One can only understand the observable aspects of student learning if one is able to probe deeper for the reasons underlying the observable aspects. Postulating a divide between the two aspects results in superficial analyses and consequently inappropriate instructional suggestions.

The LSQ has a total of 80 items, with 20 questions for each of their four learning styles. The items that comprise each learning style are given in Appendix B. Respondents are asked to tick or cross each item to indicate whether, on the balance, they agree or disagree with the item. Honey & Mumford (1982:6) maintain that the majority of items are behavioral in nature and that the LSQ

covers general trends or tendencies running through a person's behavior rather than placing an undue emphasis on any particular item.

The learning styles identified by Honey & Mumford (1982:10-15) are as follows:

1. Activist - Activists involve themselves fully in new experiences. Learners exhibiting these styles are open-minded and enthusiastic about anything new. These learners often tackle problems by brainstorming.
2. Reflector - Reflectors like to stand back to ponder experiences and observe them from many different perspectives. Such learners make a thorough collection and analysis of data. With these people what they learn is part of a wider picture which includes the past as well as the present and others' observations as well as their own.
3. Theorist - Theorists adapt and integrate observable facts into coherent theories. These learners prefer to analyse and synthesise. They are keen on basic assumptions, theories, models and systematic thinking.
4. Pragmatist - Pragmatists are keen on trying out ideas, theories and techniques to see if they work in practice. Such learners seek new ideas and tend to act quickly and confidently on ideas that attract them.

Alex Main (1985) summarises their work in the form of the Table 3.

TABLE 3 SUMMARY OF LEARNING STYLES AS IDENTIFIED BY HONEY & MUMFORD

If your preference is for the following style...	You will learn best from activities where...	You will learn least from, and may react against activities where...
Activist	-there are new experiences/problems/ opportunities from which to learn -you are involved with other people i.e. bouncing ideas off them, solving problems as part of a team.	-learning involves a passive role. i.e. listening to lectures, reading, watching -you are required to assimilate, analyse and interpret lots of data
Reflector	-you are able to stand back from events and listen	-you are forced into the limelight i.e. act as a leader -you are involved in situations which require action without planning
Theorist	-activities are being offered as part of a concept,theory, model -you are intellectually stretched by being tested in the tutorial session	-you are pitched into using something without a context or apparent purpose.
Pragmatist	-there is an obvious link between the subject matter and a problem -you are given immediate opportunities to implement what you have learned	-organisers of the learning seem distant from reality i.e. all 'chalk and talk', 'ivory towered'

Honey & Mumford (1982:74) state that the validity of the LSQ is harder to determine when there are few established questionnaires with which to draw comparisons. They maintain that their predictions have been largely accurate although they concede that this hardly constitutes respectable proof of validity. They (ibid) believe that the face validity of the inventory is not in doubt because it has been rare to encounter anyone who disputes the accuracy of their LSQ results. This will be shown to be invalid for the sample used for this research project. (cf. Chapter 4.4.)

The work of Honey & Mumford (1982) suggests that different learners will have different expectations of the courses they attend. Their work also suggests that an individual learner will have developed a unique combination of skills, attitudes, and approaches to learning, and that a knowledge of this will assist the learner in building on his strengths.

According to Main (1985) one of the implications of this work is that it is the learners who set the pattern for what must be achieved, not the teachers or organisers. What has been striking about their work is that very little research has been done with regards to the actual LSQ and it has rarely been used within the University environment. Honey & Mumford (1982:4-5) explain this as follows:

> Our main concern, however, has not been to produce something that is academically respectable, but to produce something which will give detailed practical guidance to those who are trying to develop their abilities, and those who are trying to help them

The above comment by Honey & Mumford is not only contradictory

but also misleading. Surely if one intends to help people develop their abilities or assis those who are helping others, then one has to produce a credible and reliable instrument. The allusion to 'academic respectability' can be interpreted as a rationalisation for the absence of rigour and thoroughness. It may well be a self-defensive posture in order to mask inherent deficiencies in their instrument. They contend, however, that their work has been refined and tested over several years.

2.7. LEARNING STYLES AND CULTURE

Learning styles are based on the notion that individuals are different and learn differently. One of the crucial differences is culture. This was expressed by Decker (1983:43) in the heading to her article: "Cultural Diversity, Another Element To Recognise in Learning Styles". Thus, research into "ethnic groups" is an attempt to determine what influence cultural diversity has on learning styles.

The field of research into minority groups (minority in the sense of representation at school and university level) as regards learning styles has been neglected and is underdeveloped. Very few research projects have been undertaken in this field. Haukoos & Satterfield (1980) used Babich & Randal's Learning Style Inventory to determine the learning styles of students studying a community biology course. They (ibid:1986) found that:

(i) the native and reference population (a 'non-native' group) had more similar than dissimilar learning styles;
(ii) native students were more visually linguistic but less auditory than the reference population; and
(iii) native students preferred to express themselves orally.

Freeley (IUT Conference, Heidelberg Germany, 1986) used Dunn,

Dunn & Price's (1981) Productivity Environmental Preference Survey (PEPS) with underprepared and marginally prepared students. She (1986:710) found that :

1. these students demonstrated a very strong preference for structure and working with an authority figure present;
2. these students had a strong preference for quiet and bright light;
3. these students preferred visual followed by kinesthetic activities; and
4. these students evidenced a preference for afternoon scheduling.

Kaulback (1984:27-37) in a review of research concerning styles of learning amongst native children concluded that much of the learning in "native" societies is non-verbal in nature. By this is meant that these students learn through looking and have a preference for learning through visuals materials. Questioning and imitation were the dominant modes of learning in contrast with learning in "white" societies where children were absent from most of the activities of the elders. He argued that such research has transcended earlier research projects which were biased and based on racist assumptions.

Amongst the more prominent research into learning styles of students from different cultural groups has been the work of Ramirez & Castenada (1974). Ramirez & Castenada (1974) drew from Witkin and others' work on field dependent/independent learning. They applied this concept to certain cultural groups to explain why certain minority groups fail to thrive in the average public school classroom. After conducting preliminary research with Hispanic students, they concluded that the minority child tended to be more field sensitive than non-minority students. Field sensitive learners are described as being more influenced by

personal relationships. These learners (Decker, 1983:46) tend to be more successful when global aspects of the curriculum are stressed rather than details, and when the curriculum is more relevant and personalised to fit their view of the world. Such learners learn better in group activities and prefer to work co-operatively rather than competitively. Ramirez & Castenada (1974) then argued for bicognitive education which involves both modes of perceptual learning; field independent and field sensitive. They state that a field sensitive curriculum should be humanised through the use of narration, humour, drama, and fantasy. This curriculum should emphasise description and generalities and be structured in such a way that children work cooperatively with peers or with the teacher in a variety of activities (Ornstein & Levine, 1982:241-242). Similarly, Lesser (in Messick, 1976:143) also concluded that, "... ethnic group displays distinctive pattern of mental abilities ... in other words ethnicity affects the pattern of mental abilities."

This school based investigations suggests that different cultural groups may develop differing learning styles. Primarily the research indicates that such learners probably learn best visually, co-operatively, kinesthetically, and that they may prefer to personalise their learning. However, research into the learning styles of different cultural groups and the implications for practice derived therefrom are not unproblematic. There are wider political issues to be considered.

One of the first problems of such research is that it can be used for discriminatory purposes. Lesser (in Messick, 1976:145) states that his research has been used to support racist causes.

Furthermore, such research may reinforce ethnic prejudices by creating notions that because different cultural groups learn differently they must be treated differently. Lesser (ibid:158) addresses this issue quite clearly:

> The results of scientific research can be, and will be misused to further unjust causes such as racism by arming the opponents of social reform and by bolstering the arguments from which social injustice .... scientific research on culture actually impedes progress towards social improvement and harms individuals as well

Secondly, there is a problem as to the application of such research. Should schools be created that are based on ethnic identity? Should special programmes be set up for different cultural groups in the same school? Should such differences be ignored? The answers to these questions are difficult and compounded by a whole series of political, social and economic considerations. Yet there is a need to become sensitive to the way different cultural groups learn. After all, the notion of individual differences is the basis of learning styles research. However, in becoming sensitive to these differences the following considerations must be borne in mind:

1. Different learning styles of different cultural groups should not lead to educational practices that emphasise separation, division and disunity;
2. Such research should not be used to justify second-rate education for economically disadvantaged students or minority students; and
3. Sensitivity to such differences should not blind us to the retrogressive aspects of the cultures which upon inclusion into the curriculum may trivialise it.

2.8. Conclusion

Since the initial arousal of interest in the mid-1970's student learning has become a vital part of educational research. The focus on research concerning student learning paralleled a change in thinking in education. Education was now no longer centered on the teacher and the class but rather on the individual and his/her own learning. This change towards a focus on the individual learner was in part a reaction to the largely prescriptive and authoritarian ideas that pervaded and still pervades educational thought.

With the focus on the individual learner came the notion that different students learn differently. How to assess and describe these differences led to the field of learning style research. Learning style research is thus concerned with defining how different individuals learn. This, many researchers felt, was one major step towards individualising instruction and consequently enhancing the quality of education.

The research described in this chapter indicates two main directions that investigations into learning styles has taken. The first has been towards studying student learning style from the learners' own perspective through qualitative means of research. This type of research have largely taken the form of interviews. Learning style within this approach is defined by the researcher in terms of the way the student him/herself goes about the process of learning.

The second major orientation in studies concerning student learning has been the assessment of student learning styles

through the form of learning styles instruments called learning style inventories/questionnaires. These learning styles instruments consists primarily of behavioral patterns which are operationalised in the form of single-sentence statements. Students are asked to respond to these statements on a scale defined by a particular instrument.

Learning styles instruments vary in their manner of construction. Some are constructed solely on the basis of established theories of human behavior. Few draw upon the researcher's own observation of student learning and interviews with students themselves. Some are created by a panel of judges specialising in a particular area of human learning.

These learning styles instruments are modified and refined over a period of time involving exhaustive investigations. All these instruments identify, according to their creators, learning styles yet describe them differently.

Learning styles instruments tend to either explicitly or implicitly focus on particular elements of learning style. Few focus on the conditions under which students learn effectively. Some focus on the cognitive processes involved in student learning. A certain number of these learning styles instruments concentrate on study habits and approaches. Still others attempt to match learning style with academic success/failure.

From the research described in this chapter, the following conclusions can be drawn from attempts to use learning styles instruments in assessing student learning styles :

* learning style is a complex phenomenon covering a wide

range of factors from the personal to the contextual;

* students do not possess a single learning style though they may exhibit a predominant one;
* no single instrument can hope to cover the wide range of factors which make up an individual's learning style;
* all instruments differ in their manner of construction, their intention, their scope and application; and
* all instruments appear to be concerned with assessing how students learn.

Despite the number of instruments and the varied definitions of learning style, learning styles instruments are still by far the most common way of determining a student's learning style and constitute the principal means of investigations for most research projects into student learning. The popularity of learning styles instruments is due to the following reasons :

* learning styles instruments are easy to administer;
* learning styles instruments are not time consuming and do not entail great sacrifices of manpower;
* most learning styles instruments are easy to score and administer; and
* most learning styles instruments are easy to understand and can be made accessible to great numbers of students.

For these reasons, educational research concerning learning styles has taken this direction. This research project locates itself within this framework in order to offer a critique of learning styles instrument.

The specific learning styles instrument that was investigated in

this project is Honey & Mumford's Learning Styles Questionnaire. The reason for choosing this instrument was because :

* little research has been conducted using Honey & Mumford's Learning Styles Questionnaire;
* it is one of the instruments that ASDEC has selected as part of its research project into learning styles; and
* it is one of the instruments that form part of the field of learning styles instruments.(cf. Notes 2)

NOTES

1) In discussing these two groups this literature survey will not attempt to cover all the learning styles that have been defined researched or all the instruments developed but will limit its focus to the more prominent research projects. Only the major trends in learning styles research will be reviewed.

2) A more detailed discussion of the aims and objectives of this research project can be found in Chapter 1.

CHAPTER 3 RESEARCH DESIGN AND PROCEDURE

> Humanity has an infinite number of points of view. God has an infinite number of viewing points! Fynn (1974) Mister God This Is Anna.

The researches of Marton & Saljo in Sweden and Entwistle in Britain have been the lead in an increased interest which is emerging in student learning at institutions of tertiary education. These studies into student learning have employed different research methodologies. Marton & Svensson (1979) analysis' these difference in research methodology in terms of differences in the conception of six aspects of the research process. They (ibid.) argue that underlying the various research strategies there is a variation in the way researchers' view six aspects of the research process. These aspects are: the perspective adopted, the manner of the description aimed at, the conceptualisation of data, the relations between the categories identified, the orientation of research findings, and the conceptions of the application of research. They summarise the differences between these six aspects as follows:

ASPECTS OF RESEARCH PROCESS	RESEARCHERS' VIEW OF ASPECTS
Perspective	Experiential - Observational
Description	Qualitative - Quantitative
Conceptualisation	Contextual - Generalised
Comprehension	Understanding - Explanation
Relations	Internal - External
Use	Emancipatory - Technical

In each case the two research methodologies described above differ in essence how they perceive student learning. The traditional approach, called the observational perspective, involves collecting data about students and teachers within a

framework conceptualised by the researcher. As Marton & Svensson (1979 : 472) put it:

> The learner is the object of our study and (the researchers) observe him and his behavior or functioning ... we observe the learner's world and describe it as we see it.

The alternative, experiential perspective, views the world of the learner as it is experienced by him/her. Laurillard (1979: 29) summarises this position as follows:

> to understand the students bias towards a particular learning style, it is important to see the learning context through his eyes.

This research project does not always fit neatly into one or the other of Marton & Svensson's alternative descriptions. To be more specific: the research project combines the observational and experiential perspective; it includes both qualitative and quantitative description; its data is mainly contextualised, but certain generalisations are undoubtedly made; the orientation of the findings involved both an understanding and, to a lesser extent, an explaining function, and the applications of the research will be both technical and, it is hoped, emancipatory in their consequences.

Specifically, the research procedure that was employed in this research project involved the comparison of data collected by different methods.(cf. Notes 2). In the present research, learning style inventories, open-ended questions, questionnaires and interviews are the means by which data was collected.

3.1. INSTRUMENTATION

The instruments that were employed for this research project are:

(i) Honey & Mumford's Learning Styles Questionnaire;

(ii) A Questionnaire assessing students' attitudes towards Honey & Mumford's Learning Styles Questionnaire; and

(iii) Interviews.

3.1.1. HONEY & MUMFORD'S LEARNING STYLES QUESTIONNAIRE

The instrument used for assessing learning styles for the purposes of this research project was Honey & Mumford's Learning Styles Questionnaire (1982) (cf. Appendix A)

As mentioned earlier, the learning styles of students completing Honey & Mumford's Learning Styles Questionnaire is obtained by asking respondents to state whether they agree or disagree to a set consisting of eighty items. Based on the sum of particular groups of the eighty items, the respondents predominant learning style is obtained. (cf. Chapter 2.6.)

To facilitate the selection of the interview and questionnaire sample students were also asked to provide their student number.

The questionnaire was modified sample in order to allow for students who did not understand particular items or who were not sure of their response, that is, students who neither agreed nor disagreed. The scoring pattern was changed to allow students the following four options for each response: Agree, Disagree, Unsure and Do Not Understand. Furthermore these two response options were included in the questionnaire in order to subject students' responses to an item analysis.

In computing individual students' scores,the results were rescaled in order to determine predominant learning styles.

Rescaling is a statistical technique involving the adjustment of responses to items in which respondents had coded either "Unsure" or "Do Not Understand" . The rescaled score for each learning style of individual students involves treating responses coded as "Unsure" or "Do Not Understand" as "Agree" or "Disagree" based on the following formula:

$$R = OS \times NI / NAD$$

Where R = Rescaled Score .

OS = Original Score Per Learning Style

NI = Number of Items Per Learning Style

NAD = Number of Agrees and Disagrees Per learning Style

It was necessary to rescale each of the four learning styles of individual students in order to make these learning styles comparable to those that would have been obtained had the scoring pattern of the questionnaire not been modified.

The assumption underlying rescaling is that students would have answered according to the above formula. The actual responses of students may differ if they did not have a choice. Nonetheless, rescaling is a validated statistical technique for adjusting responses when scales are modified. (see Philips J, Statistical Thinking)

3.1.2. QUESTIONNAIRE

Following the administration of Honey and Mumford's Learning Styles Questionnaire, a fifteen percent random sample was selected from each of the two groups (cf. 3.2) and asked to fill in a questionnaire (cf Appendix C)

The questionnaire was divided into two parts. The first part captured biographical data concerning the student. This data included student number, year of study, faculty, sex, intended major, other courses registered for and home language. The second part of the questionnaire asked questions directly concerning Honey & Mumford's Learning Styles Questionnaire and questions relating to learning and learning styles. Some of the questions which were included are the following:

* What do you understand by the term learning?
* What do you understand by the term learning styles?
* Honey and Mumford's Learning Styles Questionnaire accurately determines Learning Styles

  Agree Disagree Unsure
* List the items from Honey & Mumford's Learning Styles Questionnaire that you believe have no relevance to determining learning styles.

The questionnaire that was administered included both closed and open-ended questions. In addition, provision was also made for open-ended comments.

3.1.3 INTERVIEWS

A five percent stratified sample from the two groups sample (cf. 3.2) was selected and interviewed in a semi-structured fashion. The interviews were conducted in the following manner:

* Interviewees were asked to complete Honey & Mumford's Learning Styles Questionnaire and the questionnaire. The results of these students were then computed.
* Interviewees attended a subject-specific group interview.

* Subsequent to the subject-specific group interviews, interviewees were individually interviewed.

During the subject-specific group interview, interviewees were told about the nature of the research project. The session was further used to establish rapport with the interviewees and to conduct a general discussion concerning learning and learning styles.

The first individual interviews followed the following schedule:

* Interviewees were given the descriptions of the four learning styles identified by Honey & Mumford and asked to choose the one that described their predominant learning style. The interviewer probed subjects as to their reason(s) for making a particular choice. Subjects were asked to explicate the way they understood the four learning styles.
* Interviewees were then given their results and asked questions relating to the match/mismatch between their results and what they had said earlier.
* Interviewees were then shown the actual inventory and were asked to explain their responses for each item.

One of the issues that the interview focussed upon was whether an interviewees' learning style remains constant or differs from subject to subject.

3.2 SAMPLE

The samples that were chosen for this research project were students registered for Chemistry I and Sociology I in 1988. Undergraduate students studying first-year courses were chosen

because they allow for the possibility of a longitudinal follow-up. The above-mentioned departments were chosen because they are among the larger faculties within the University. There are two parallel groups of students studying first-year Sociology. First-year sociology classes are divided into two groups due to the large number of students enrolled for the course. Honey & Mumford's Learning Styles Questionnaire was administered to one of these groups of students.

Students at Wits University intending to study first-year Chemistry have a choice of two courses: Chemistry I Major and Chemistry I Auxiliary. In addition, there are students who, because of their matric rating and admission interviews, enrol for first-year Chemistry as a half course. It was decided to administer Honey & Mumford's Learning Styles Questionnaire to Chemistry I Auxiliary students because these students experienced great learning difficulties.

From each of these two groups registered for these courses a fifteen percent randomly selected sample was chosen and asked to complete the questionnaire. Five percent of students from both these groups were invited to attend an interview. The selection of the interview sample was based upon stratified sampling. The interview sample was stratified into three groups on the basis of the university admissions ratings: high achievers, medium achievers and low achievers.

In order to be admitted automatically to the Faculty of Arts, students require an admissions rating of 21 points. Students who do not obtain the requisite number of points are given a chance

to write a selection test. (This information was obtained from the Faculty of Arts-31/3/88). On the basis of this information, medium achievers were categorised as those obtaining an admissions rating of 21 points, low achievers as those having a admissions rating of lower than 21 points, and high achievers as those with an admissions rating of more than 21 points. The researcher was informed by the Central Admission Office (31/3/88) that this was indeed a fair categorisation.

A student is automatically accepted to the Faculty of Science if he/she has an admissions ratings of 23 or 24 points. However, students who sat for Joint Matriculation Board or House of Delegates, Department of Education and Culture examinations are admitted if they obtain an admissions rating of 20 points, provided they pass the selection test. (This information was obtained from the Faculty of Science. 31/3/88) On the basis of this information, medium achievers were categorised as those obtaining an admissions rating of 22 points, low achievers as those having a admissions rating of lower than 22 points, and high achievers as those with an admissions rating of more than 22 points.

Within each strata however, students were randomly selected for both groups. Table 4 below gives a breakdown of the sample used in this research project.

TABLE 4 SAMPLE SIZE FOR THE RESEARCH PROJECT

GROUP	HONEY & MUMFORD'S LSQ	QUESTIONNAIRE	INTERVIEW
Socio. 1.	N = 191	N = 26	N = 9
Chem. 1.	N = 90	N = 14	N = 4

N - Number of Respondents

3.4. CONCLUSION

Research into learning styles is one attempt to uncover the processes involved in student learning. As student learning is a complex and varied phenomenon, the methodology employed for this research project incorporates both qualitative and quantitative research techniques. As much of the research into learning styles thus far has been largely quantitative and statistical in nature, this research project has been slanted in the qualitative direction to redress what appears to be an imbalance.

NOTES

1) For the purpose of this study the term "research method" will be taken to have a fairly specific meaning; viz. Techniques and Procedures used in the process of data-gathering.(Cohen & Manion,1980).

2) Where a more holistic view of educational outcome is needed, and where the phenomena being studied are complex, it is appropriate to use triangulation. Triangulation makes use of both quantitative and qualitative data and establishes more valid and reliable data. The rationale for triangulation is that the use of a single method not only distorts data, but produces data which are an artifact of the measuring instrument itself
(Denzin, 1970; Cohen & Manion, 1980; Smith 1975)

CHAPTER 4 FINDINGS AND DISCUSSION

This chapter will examine Honey & Mumford's Learning Styles Questionnaire on the basis of evidence obtained from the questionnaire administered, sample interviews conducted with students and an item analysis conducted on students' responses to Honey & Mumford's Learning Styles Questionnaire.

4.1. DISTRIBUTION OF LEARNING STYLES

Table 5 and Figure 3 shows the distribution of learning styles of the two groups of students, classified on the basis for which each student obtained the highest score. (cf. Appendix E)

FIGURE 3 DISTRIBUTION OF LEARNING STYLES

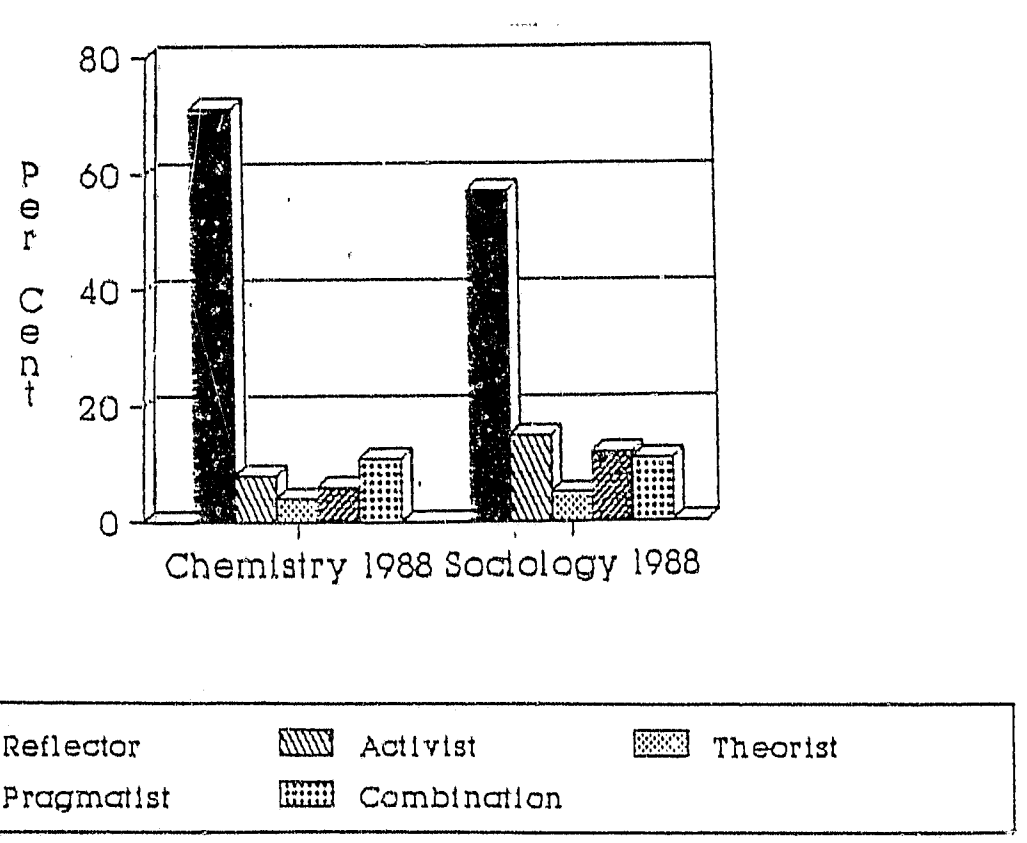


TABLE 5 PERCENTAGE DISTRIBUTION PER LEARNING STYLE

	Reflector	Activist	Theorist	Pragmatist	Combination
Chemistry I N 1988 = 90	71%	8%	4%	6%	11%
Sociology I N 1988 = 191	57%	15%	5%	12%	11%

The grossly uneven distribution across the four learning styles casts some doubt upon the appropriateness Honey & Mumford's Learning Styles Questionnaire in classifying learning styles. If such a large majority of students fall in the Reflector category, it would be difficult to make adequate and continuous provision for the remaining categories, each with about ten percent of the sample.

4.2 THE CONCEPT LEARNING AND LEARNING STYLE

4.2.1. THE CONCEPT LEARNING

From the findings there seem to be three broad categories of understanding concerning the concept learning. One group of students saw learning as being merely factual recall. This group understood learning as involving a process whereby knowledge is received passively without critical reflection. This notion of learning is very much related to the utilitarian conception of education, that is, we learn because we have to! The end product according to this group is not the development of their critical faculties but rather passing and getting a degree. The words these students use to describe their understanding of learning are: "acquiring the fact", "taking in of knowledge", "being able

to reme. ber it", etc. These students see learning as being similar to a sponge; that is, "absorbing" and "pouring out". As the following students expressed it :

> Learning is a process by which knowledge is stored in the brain and the ability to recall such knowledge at will.
> Learning brings to mind having to sit down and learn something parrot fashion.
> Learning is introducing something new to the brain.

The second group of students saw learning as directed towards understanding. Learning for this group involved more than just being able to remember. Learning for these students was concerned with asking why. For this group of students, learning was related to critical reflection and thought. The words used by these students to describe their conception of learning are: "actively understanding", "logic behind that approach", "getting a deeper knowledge", etc. While these students were also concerned with passing, they believed that understanding their work rather than just swotting was the way to pass. In the words of the following students :

> It is understanding your work and being able to apply it in different practical situations.
> Learning means to understand a certain approach to a subject and to absorb the logic behind that approach.
> Learning is the process in which new information is taken in and understood by an individual and integrated into already existing knowledge.
> Understanding, remembering and then being able to apply specific facts, figures and material set out in a course.

The third group of students saw learning in a wider sense. These tudents understood learning to be effected mainly through experience (experience being understood by them in its most general sense) and as aiding the development of their personalities and characters. Studying and being at University was for this group only one particular learning experience. The

words these students used to describe their understanding of learning are: "permanent change resulting from experience", "the means by which one develops as an individual", etc. As the following students expressed it :

> Learning is to gain knowledge through personal experience.
> Education I believe is the learning and development of the whole being especially character development.
> A fine balance should be achieved by an individual between an assessment of facts and intuition. Theories should be adaptable to everyday life.

These three conceptions of learning are similar to Saljo's categorisation of Swedish students' conceptions of learning. Saljo found the answer of students to the question "What is Learning" revealed five rather different conceptions. According to Saljo (1979a) the five conceptions are:

Conception Level 1

Learning as the increase of knowledge

Conception Level 2

Learning as memorising

Conception Level 3

Learning as the acquisition of facts, procedures, etc., which can be retained and/or utilized in practice

Conception Level 4

Learning as the abstraction of meaning

Conception Level 5

Learning as an interpretative process aimed at the understanding of reality

It would seem that many of these first-year students do not understand learning in terms of Saljo's Conception 4 and 5. This would indicate the possibility that many first-year students do

not see learning at the level of abstraction of meaning or as an aid to understanding reality.

4.2.2. THE CONCEPT LEARNING STYLE

When considering students' understanding of the concept learning style it seems that most students thought learning style to be the specific methods/techniques/strategies one employed in studying. This would indicate that for most, learning style is how people structure the way they study. As the following students expressed it :

> It is the way in which you study or learn, what methodology you use and how your studies are approached.
> The technique used to actually learn something is the learning style.
> The manner in which you acquire and store the knowledge needed to pass.
> The strategy one uses to acquire knowledge.
> (my emphasis)

However one group of students saw learning style as being more than the strategies one utilised in studying. These students saw learning style as involving understanding and related to cognitive processes. As the following students put it :

> The way you mentally approach learning and then the physical way in which you carry out your learning.
> The means by which one learns and succeeds. This learning procedure involves an analytical, logical and practical process.
> Learning style is the way in which one gathers information, retains it and then applies it.

Further light on students' conceptions of learning and learning style emerged when students were asked to mention what items they felt should be included in the inventory. Most students' suggestions revolved around note-taking techniques, methods of recall, hours of study, etc. The following are some of the items

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that students suggested should be included in the questionnaire:

At what time of day do you think best?
Do you feel tired before studying?
Does your studies interest you?
Are you consistent in your work?
Do you learn from end or do you start in the middle?
Do you concentrate on sections you like best?
What do you do before and after studying?
Would you prefer a noisy library to a quiet room at home?
What motivates you to learn?
Are you an organized person?
Do you always clarify points you don't understand?
How capable are you in picking out relevant facts?
How successful do you feel about the style you use?
Do you relate matters or principles to other matters or principles?

In addition they also suggested that questions should be asked concerning the following issues :

Summary methods.
Methods for memorising work.
Methods for recalling work.
What distracts student from learning.
Importance of having the ability to learn.
Characteristics of a person e.g. diligence,Self-discipline.
Reaction to pressure.
Receptivity to new ideas.
Previous learning patterns.

It seems that this sample of students would like learning styles instruments to have questions that require more detailed answers. The suggestions of questions that involve detailed answers suggest that students found the single response format of the questionnaire a problem.

It could be argued that the students see learning style as involving three factors; physiological factors, cognitive processes and personality variables. The physiological factors that students felt should be used to assess learning style are noise levels, the need for company and having 'breaks'. The cognitive processes that students identified are methods of recall and the ability to understand. The personal variables

related to students reaction to pressure, diligence and self-discipline.

This suggest that students' understanding of the concepts learning style is more complex and nuanced than that suggested by Honey & Mumford. The type of suggestions that students made are an indication of what they perceive to be lacking and the problem they associate with Honey & Mumford's Learning Styles Questionnaire.

Similarly most learning style researchers (cf. Chapter 2) argue that learning styles involves more than just methods of study. There seems to be some degree of consensus amongst researchers that learning style is constituted by cognitive, physiological and environmental factors. Lynn (1983:7) has argued that

> learning behaviour is fundamentally controlled by the central personality dimensions, translated through middle strata information processing dimensions and given a final twist by interaction with environmental factors encountered in the outer strata

In other words, learning style is analogous to the layers of an onion with instructional preferences being the outermost layers, information processing being the middle layer and cognitive personality style being the innermost layer. In short, most (if not all) researchers argue that learning style is constituted by more than one factor.

The picture that emerges when considering students' conceptions of learning and learning style is that to many students these concepts are distinct. Further than this, students' understanding of the concept learning influences their conceptualisation of the concept learning style. For example, those who see learning as

the process of memorisation see learning style as the specific strategy used to memorise.

More importantly, it is probable that students perceive these concepts in a holistic fashion. That is, they understand learning and learning style to be constituted by the following factors :

1) the specific approaches towards studying. This involves note-taking techniques, summary methods, etc. ;
2) students own characters though not in a general sense but specific to the studying situation, These characteristics are defined as the ability to concentrate, preferences for a quiet or noisy environment, etc. ;
3) cognitive abilities viz., methods of recall, coding of information, etc. ; and
4) context, that is, What are they studying?, Why are they studying?, etc.

The findings from this research project seems to suggest that the dominant understanding of the concepts is largely "technicist", that is, these concepts are understood as a set of traits and mannerisms relating to students' everyday studying experience. This would indicate that students' major problem with Honey & Mumford's Learning Styles Questionnaire is that it does not relate directly to their perceptions. The picture that emerges is of students who are unable to extricate themselves from their university studying environment. Consequently, any inventory that wishes to assess students' learning style would have to start from this basis.

4.3. PROBLEMS ASSOCIATED WITH HONEY AND MUMFORD'S LEARNING STYLES QUESTIONNAIRE

Students who participated in the project were asked to comment on Honey & Mumford's Learning Styles Questionnaire by means of an open-ended question, interviews and a questionnaire. These comments provide valuable insights into various problems students had with this questionnaire. In this way the data shed light on whether the questionnaire can be used to determine student learning styles at the University of the Witwatersrand.

4.3.1. JUDGING ONESELF

Many students felt that the questions asked were "personality-type" questions. As a consequence students' experienced discomfort in answering the questions. Students' reasons for this feeling of discomfort were primarily due to the fact that they felt they were not in a position to judge themselves.

Furthermore, students mentioned that many of the questions were related to how one was perceived by others and they were unable to assess other people's perceptions of their own actions. Students also commented that since every individual is unique they do not know how this questionnaire could help in assessing learning styles. The students expressed their feelings on this issue as follows:

> This inventory is testing people's character and their views concerning other people and work, but since everybody is different I don't know how it will help.
> The questions have an ambiguous notion, as I tend to deal more with the person in question than persons in general.
> It delves considerably into the personal depths of one's mind and it therefore tends to be set up in a conceited manner e.g., "I can do this better". One is not usually sure of one's approach.

> Many of the questions are things you cannot see in yourself, but others may. Therefore some of the questions should be answered by someone who knows you well.

When considering that the sample used for this research project were first-year students who are undergoing a major transformation in their lives, these comments suggest that an inventory of this nature is inappropriate to the level of the sample. In other words, many students at the first-year level have not clearly defined their personalities or their attitudes towards the questions asked at this stage. What students are pointing out is that the inventory is aimed at people who have clearly formed opinions and who are established in their respective professions. The unsettled nature of first-year life, in fact one's entire university experience, makes it difficult for students to respond with decisiveness to the questions asked. These comments are understandable in light of the fact that the sample used by Honey and Mumford were graduates who were established in their careers as managers.

4.3.2. CONTEXT - IN WHAT SITUATION ?

One of the major problems that students identified with the questionnaire was that many of the questions were generalised and did not specify a context for the questions. Students felt uncomfortable in responding to questions that did not refer to specific situations or events. Many students pointed out that their responses would differ depending on the circumstances they found themselves in. One student felt that the questionnaire was similar to career guidance tests which assume that student responses to particular items remain the same irrespective of the context. As the following students put it:

> In some questions e.g. Q52 my response would be different depending on who the people are that are in question. That is in Q52 with long term acquaintances and close friends I may speak about specific things and with people that I have known for a short time I usually engage in small talk.
> The questionnaire can only give an approximate thought to my views on what was asked at the time of asking. I am not sure to what extent my views in this context remain the same and hence the answers.
> The questions are not specific enough and a definite answer cannot be given since one might react differently depending on circumstances of the people involved.
> I find these multiple-choice questions very limiting as I base my situation to a reaction, and that reaction often changes so the answers aren't wholly true, but to the best of my knowledge these are the most frequent answers I would give.
> These questions do not take situational circumstances into account and could produce biased information. Wouldn't it have been better to attach a definite "case study" to some of these questions?

One student who was interviewed put this quite clearly in relation to item thirteen :

> Well, I take pride in doing a thorough job but it depends on the time and amount of work I have to do at the time

The comments made by students concerning the lack of specificity with regard to many of the items indicates that learning for them is not an isolated act. Learning style instruments which ask decontextualised questions make it difficult for students to respond. These comments reflect the notion that the environment is crucial in determining how learning takes place. This becomes more apparent when we consider that most of the items that students felt should have been included in the inventory (cf. 4.4.2.) were directly related to the actual way they went about studying.

For many students, learning style is a very practical activity. Students have difficulty in responding to items of a very general nature. This raises questions regarding the entire exercise of

measuring learning style. In other words, if learning style is a very practical activity and if learning can only be understood within a specific context, can one then talk of an individual's learning style?

Learning style as many of the students who were interviewed commented varies from subject to subject. What this would seem to indicate is the fact that Honey & Mumford's Learning Styles Questionnaire merely provides a snap-shot at a particular moment in time of student learning. It would further imply that learning style instruments are unable to account for the processes of student learning.

The interview data also suggests that students do not have fixed or unchangeable ways of learning. Students who were interviewed stated that their approach to learning changed from subject to subject. As the following students who were interviewed expressed it:

> Psychology leads to a lot more discussion and Chemistry is facts and you can't change and that's sort of fed to you whereas Psychology is fed to you but you've got so many options as well
> I learn differently in all my subjects. In Sociology I just read the text. In psychology I have to think about it and apply it. I use a different technique because the subjects are so different

The reasons for the differences in approach vary, ranging from the nature of the subject to the influence of the lecturer. Can one then talk of the particular learning style of individual students?

These comments seem to, in the end, indicate that one can only understand learning styles within a particular context. Learning

style instruments would seem to have limited applicability as any response to a particular item from any learning styles instrument can only be framed within a specified setting. The lack of specificity is thus one of the major failings identified by students in connection with Honey & Mumford's Learning Styles Questionnaire.

4.3.3. RESPONSE OPTIONS - WHAT TO CHOOSE?

Related to the lack of specificity, many students took issue with the options (cf. Notes 1) provided for each item. The problems students raised in connection with the options that were available for each item related to (a) the type of options provided and (b) the number of options that were available.

As regards the type of options provided students felt the category Unsure does not cover their exact feelings about certain issues. One student answered that she was not unsure of her response but she felt she neither agreed nor disagreed with the statement in the question. Students felt that the Agree/Disagree option was too rigid in that it created an 'either-or' situation. They also commented that the type of options provided are not able to convey the degrees of views they hold regarding particular questions; that is, they may not entirely agree or disagree with a question but only slightly agree or disagree.

Students also pointed out that the number of options available for each item was insufficient. They felt that the options Agree, Disagree, Unsure and Do Not Understand, do not offer sufficient scope for conveying their attitudes towards particular statements. Their suggestions for options varied. The following

were typical suggestions:

a) "Some of the Time", "Most of the Time", etc.

b) Please include the option "Sometimes"

c) Unsure should be replaced by "Usually Agree" and "Tend not to Agree"

d) "Agree", "Disagree", "Neither Agree nor Disagree", "Strongly Agree" and "Strongly Disagree".

Students expressed their views with regards to the answer options as follows:

> When a questionnaire limits one to a choice of its own answers, then one is already limited. Therefore a questionnaire of this nature should have a variety of responses to choose from.
> I think that the column unsure should be scrapped and instead "usually agree" and "tend not to agree" should be used because often one agrees or disagrees on something depending on the situations.
> I find the alternatives of "Agree", "Disagree" and "Unsure" rather limiting, and perhaps they could be replaced by "Most of the time", "Some of the time", etc.
> Some of your questions were incredibly broad demanding a hypothetical answer. But there was nothing between AGREE and DISAGREE. Since the answers in most cases were relative and because there was not a large enough choice of possible answers the questions were impossible to approach.

A student who was interviewed expressed this well when she said:

> Many of the unsures would have been sometimes ... I think Sometimes would have been better because unsure suggests that you haven't thought about it but Sometimes means you know you do it sometimes and other times you don't

The quantitative data from the item analysis corroborate these perceptions. (cf. 4.3.4. & 4.5.) This evidence bears out students comments that the option of either Agree or Disagree is restrictive and problematic.

What students seem to be intimating is that the options provided

for the responses are inadequate, both in terms of number and type. Students' criticisms of the response options provided suggests that they feel that the questions are of a nature for which their feelings are not able to be conveyed through the response format. It also implies that they have problems with 'pigeon-holing' their feelings and that they would prefer a scale which is able to express the nuances of their feelings.

This issue also emerged when students from the questionnaire sample were asked how they felt that their learning style could best be determined. The majority of students from both Sociology I and Chemistry I felt that their learning style could not be best determined by the questionnaire only. They felt that a combination of interviews and a questionnaire would be the best predictor of their learning style.

This would indicate that students are uncertain whether a learning styles instrument can determine their manner of learning. It further suggests that students feel that their learning style is more complex than any learning styles instrument can determine. The suggestion of interviews implies that students see learning style instruments with their fixed response formats as pigeon-holing their varied approaches to learning.

This factor, together with the lack of specificity indicates that students are not able to respond with clarity to any item in Honey & Mumford's Learning Styles Questionnaire. These two factors taken together would suggest that the applicability of this questionnaire to the two groups of students investigated is limited.

4.3.4. LANGUAGE - WHAT DO THE QUESTIONS MEAN?

Honey & Mumford's Learning Styles Questionnaire also posed problems for students at the level of language. The problems students identified were the vagueness, repetitiveness and the language style of the questions. Students felt that many questions were similar but merely differently worded. They felt that this caused them to contradict themselves. In the words of the following students:

> The style of language is slightly inappropriate. I would prefer simple and straightforward language rather than expressions being used.
> With some of the questions it is difficult to be straight forward, because there is a conflict of interest - one may agree with one point of the sentence but not the other.
> Most of the statements have ambiguous meanings. They are open to subjective interpretation depending on one's frame of reference.
> The questions tend to be ambiguous as the statements "I tend to", "I often", do not lead to a direct answer.
> I found it constantly trying to check my consistency by asking me similar type questions rephrased differently. I have a problem with this as the rewording of questions changes my responses.

It is not only the way the questions were phrased that proved to be a difficulty but also the words that are used. Students felt that many of the words that were used were difficult to understand. The instances of difficulty cited were:

> Throw caution to the wind (Item 2)
> Meticulous (Item 25)
> Flippant (Item 30)
> Contingency Planning (Item 35)
> Network Analysis (Item 35)
> Red Herrings (Item 54)

At the level of language idioms also proved to be a particular difficulty. An examination of the distribution of idioms across the learning style categories indicates that an average of 6 of the 20 items for each learning style involved idiomatic

expressions, for example:

flights of fancy (Item 3)
leaves no stone unturned (Item 7)
off-the-top-of-the-head (Item 54)
look before you leap (Item 72)

A further weakness of Honey & Mumford's Learning Styles Questionnaire is uncovered through the introduction of the 'Do Not Understand' option for the sample. For certain items there are quite a number of students who chose the 'Do Not Understand' options. These items seem to be the same for both groups, and tend to have the same grammatical construction.

Having taken 4% of the sample as an arbitrary cut-off point for the analysis, Table 6 shows the items for which more than 4% chose this option. (cf. Appendix D for a detailed breakdown of student responses per item)

TABLE 6 STUDENT DISTRIBUTION BY ITEM FOR THE DO NOT UNDERSTAND OPTION *

ITEM NO.	% DO NOT UNDERSTAND CHEMISTRY I	% DO NOT UNDERSTAND SOCIOLOGY I
2	32	18
5	10	4
6	11	4
20	12	4
26	20	6
35	20	10
41	7	5
43	18	5
54	13	4
63	20	4
65	14	6
69	22	6
71	13	8
78	12	4

* This table only includes those items for which more than 4% of the 'Do not understand' option selection was obtained in both groups.

Analysis of the items that Table 6 refers to show that their common feature is almost exclusively the presence of idiomatic expressions such as 'off-the-top-of-my-head', 'gut feel', 'caution to the winds' and less familiar phrases/words such as network analysis, contingency planning, manoeuverings, etc

Idioms are culturally bound as well as being single language items. The meaning does not arise from the sum of the individual words but from the accepted understanding of the phrase as a whole. Both these instances of semantic difficulty bias the questionnaire against English Second Language speakers for example and makes an assessment of their learning styles on this basis spurious.

Further analysis of the items referred to in Table 6 indicates that 4 of the items apply to the Theorist learning style, 5 to the Pragmatist learning style, 4 to the Activist learning style and only one to the Reflector learning style. This would possibly explain why the Reflector learning style was predominant for the groups surveyed.

The students who filled in the questionnaire stated that there were fourteen items from Honey & Mumford's Learning Styles Questionnaire that they felt were irrelevant in determining their learning style. The most commonly listed items by more than 50% of the sample were:

Item 1 - I have strong beliefs about what is right and wrong, good and bad ;
Item 12 - I tend to be open about how I'm feeling ;
Item 15 - I tend to judge people's ideas on their practical merits ;
Item 16 - I often get irritated by people who want to rush headlong into things ;

Item 17 - It is more important to enjoy the present moment than to think about the past or future ;
Item 21 - More often than not, rules are there to be broken ;
Item 24 - I enjoy fun-loving, spontaneous people ;
Item 26 - I enjoy being the one that talks a lot ;
Item 28 - In discussions with people I often find I am the most dispassionate and objective ;
Item 30 - Flippant people who don't take things seriously enough usually irritate me ;
Item 33 - Most times I believe the end justifies the means ;
Item 72 - I'm usually the "life and soul of the party ;
Item 79 - I enjoy the drama and excitement of a crisis situation ; and
Item 80 - People often find me insensitive to their feelings.

The items that students felt were irrelevant are those that:

a) lack specificity;

b) contain idiomatic expressions;

c) ask students to make value judgements; and

d) ask students to judge themselves.

Approximately 18% of the items were found to be totally inapplicable by the questionnaire sample suggesting that Honey & Mumford's Learning Styles Questionnaire contain statements that are unable to be used in assessing learning styles. The presence of items that lack relevancy negates the applicability of the questionnaire.

The preceding analysis suggests that the language used in Honey & Mumford's Learning Styles Questionnaire is one of the major stumbling blocks in students responses to the items. This throws greater doubt on the suitability of the questionnaire for use at the University of the Witwatersrand particularly in the light of the fact that there is an increasing number of English Second Language students. This further implies that one's command of the English language is one of the major determinants for the learning style one is categorised as having in terms of Honey &

Mumford's Learning Styles Questionnaire.

4.3.5. RELATIONSHIP TO LEARNING - HOW DO I LEARN?

Another factor that students raised as a problem was that they felt that many items were not directly related to teaching and learning. There was a feeling amongst students that the questionnaire dealt more with their personalities and characters than with their learning styles. One student called Honey & Mumford's Learning Styles Questionnaire a "psychological questionnaire". Students frequently made comments that they felt there were no questions that were relevant to the way they approached their studying. As the following students stated :

> Didn't ask many questions relative to what our feelings are about the quality of lectures and what we feel about what we're learning.
> I cannot see how this is a questionnaire about learning styles because it delves more into type of thinker you are.
> I could not find questions relating to my study.
> The questions made me think but I am unsure about how it will help the academic staff to evaluate learning and teaching.
> I feel that it does not have any relevance to learning and teaching techniques. It may have some underlying 'psychological' pattern which you may be able to determine something from, but I feel a more to the point questionnaire would be more beneficial.

These comments imply that students at the first-year level see learning style as relating directly to studying. They find it difficult to associate questions concerning their attitudes and their ways of dealing with people with learning style. The evidence suggests that Honey & Mumford's Learning Styles Questionnaire as one instrument designed to assess students' living style is isolated from student's everyday understanding and experience of learning styles. Any instrument that attempts to improve the learning situation must root itself within the

immediate realities of students. Honey & Mumford's Learning Styles Questionnaire fails to do this by virtue of the nature of the questions asked. The questions from the questionnaire confuses students which once again throws doubts upon the applicability of the questionnaire.

4.3.6. INDIVIDUALITY - I AM DIFFERENT!

Students also stated that they thought learning styles were personal/individualistic and wished to be provided with information on successful learning styles. As they put it:

> The inventory does not cater for a complete person but stereotypes; the thinkers and the spontaneous, the practical and the idealists. I feel I'm a bit of both.
> Learning styles suit different people and therefore many different diverse styles should be reviewed.
> I feel that learning styles are as individual as the person.
> You may want to adopt certain learning styles, but the best one for you is your own.
> Perhaps you can give us some useful hints on successful learning styles.
> Everyone has a different learning style so how do you plan to please them?

The above comments indicate that learning style is such a diverse phenomenon that students wonder whether any one instrument can measure all the learning styles. The data also suggests that students feel that Honey & Mumford's Learning Styles Questionnaire does not take into account the fact that they are all different as learners. They are taking issue with what they feel is an attempt to categorise and put them into 'little boxes'. In fact, the last comment above is the crux of the issue concerning learning style research, which is, how do we use such information. Another important question is whether one or any learning style instrument measures all the variables associated with the complex phenomenon of student learning? These questions

will be addressed later in the chapter.

4.4. RELATIONSHIP BETWEEN STUDENT'S CONCEPTUALISATION OF THEIR LEARNING STYLE IN TERMS OF HONEY & MUMFORD'S LEARNING STYLES QUESTIONNAIRE AND THEIR RESULTS

One of the major findings to emerge from the questionnaire data was the fact that most of the students were unsure as to whether Honey & Mumford's Learning Styles Questionnaire accurately determined their learning style. This lack of certainty has two important implications:

a) Students felt that they were not in a position to venture any answer to this question; and

b) Students are unsure as to whether Honey & Mumford's Learning Styles Questionnaire accurately measures their learning style.

A comparative study of students' classification of their learning styles in contrast to that of Honey & Mumford bore out the latter implication. The table below presents a comparison of how students categorised themselves in terms of the four learning styles described by Honey & Mumford and their results as obtained from the questionnaire results itself.

TABLE 7 COMPARISON BETWEEN STUDENT'S CLASSIFICATION OF THEIR LEARNING STYLE AND HONEY & MUMFORD'S CLASSIFICATION

Student	Student's Classification	H & M's Classification	Match/Mismatch
Sociology I			
Student A	Combined #	Combined	Match
Student B	unclassified *	Reflector	***
Student C	Reflector/ Activist	Theorist	Mismatch
Student D	Reflector	Reflector	Match
Student E	Activist	Reflector	Mismatch
Student F	Activist	Reflector	Mismatch
Student G	Unclassified *	Reflector	Mismatch
Student H	Pragmatist	Theorist	Mismatch
Chemistry I			
Student A	Theorist/ Activist **	Reflector	Mismatch
Student B	Unclassified *	Theorist	***
Student C	Theorist	Reflector	Mismatch
Student D	Activist	Reflector	Mismatch

Combined implies that the student felt that her learning style was a combination of all four learning styles
* The student's classification of how they would place themselves in terms of Honey & Mumford's Learning Styles Questionnaire could not be determined from the interview data
** This student felt that in her own words she "was an Theorist masquerading as an Activist" though she was more biased towards being a Theorist

N
match = 2 (20%)

N
mismatch = 8 (80%)

The results indicate that there is a great discrepancy between students' understanding of their learning style based upon the descriptions provided by Honey & Mumford and their results obtained according to their responses to the 80 items in Honey & Mumford's Learning Styles Questionnaire. The crucial question that needs to be answered is why is there such a divergence.

It could be argued that Honey & Mumford's understanding of the four learning styles differs substantially from those of the students. Part

of the reason may be that the items do not accurately reflect the four learning styles identified. This raises doubts about the basis upon which Honey & Mumford decided on the items selected and the way they arrived at a description of the four styles identified.

In order to investigate further as to the reason(s) for this discrepancy students were interviewed at length. The following reasons were forwarded by the students themselves in order to explain the discrepancy:

> ... the activist items they're a bit strange. You have this image of this person who's big and bouncy and goes into everything with incredible enthusiasm ; it's a bit like a character description
> I think the reason why my score is different is because I was thinking more of life than of learning when I was answering the questionnaire .... The way the questions are asked are very general, and I thought that it was a questionnaire asking about life in general and not really about the way I learn
> I don't think the inventory is wrong. I could have a different interpretation of a theorist
> I am able to enjoy theorising; it doesn't have to be practical. But if I'm studying, I like to know where it fits in. Context is important : with my friends I am an activist; in a tutorial I am not.
> I think the results are different because the questions revolve too much around personality

From the interview data it is evident that students were highlighting similar problems discussed above (cf. 4.3.) viz., lack of context, no relation to learning and differences in understandings of the styles from that identified by Honey & Mumford. This further corroborates the view that Honey & Mumford's Learning Styles Questionnaire is of limited usefulness.

An interesting observation by one of the interview sample whose results tallied is as follows (Even though her results tallied she understood the styles differently from Honey & Mumford) :

> Well the fact that I was able to pick up the implications of the perspectives provided by these definitions and force myself within the context of those implications resulting in a

> higher correlation by which I was able to pick up a different perspective, pick up its implications, exercise it .. the extent of the correlation depends on how high or low their ability is to empathise with the implications of the definitions given here.

Her observation allude to the fact that consistency in results can only be obtained by being able to see learning styles within the perspective defined by Honey & Mumford. This would render Honey & Mumford's Learning Styles Questionnaire valueless as students would have to participate in some kind of guessing-game. Learning styles instruments are useful only if students can understand them without having to resort to viewing the instrument from the creator's perspective. The value of any learning styles instrument must be vested in what the students say to the instrument rather than in some kind of 'guess what I mean' riddle.

The following comments by one of the interview subjects sum up students' view of the four styles identified by Honey & Mumford:

> Activist: Somebody who is actively and critically involved in the process of assimilating knowledge. On that basis assimilating knowledge in a negative or positive sense ,that is, in terms of whether they disagree or agree with it.
> Reflector: Someone who regurgitates what they learn. They absorb all the information relatively indiscriminately. They tend to start without a good understanding. If one could contrast between an activist and a reflector: the activist is critical; the reflector relatively uncritical.
> Pragmatist: He is not interested in relative details. His motive is to get it right. They want to know: do we have to know this? Will I get marks for it? That is one type. Another type is someone whose attitude towards knowledge is: of what use will this knowledge be in assisting us to analyse things and solve problems.
> Theorist: The microcosmic theorist could be someone who says: This is interesting and I want to know more. I'll go out and read journals. You could have a theorist within a macrocosmic context just philosophising.

One can conclude from the above that students' understanding of the four learning styles is very different from that of Honey &

Mumford.

4.5. ITEM ANALYSIS OF THE UNSURE RESPONSE OPTION

On the whole students' problems with Honey & Mumford's Learning Styles Questionnaire reside in the nature of the questions that are included. Students claimed that many of the items were decontextualised and did not relate directly to learning. (cf. 4.3.) The evidence for this can be found in the item analysis that was conducted of the students who selected the response option Unsure.

The two groups of students were presented with a questionnaire in which Unsure was one of the response options available. For the two groups sample, in all but four items the percentage of students who chose the option Unsure were more than 10%. The four items that were less were; 13, 36, 46 and 76 for the Chemistry I sample and 22, 36, 70 and 76 for the Sociology I sample. For some items as many as 32% of the respondents chose the option Unsure.

The means and standard deviation for the response option Unsure revealed the following results which are presented in the table below.

TABLE 8 MEANS AND STANDARD DEVIATION FOR THE RESPONSE OPTION UNSURE

GROUP	YEAR	MEAN	STANDARD DEVIATION
Sociology I N = 191	1988	33.9	11.4
Chemistry I N = 90	1988	17.0	6.4

The table indicates that approximately 18% of the Sociology I

sample chose the option Unsure for all items. Approximately 15% of the Chemistry I sample on the other chose this option. (cf. Notes 2)

The data suggests that there was a significant number of students from both groups who could not respond affirmatively or negatively to the items from Honey & Mumford's Learning Styles Questionnaire. The inability to respond with decisiveness to the questionnaire makes the determination of learning styles using Honey & Mumford's Learning Styles Questionnaire a difficult exercise. The vital question is : Can one have faith in the results of a questionnaire where more than 18% of the sample cannot respond to the items? In short, how do we use a questionnaire which when the response options are increased result in a greater selection of the newly included response?

4.6 LEARNING STYLES - SO WHAT?

Even assuming that Honey & Mumford's Learning Styles Questionnaire (or any learning styles instrument) could be argued to be valid and reliable, the crucial question is what do we do with such information. Within the context of this research project the major question is, if the predominant learning style of, for example, Chemistry I students is Reflector, how do we use such knowledge to enhance the educational practice? Furthermore, should we consider other Chemistry I students who possess different predominant learning styles?

Much of the literature surveyed in connection with the application of learning style information seem to suggest two possibilities : using learning style information to

match/mismatch students and teachers or to use learning style information to increase the learner's self-awareness.

Proponents who suggest matching seem to imply that teaching style and the teaching environment must be altered to suit the learning style of the individual student. Dunn quoted in Semple, (1982: p.17) stated that "the closer the teaching style and learning style are matched, the higher the grade point average, consistently". The assumption underlying such an approach is that matching teaching style with learning style would enhance the educational process and in so doing, increase academic performance. Further to this, the approach assumes that there is one preferred way to conduct learning and that learning style information would be able to determine this preference.

The problem with such an approach is that it leaves unanswered the question of what to match. Learning style is constituted by a variety of factors ; cognitive, affective, physiological and environmental. Which factor of learning do we match and to what? Further than this, the proponents of matching avoid the issue of matching for what? In other words, what is the purpose of matching? Also absent from this approach is the whole issue of content. Matching teaching and learning styles is not isolated from the content.

In a contrasting and forcibly argued approach Grasha (1984); Fizzell (1984) and others suggest that learning and learning styles should not be matched. They suggest an approach called "style flex" or "adaptation" which calls for a mismatch between the learning style of the student and the teaching style of the

teacher. Grasha (1984:52) puts this as follows:

> Stretching the learner may mean creating a mismatch between his or her learning style and the instructional environment. The goal would be not only tc teach content but to expose individuals to alternative learning styles ... It is probably desirable for people to know how to use learning styles other than their own.

This approach is open to the same criticism that proponents of matching are faced with; mismatching for what purpose?, what factor do we mismatch? and what about content?

On the other hand Reichman (1979) and others argue that learning style information should be used as a means to make learners aware of their own learning. This would enable them to adapt and adjust to any teaching style. This approach is no different from the mismatching approach in that it also sees learning style information as involving the student adjusting to a particular educational environment. Reichman (op cit) explained this as follows:

> Knowing that everyone does not learn in the same way can be a very liberating experience .... to know our own style can relieve a sense of being dumb .... Effectiveness stems from such awareness of self.

Further than this, proponents of both matching/mismatching and self-awareness do not take into account the variety of ways people learn. Within the context of this research project the question th t is raised is can one practically design a learning situation that would take the learning styles of all students into account? In suggesting the possibilities for implementation, most writers fail to take the context into account. Schmeck, quoted in Cornett et al (1981 : 373), himse'f a keen proponent of learning styles instruments, pointed out :

> While we all emphasize stylistic consistency, we must also recognize that the context is very influential. Many individuals can change their strategies in response to the unique contextual demands of the instruction, the content and the test. Perhaps the most important "style" is the metacognitive activity involved in selecting the appropriate strategy for a particular context.

As the following student summed it up:

> Students have to be versatile enough to identify that particular method and to adapt and adopt and I think that's the big hassle

4.7 DO LEARNING STYLE INSTRUMENTS MEASURE ALL THE VARIABLES ASSOCIATED WITH LEARNING?

The one important issue that this research has raised is whether learning styles instruments measure all the variables associated with the concept. The findings below questions whether any instrument can achieve this.

Table 9 below details the mean score data for each learning style for the sample used in the research project. The table indicate significant mean differences for the sample with regards to the Reflector learning style. However, there is not a very significant mean difference for the other three learning styles. This is particularly prominent in the Sociology I results. This implies that Honey & Mumford's Learning Styles Questionnaire does not discriminate clearly between all the learning styles it identifies.

TABLE 9 MEAN SCORE DATA FOR THE SAMPLE

LEARNING STYLE	CHEM. I 1988 N = 90		SOCIO. 1 1988 N = 191	
	M	SD	M	SD
Activist	9.8	3.7	11.0	3.8
Reflector	16.6	2.3	15.3	3.7
Theorist	12.9	3.1	12.5	3.9
Pragmatist	12.8	3.2	12.6	3.9

M - Mean SD - Standard Deviation N - Sample Size

The inability of Honey & Mumford's Learning Styles Questionnaire to discriminate between the four learning styles is further evident when one looks at the individual results for the sample. (cf. Appendix E) The individual results indicate that the scores students obtained for each learning style do not differ greatly. This implies that if students change their response to one or two items then their predominant learning would shift. This taken together with the earlier discussion (cf. 4.2., 4.3., 4.4. & 4.5.) suggests that Honey & Mumford's Learning Styles Questionnaire could only be regarded as a coarse predictor of an individual student's learning style and may indeed be subject to a considerable error margin if the style category can be altered by a difference of only two responses to the questionnaire.

Furthermore a large percentage of students from the sample obtained Combination scores. (cf. Table 5 : 4.1.) On average approximately 11% of the sample had Combination scores. This indicates that a substantial number of students could not be placed in any of the categories identified by Honey & Mumford.

This indicates the virtual impossibility of categorising many students into a particular learning style using this instrument.

One of the insights provided by the interview data is that students change their approach of studying from subject to subject. Furthermore, many students from the open-ended comments and questionnaire data questioned whether Honey & Mumford's Learning Styles Questionnaire related directly to the practice of teaching and learning. Students also pointed out that they felt that the questionnaire was more of a character assessment or personality test.

These comments suggest that there is a perception that Honey & Mumford's Learning Styles Questionnaire does not measure all the variables associated with the complex phenomenon of learning. What is absent from the questionnaire is:

a) how students actually process the information;
b) the manner by which students study;
c) the content and context within which student learning takes place; and
d) affective factors such as motivation.

The questionnaire as it is constructed emphasises interpersonal skills and approaches to decision-making, elements of a managerial approach. In short, the audience for which the inventory was designed is evident in the type of questions that are asked.

More generally, can any learning style instrument attempt to capture all the subtleties associated with learning? From the learning style instruments that were reviewed and the data

collected for this research project the answer would be in the negative. Even if we increase the number of items included in learning style instruments, we still would not be capturing the total situation. Who would decide what to include in the first place. M C Witrock quoted in Cornett (1983:p.33) makes this point well when he states

> ....instruction cannot be thoroughly understood by attending to the apparent qualities of treatment .... mental transformations performed by different people determine whether instruction is rote or meaningful, whether it stimulates verbal or spatial processes, and whether it facilitates learning and memory (my emphasis).

The point being made is that learning is a much more complex phenomenon than an inventory/questionnaire indicates. In the end, learning style is more than a computer printout or an 80 item questionnaire.

4.8. CONCLUSION

The following comment by one the students provides a concise summary of students' perceptions of Honey & Mumford's Learning Styles Questionnaire :

> I think that if you want to get more accurate results, you would have to be less direct about the questions that you're asking, because there are a lot of questions that are likely to elicit deceptive responses from people. For some questions, you feel as if you're in a corner to some extent. Another thing is that questions have too much stigmatic import which people may not pick up consciously but subconsciously, eg.... the question as to whether I throw caution to the wind; most people don't like to be thought of in this way. There are a number of questions that could fall under the heading of having words within them that have a positive import; others which have a negative import; others which jump the gun; others which don't take into account that there is a middle path; others that don't take into account that there are other factors at play. Let me give you an example: eg. I have strong beliefs about what is right, wrong, good or bad. I thought that I wasn't sure whether I wanted to tell someone this, because that has implications in itself. Now if someone doesn't think about it, they may just

> think: "yes". But the thing is they could be saying yes, and the reality is no, and vice versa. So you don't get accurate results.

Reflecting on these observations raises questions on one's mind about the entire exercise of learning style research. The question one is forced to confront is: What is the value of learning style research? Can the complex phenomenon of student learning be determined by any instrument with a limited number of questions and response options? It is these kinds of reflections which Biggs made after 6 years of research with learning styles instruments. In the end, he stated, learning styles cannot be determined by learning style instruments.

To conclude Honey & Mumford's Learning Styles Questionnaire appears to fall short when used with this sample for the following reasons:

a) the difficulty students have in making self-judgements;
b) the decontextualised nature of many of the questions;
c) the absence of questions related to every day studying;
d) the limited nature of the response options;
e) the language style of many of the questions;
f) the inability of the questionnaire to clearly discriminate between the four learning styles.

It is therefore argued that Honey & Mumford's Learning Styles Questionnaire appears to be not directly transferable to the group of students used for this research project.

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Chapter 5 CONCLUSION

The findings of this research project indicates that investigations into learning are an important area of study. Furthermore, they highlights some of the major problems and contradictions in the application of learning styles instruments.

One of the directions that future research can go is to determine to what extent are the results of this research project generalisable to other learning styles instruments and to other sample groups studied longitudinally. Furthermore it also seems necessary to investigate why or how individual students have come to adopt particular learning styles.

One of the major problems concerning investigations into learning styles is the dearth of literature exploring the theories and philosophical assumptions underpinning the concept. Learning style research has been notorious for the lack of rigor and clarity with which the concept and instruments have been applied. Critical reflection and systematic development of theory has not been the hallmark of learning style researchers. In order to redress this balance, intensive research needs to be conducted in this area. Amongst the questions that needs to be asked are :

1) What are the theories underpinning learning style research?
2) How does learning style research relate to wider educational practice?
3) What is meant by the concept learning style?
4) Is it possible to measure/determine student's learning style? and

5) What is the political scenario within which such research is located?

These questions would orientate learning style research away from quantitative empiricism to more philosophical reflection. This re-orientation is necessary to provide greater clarity for future research. It is hoped that this is one of the directions that future learning style research would veer towards.

The methodology employed for this project underlines the fact that future research into learning styles should be more qualitative in nature. This is evident by the fact that the some of the more useful insights concerning Honey & Mumford's Learning Styles Questionnaire were gleaned from the qualitative data. Quantitative data where it is used should supplement the information gathered from qualitative methods of research. In the words of the following students:

> Ask a student to learn a passage and then test him or her on it. Then ask the person how s/he approached the task.

In short it is necessary to continue to allow the students to "speak for themselves."

In conclusion, I would propose that the direction of research should concern itself with:

a) the basis on which individual students appear to adopt particular learning styles;

b) the context of learning;

c) the theories and philosophical assumptions which underpin researches into learning styles; and

d) the reliability of learning styles instruments.

Learning style definitions have as their point of departure the fact that all individuals are different and consequently process information in different ways. The conflict arises when it becomes necessary to categorise and measure these differences. One of the arguments of this research project has been that learning styles instruments overlook content and context as two of the vital factors in learning styles.

Learning style research is very often based on a model of learning that views learning as a two-way structure of teacher and student. Hyman & Roshoff (1984: 38) put this as follows:

> teaching is not a dyadic relationship between teacher and student. To teach, the teacher must relate to the student in terms of subject matter.... Teaching is thus a triadic relationship made up of three critical content elements: teacher, student and subject matter.

Nonetheless even the above notion of learning is wanting. It fails to understand the fact that learning style is not independent of the learning context, that is, it cannot be understood in abstraction. Learning style can only be known to us within a learning context.

Learning and learning style must be understood as a quadruple relationship of student, teacher, content and context. Which of these elements are determinant in defining a student's learning style can only be answered by studying each case in its own specificity. Learning style can thus be understood as students' way of processing a particular piece of work (content) for a particular teacher within a given learning context. All the above-mentioned factors are involved in and affect this quadruple relationship. But having said this the real question is whether a learning styles instrument can measure all these variables.

Honey & Mumford's Learning Styles Questionnaire as one learning styles instrument is unsuitable in capturing the full complexity of the learning process. In the end learning style is a complex phenomenon that probably does not lend itself to assessment through such an instrument as a questionnaire or inventory. Learning is essentially contextually bound and a more profitable line of research would be the analysis and observation of students in different learning situations.

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APPENDIX A HONEY & MUMFORD'S LEARNING STYLES QUESTIONNAIRE

Item 1 : I have strong beliefs about what is right and wrong, good and bad.
Item 2: I often "throw caution to the winds".
Item 3 : I tend to solve problems using a step-by-step approach, avoiding any "flights-of-fancy'.
Item 4: I believe that formal procedures and policies cramp people's style.
Item 5 : I have a reputation for having a no-nonsense, "call a spade a spade" style.
Item 6: I often find that actions based on "gut feel" are as sound as those based on careful thought and analysis.
Item 7 : I like to do the sort of work where I have time to "leave no stone unturned".
Item 8 : I regularly question people about their basic assumptions.
Item 9 : What matters most is whether something works in practice.
Item 10: I actively seek out new experiences.
Item 11: When I hear about a new idea or approach I immediately start working out how to apply it in practice.
Item 12: I am keen on self discipline such as watching my diet, taking regular exercise, sticking to a fixed routine, etc.
Item 13: I take pride in doing a thorough job.
Item 14: I get on best with logical, analytical people and less well with spontaneous, "irrational" people.
Item 15: I take care over the interpretation of data available to me and avoid jumping to conclusions.
Item 16: I like to reach a decision carefully after weighing up many alternatives.
Item 17: I'm attracted more to novel, unusual ideas than to practical ones.
Item 18: I don't like "loose-ends" and prefer to fit things into a coherent pattern.
Item 19: I accept and stick to laid down procedures and policies so long as I regard them as an efficient way of getting the job done.
Item 20: I like to relate my actions to a general principle.
Item 21: In discussions I like to get straight to the point.
Item 22: I tend to have distant, rather formal relationships with people at work.
Item 23: I thrive on the challenge of tackling something new and different.
Item 24: I enjoy fun-loving, spontaneous people.
Item 25: I pay meticulous attention to detail before coming to a conclusion.
Item 26: I find it difficult to come up with wild, off-the-top-of-the-head ideas.
Item 27: I don't believe in wasting time by "beating around the bush".
Item 28: I am careful not to jump to conclusions too quickly.
Item 29: I prefer to have as many sources of information as possible - the more data to mull over the better.
Item 30: Flippant people who don't take things seriously enough usually irritate me.
Item 31: I listen to other people's point of view before putting my own forward.
Item 32: I tend to be open about how I'm feeling.
Item 33: In discussions I enjoy watching the manoeuvrings of the other participants.

Item 34: I prefer to respond to events on a spontaneous, flexible basis rather than plan things out in advance.
Item 35: I tend to be attracted to techniques such as network analysis, flow charts, branching programmes, contingency planning etc.
Item 36: It worries me if I have to rush out a pie of work to meet a tight deadline.
Item 37: I tend to judge people's ideas on their practical merits.
Item 38: Quiet, thoughtful people tend to make me feel uneasy.
Item 39: I often get irritated by people who want to rush headlong into things.
Item 40: It is more important to enjoy the present moment than to think about the past or future.
Item 41: I think that decisions based on a thorough analysis of all the information are sounder than those based on intuition.
Item 42: I tend to be a perfectionist.
Item 43: In discussions I usually pitch in with lots of off-the-top-of-the-head ideas.
Item 44: In meetings I put forward practical realistic ideas.
Item 45: More often than not, rules are there to be broken.
Item 46: I prefer to stand back from a situation and consider all the perspectives.
Item 47: I can often see inconsistencies and weaknesses in other people's arguments.
Item 48: On balance I talk more than I listen.
Item 49: I can often see better, more practical ways to get things done.
Item 50: I think written reports should be short, punchy and to the point.
Item 51: I believe that rational, logical thinking should win the day.
Item 52: I tend to discuss specific things with people rather than engaging in "small talk".
Item 53: I like people who have both feet firmly on the ground.
Item 54: In discussions I get impatient with irrelevancies and "red herrings".
Item 55: If I have a report to write I tend to produce lots of drafts before settling on the final version.
Item 56: I am keen to try things out to see if they work in practice.
Item 57: I am keen to reach answers via a logical approach.
Item 58: I enjoy being the one that talks a lot.
Item 59: In discussions I often find I am the realist, keeping people to the point and avoiding "cloud nine" speculations.
Item 60: I like to ponder many alternatives before making up my mind.
Item 61: In discussions with people I often find I am the most dispassionate and objective.
Item 62: In discussions I'm more likely to adopt a "low profile" than to take the lead and do most of the talking.
Item 63: I like to be able to relate current actions to a longer term bigger picture.
Item 64: When things go wrong I am happy to shrug it off and "put it down to experience".
Item 65: I tend to reject wild, off-the-top-of-the-head ideas as being impractical.
Item 66: It's best to "look before you leap".
Item 67: On balance I do the listening rather than the talking.
Item 68: I tend to be tough on people who find it difficult to adopt a logical approach.
Item 69: Most times I believe the end justifies the means.

Item 70: I don't mind hurting people's feelings so long as the job gets done.
Item 71: I find the formality of having specific objectives and plans stifling.
Item 72: I'm usually the "life and soul of the party".
Item 73: I do whatever is necessary to get the job done.
Item 74: I quickly get bored with methodical, detailed work.
Item 75: I am keen on exploring the basic assumptions, principles and theories underpinning things and events.
Item 76: I'm always interested to find out what other people think.
Item 77: I like meetings to be run on methodical lines, sticking to laid down agenda, etc.
Item 78: I steer clear of subjective or ambiguous topics.
Item 79: I enjoy the drama and excitement of a crisis situation.
Item 80: People often find me insensitive to their feelings.

OPEN-ENDED QUESTIONS

Please use this space to make any comments about:
A) the inventory you have just completed:

B) anything else you might like to add about teaching and learning more generally:

Item 70: I don't mind hurting people's feelings so long as the job gets done.
Item 71: I find the formality of having specific objectives and plans stifling.
Item 72: I'm usually the "life and soul of the party".
Item 73: I do whatever is necessary to get the job done.
Item 74: I quickly get bored with methodical, detailed work.
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Item 79: I enjoy the drama and excitement of a crisis situation.
Item 80: People often find me insensitive to their feelings.

OPEN-ENDED QUESTIONS

Please use this space to make any comments about:
A) the inventory you have just completed:

B) anything else you might like to add about teaching and learning more generally:

APPENDIX B GROUPING OF ITEMS ACCORDING TO LEARNING STYLE

ACTIVIST

Item 2: I often "throw caution to the winds".
Item 4: I believe that formal procedures and policies cramp people's style.
Item 6: I often find that actions based on "gut feel" are as sound as those based on careful thought and analysis.
Item 10: I actively seek out new experiences.
Item 17: I'm attracted more to novel, unusual ideas than to practical ones.
Item 23: I thrive on the challenge of tackling something new and different.
Item 24: I enjoy fun-loving, spontaneous people.
Item 32: I tend to be open about how I'm feeling.
Item 34: I prefer to respond to events on a spontaneous, flexible basis rather than plan things out in advance.
Item 38: Quiet, thoughtful people tend to make me feel uneasy.
Item 40: It is more important to enjoy the present moment than to think about the past or future.
Item 43: In discussions I usually pitch in with lots of off-the-top-of-the-head ideas.
Item 45: More often than not, rules are there to be broken.
Item 48: On balance I talk more than I listen.
Item 58: I enjoy being the one that talks a lot.
Item 64: When things go wrong I am happy to shrug it off and "put it down to experience".
Item 71: I find the formality of having specific objectives and plans stifling.
Item 72: I'm usually the "life and soul of the party".
Item 74: I quickly get bored with methodical, detailed work.
Item 79: I enjoy the drama and excitement of a crisis situation.

REFLECTOR

Item 7 : I like to do the sort of work where I have time to "leave no stone unturned".
Item 13: I take pride in doing a thorough job.
Item 15: I take care over the interpretation of data available to me and avoid jumping to conclusions.
Item 16: I like to reach a decision carefully after weighing up many alternatives.
Item 25: I pay meticulous attention to detail before coming to a conclusion.
Item 28: I am careful not to jump to conclusions too quickly.
Item 29: I prefer to have as many sources of information as possible - the more data to mull over the better.
Item 31: I listen to other people's point of view before putting my own forward.
Item 33: In discussions I enjoy watching the manoeuvrings of the other participants.
Item 36: It worries me if I have to rush out a piece of work to meet a tight deadline.
Item 39: I often get irritated by people who want to rush headlong into things.
Item 41: I think that decisions based on a thorough analysis of all the information are sounder than those based on intuition.

Item 46: I prefer to stand back from a situation and consider all the perspectives.
Item 52: I tend to discuss specific things with people rather than engaging in "small talk".
Item 55: If I have a report to write I tend to produce lots of drafts before settling on the final version.
Item 60: I like to ponder many alternatives before making up my mind.
Item 62: In discussions I'm more likely to adopt a "low profile" than to take the lead and do most of the talking.
Item 66: It's best to "look before you leap".
Item 67: On balance I do the listening rather than the talking.
Item 76: I'm always interested to find out what other people think.

THEORIST

Item 1 : I have strong beliefs about what is right and wrong, good and bad.
Item 3 : I tend to solve problems using a step-by-step approach, avoiding any "flights-of-fancy".
Item 8 : I regularly question people about their basic assumptions.
Item 12: I am keen on self discipline such as watching my diet, taking regular exercise, sticking to a fixed routine, etc.
Item 14: I get on best with logical, analytical people and less well with spontaneous, "irrational" people.
Item 18: I don't like "loose-ends" and prefer to fit things into a coherent pattern.
Item 20: I like to relate my actions to a general principle.
Item 22: I tend to have distant, rather formal relationships with people at work.
Item 26: I find it difficult to come up with wild, off-the-top-of-the-head ideas.
Item 30: Flippant people who don't take things seriously enough usually irritate me.
Item 42: I tend to be a perfectionist.
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Item 57: I am keen to reach answers via a logical approach.
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Item 63: I like to be able to relate current actions to a longer term bigger picture.
Item 68: I tend to be tough on people who find it difficult to adopt a logical approach.
Item 75: I am keen on exploring the basic assumptions, principles and theories underpinning things and events.
Item 77: I like meetings to be run on methodical lines, sticking to laid down agenda, etc.
Item 78: I steer clear of subjective or ambiguous topics.

PRAGMATIST

Item 5 : I have a reputation for having a no-nonsense, "call a spade a spade" style.
Item 9 : What matters most is whether something works in practice.
Item 11: When I hear about a new idea or approach I immediately start working out how to apply it in practice.

Item 19: I accept and stick to laid down procedures and policies so long as I regard them as an efficient way of getting the job done.
Item 21: In discussions I like to get straight to the point.
Item 27: I don't believe in wasting time by "beating around the bush".
Item 35: I tend to be attracted to techniques such as network analysis, flow charts, branching programmes, contingency planning etc.
Item 37: I tend to judge people's ideas on their practical merits.
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Item 49: I can often see better, more practical ways to get things done.
Item 50: I think written reports should be short, punchy and to the point.
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Item 56: I am keen to try things out to see if they work in practice.
Item 59: In discussions I often find I am the realist, keeping people to the point and avoiding "cloud nine" speculations.
Item 65: I tend to reject wild, off-the-top-of-the-head ideas as being impractical.
Item 69: Most times I believe the end justifies the means.
Item 70: I don't mind hurting people's feelings so long as the job gets done.
Item 73: I do whatever is necessary to get the job done.
Item 80: People often find me insensitive to their feelings.

APPENDIX C QUESTIONNAIRE USED TO SOLICIT STUDENTS' VIEWS ON HONEY & MUMFORD'S LEARNING STYLES QUESTIONNAIRE

Student Number..... Year of Study.....
Faculty..... Sex.....
Intended Majors.....
Other Courses Registered for.....
Home Language.....

Please tick the appropriate box.

1. What do you understand by the term learning style?
.....
.....
.....

2. What do you understand by the term learning?
.....
.....
.....

3. Did you find the Honey and Mumford Learning Style Questionnaire
Too Long Too short Just right

4.a. How many words/phrases from Honey and Mumford's Learning Style Questionnaire were unfamiliar to you
0-5 5-10 10-15 More than 15

b. Please give a few examples of the words/phrases that were unfamiliar to you
.....
.....
.....

5. How do you think your learning style can best be determined?
Interviews Questionnaires like the one you filled in
Interviews and Questionnaires
Other Please specify.....
.....
.....

6. Honey and Mumford's Learning style Querstionnaire accurately determines learning style
Agree Disagree Unsure

7. List the items from Honey and Mumford's Learning Style Questionnaire that you believe have no relevance to determining learning style
.....
.....
.....
.....
.....

8. List the 5 most important items you feel should be included in order to determine learning style

.....
.....
.....
.....
.....

9. Any other comments concerning
Honey and Mumford's Learning Style Questionnaire

.....
.....
This questionnaire
.....
.....
.....
Learning styles
.....
.....
.....

Thank you for your co-operation and assistance

APPENDIX D DISTRIBUTION OF RESPONSES PER ITEM

CHEMISTRY I (1988)

	A	D	U	N	X		A	D	U	N	X
Item 1	78	1	11	0	0	Item 41	56	10	16	7	1
Item 2	9	34	17	29	1	Item 42	30	36	22	2	0
Item 3	68	5	16	0	1	Item 43	16	43	15	16	0
Item 4	39	23	23	4	1	Item 44	44	13	33	0	0
Item 5	39	25	17	9	0	Item 45	25	48	16	1	0
Item 6	24	35	21	10	0	Item 46	50	12	24	4	0
Item 7	68	5	11	2	4	Item 47	64	8	18	0	0
Item 8	44	31	12	3	0	Item 48	16	60	13	0	1
Item 9	59	12	18	0	1	Item 49	43	16	28	2	1
Item 10	61	9	20	1	0	Item 50	73	8	9	0	0
Item 11	37	25	28	0	0	Item 51	62	3	22	2	1
Item 12	45	36	9	0	0	Item 52	39	29	20	2	0
Item 13	78	4	5	1	2	Item 53	62	7	18	3	0
Item 14	28	35	25	2	0	Item 54	38	27	13	12	0
Item 15	63	9	18	0	0	Item 55	41	32	14	2	1
Item 16	75	5	10	0	0	Item 56	62	6	22	0	0
Item 17	27	43	17	2	1	Item 57	77	1	12	0	0
Item 18	58	7	15	8	2	Item 58	15	59	14	0	2
Item 19	59	15	12	3	1	Item 59	32	32	22	4	0
Item 20	39	14	25	11	1	Item 60	75	3	10	2	0
Item 21	62	14	14	0	0	Item 61	12	44	23	9	2
Item 22	20	58	11	1	0	Item 62	47	19	21	3	0
Item 23	60	8	18	4	0	Item 63	44	7	21	18	0
Item 24	66	13	9	2	0	Item 64	45	22	21	2	0
Item 25	46	13	27	4	0	Item 65	13	42	22	13	0
Item 26	26	35	11	18	0	Item 66	83	2	4	1	0
Item 27	66	10	13	1	0	Item 67	59	18	13	0	0
Item 28	69	8	10	1	2	Item 68	16	55	19	0	0
Item 29	62	13	13	2	0	Item 69	28	20	21	20	1
Item 30	39	29	21	1	0	Item 70	11	69	9	1	0
Item 31	58	16	16	0	0	Item 71	23	28	27	12	0
Item 32	42	34	13	0	1	Item 72	19	35	28	8	0
Item 33	63	8	11	7	1	Item 73	50	22	18	0	0
Item 34	31	42	14	3	0	Item 74	34	39	15	2	0
Item 35	19	27	26	18	0	Item 75	48	10	20	11	1
Item 36	71	12	6	0	1	Item 76	88	1	0	0	1
Item 37	35	37	13	5	0	Item 77	42	22	24	2	0
Item 38	27	53	10	0	0	Item 78	17	37	25	11	0
Item 39	33	31	23	2	1	Item 79	49	19	22	0	0
Item 40	34	39	15	1	0	Item 80	13	50	24	3	0

A = Agree D = Disagree X = No response
U= Unsure N = Do not understand

SOCIOLOGY I (1988)

	A	D	U	N	X		A	D	U	N	X
Item 1	164	13	13	1	0	Item 41	94	36	49	11	1
Item 2	47	68	38	35	3	Item 42	73	75	41	2	0
Item 3	105	41	39	2	4	Item 43	54	89	39	9	0
Item 4	99	49	34	7	2	Item 44	102	35	52	0	2
Item 5	74	63	46	8	0	Item 45	71	77	41	1	1
Item 6	89	48	37	15	2	Item 46	117	34	36	2	2
Item 7	115	41	30	3	2	Item 47	142	16	30	2	1
Item 8	122	41	22	5	1	Item 48	37	128	25	1	0
Item 9	142	24	23	2	0	Item 49	105	29	54	1	2
Item 10	133	20	36	1	1	Item 50	159	15	16	0	1
Item 11	72	64	54	0	1	Item 51	118	27	44	0	2
Item 12	89	70	32	0	0	Item 52	87	70	34	0	0
Item 13	158	12	21	0	0	Item 53	130	27	28	5	1
Item 14	47	100	38	4	2	Item 54	109	43	32	6	1
Item 15	109	36	44	0	2	Item 55	101	59	28	1	2
Item 16	150	18	21	0	2	Item 56	122	29	37	1	2
Item 17	69	65	52	2	3	Item 57	139	24	27	1	0
Item 18	136	24	26	5	0	Item 58	51	109	29	0	2
Item 19	133	32	23	1	2	Item 59	67	64	55	4	1
Item 20	98	41	43	8	1	Item 60	140	15	34	0	2
Item 21	141	29	21	0	0	Item 61	40	91	53	6	1
Item 22	45	126	17	2	1	Item 62	85	63	41	0	2
Item 23	138	21	31	1	0	Item 63	119	13	51	6	2
Item 24	163	11	17	0	0	Item 64	87	73	28	3	0
Item 25	89	51	45	3	3	Item 65	55	88	35	12	1
Item 26	61	77	39	12	2	Item 66	153	13	24	1	0
Item 27	134	25	31	0	1	Item 67	101	51	38	0	1
Item 28	128	3	31	0	2	Item 68	49	97	42	2	1
Item 29	123	34	29	5	0	Item 69	71	58	48	12	2
Item 30	84	67	36	3	1	Item 70	24	150	13	3	1
Item 31	135	25	30	0	1	Item 71	63	68	40	16	4
Item 32	115	50	25	0	1	Item 72	27	91	62	8	3
Item 33	154	15	16	4	2	Item 73	92	57	42	0	0
Item 34	88	66	33	3	1	Item 74	98	52	38	3	0
Item 35	30	95	45	19	2	Item 75	105	33	45	5	3
Item 36	135	40	13	3	0	Item 76	181	6	4	0	0
Item 37	70	84	29	5	3	Item 77	85	75	29	1	1
Item 38	36	134	19	1	1	Item 78	47	94	43	7	0
Item 39	81	83	26	1	0	Item 79	100	47	41	2	1
Item 40	74	87	29	0	1	Item 80	31	121	37	2	0

A = Agree D = Disagree X = No response
U = Unsure N = Do not understand

SAS

OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
1	3Q	8404253	1	3	8	13	12	17	reflector
2	3Q	8601444	1	3	8	16	14	19	reflector
3	3R	8604917	1	H	4	17	18	19	reflector
4	3R	8605561	1	H	11	16	16	18	reflector
5	3Q	8700178	1	H	8	15	14	15	combination
6	3R	8701480	2	3	16	5	8	15	activist
7	3R	8701842	2	F	19	15	19	18	combination
8	3R	8702542	1	3	15	9	11	11	activist
9	3R	8703439	2	3	8	4	5	16	reflector
10	3R	8704030	1	3	9	13	9	19	reflector
11	3Q	8707693	1	E	7	20	14	18	theorist
12	3R	8710103	2	E	11	15	18	18	combination
13	3Q	8800144	1	3	12	11	9	12	combination
14	3R	8800185	1	H	13	18	16	20	reflector
15	3R	8800222	2	I	12	13	14	20	reflector
16	3R	8800241	2	A	10	15	13	17	reflector
17	3R	8800490	1	3	7	15	17	17	combination
18	3R	8800685	1	3	13	14	14	14	combination
19	3R	8800758	2	F	12	15	15	17	reflector
20	3R	8800930	1	I	16	7	14	11	activist
21	3R	8801121	2	6	4	9	14	17	reflector
22	3R	8801336	1	3	13	12	13	18	reflector
23	3R	8801657	1	B	4	16	11	16	combination
24	3R	8801769	1	3	11	13	11	18	reflector
25	3Q	8801771	1	3	8	15	16	18	reflector
26	3R	8801784	1	F	8	15	15	18	reflector
27	3R	8801890	2	3	15	16	12	17	reflector
28	3Q	8801938	1	3	9	12	13	19	reflector
29	3Q	8801947	2	3	9	12	11	14	reflector
30	3R	8802012	1	3	7	15	11	16	reflector
31	3R	8802022	1	E	9	17	16	18	reflector
32	3R	8802080	1	E	14	13	13	17	reflector
33	3R	8802095	2	3	6	18	15	16	theorist
34	3R	8802316	2	3	12	13	14	13	pragmatist
35	3Q	8802322	2	3	9	17	17	18	reflector
36	3R	8802346	1	H	6	16	10	18	reflector
37	3R	8802364	2	A	11	14	16	15	pragmatist
38	3R	8802603	2	3	13	14	9	17	reflector
39	3R	8802605	2	3	7	13	12	19	reflector
40	3Q	8802606	1	3	8	5	8	18	reflector
41	3R	8802715	2	3	3	11	13	20	reflector
42	3Q	8802735	2	3	5	12	9	16	reflector
43	3Q	8802811	2	3	3	13	11	17	reflector
44	3R	8802833	2	3	6	12	12	14	reflector
45	3R	8802936	2	3	13	11	11	16	reflector
46	3R	8802947	1	3	10	9	11	12	reflector
47	3R	8803099	1	3	11	9	9	18	reflector
48	3R	8803204	1	3	15	9	10	19	reflector
49	3Q	8803422	1	H	13	13	19	20	reflector
50	3R	8804030	2	3	19	13	12	17	activist
51	3R	8804235	1	3	9	10	12	15	reflector
52	3R	8804352	2	3	8	15	14	18	reflector
53	3R	8804671	2	3	14	12	6	17	reflector
54	3R	8804853	1	E	7	11	16	15	pragmatist
55	3R	8804958	1	3	7	5	4	12	reflector

SAS

OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
56	3R	8804986	2	3	9	11	11	19	reflector
57	3Q	8805194	1	3	7	14	11	18	reflector
58	3R	8805647	2	3	8	13	11	14	reflector
59	3Q	8806106	2	5	13	9	15	15	combination
60	3Q	8806109	2	3	17	9	14	16	activist
61	3Q	8806427	1	3	20	12	14	12	activist
62	3R	8806461	1	I	15	15	13	12	combination
63	3R	8807051	1	E	11	16	18	19	reflector
64	3Q	8807089	1	3	9	16	12	15	theorist
65	3R	8807279	1	3	11	14	13	20	reflector
66	3R	8807429	2	3	5	16	13	15	theorist
67	3R	8807529	1	3	4	10	13	19	reflector
68	3R	8807507	1	H	15	9	13	13	activist
69	3R	8807828	1	I	8	13	14	18	reflector
70	3R	8807963	1	I	9	11	13	16	reflector
71	3Q	8807972	2	E	13	9	13	19	reflector
72	3Q	8808029	2	H	11	13	11	20	reflector
73	3R	8808881	1	I	10	15	13	16	reflector
74	3Q	8809023	1	3	11	10	6	13	reflector
75	3Q	8809078	1	H	10	17	20	18	pragmatist
76	3Q	8809329	2	3	8	11	17	16	pragmatist
77	3R	8809624	1	I	8	14	14	17	reflector
78	3R	8809727	1	3	9	15	17	19	reflector
79	3R	8810129	1	I	6	11	10	12	reflector
80	3R	8810514	1	H	9	12	11	18	reflector
81	3R	8810763	2	I	13	16	14	16	combination
82	3R	8810948	2	E	9	16	18	20	reflector
83	3R	8810953	2	3	8	11	7	17	reflector
84	3R	8811013	1	3	15	14	12	18	reflector
85	3R	8811036	1	9	5	14	11	15	reflector
86	3R	8811077	1	3	7	16	14	17	reflector
87	3Q	8811080	1	E	4	11	16	18	reflector
88	3R	8811094	1	3	8	12	11	17	reflector
89	3R	8811211	1	H	5	17	14	18	reflector
90	3R	8811259	1	G	9	14	14	17	reflector

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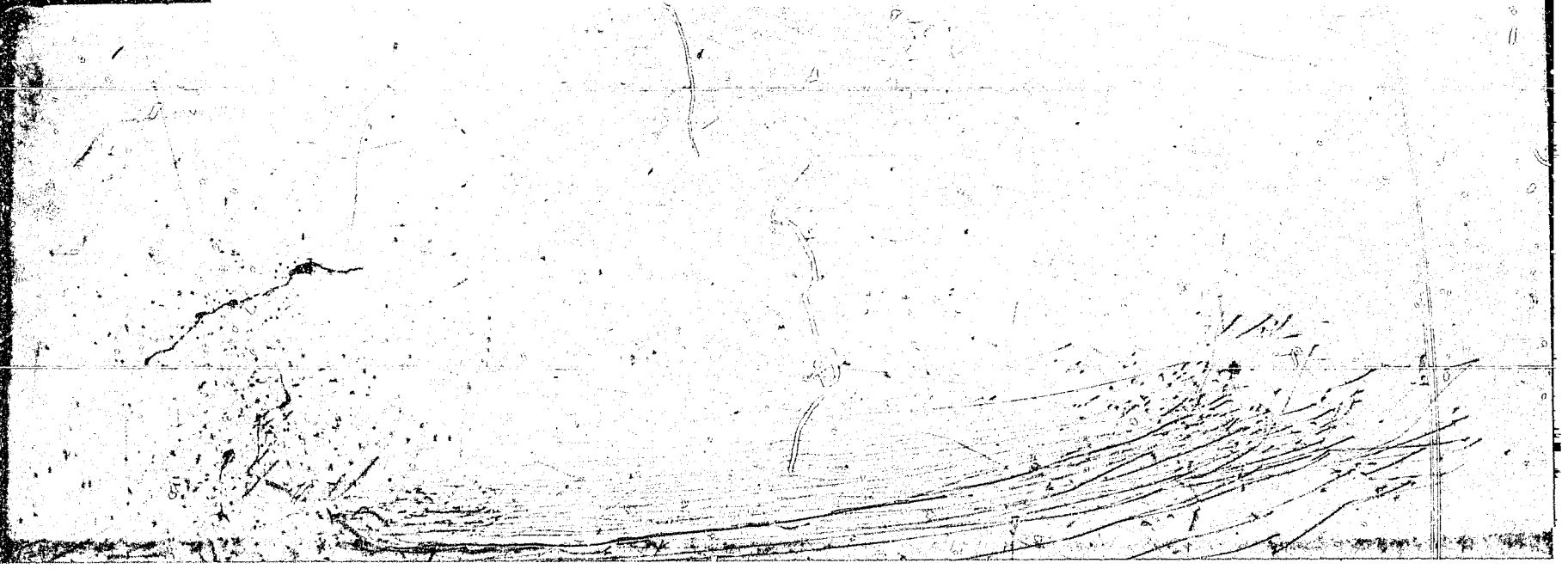
OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
1	6R	7912937	2	3	16	12	14	15	activist
2	6Q	8426884	2	3	17	15	18	10	pragmatist
3	6R	8432960	1	3	14	13	15	13	pragmatist
4	6R	8504159	2	3	4	17	18	19	reflector
5	6R	8518130	2	3	13	12	13	18	reflector
6	6Q	8530813	2	E	5	17	15	17	combination
7	6R	8531579	2	7	10	9	10	15	reflector
8	6R	8558066	1	3	15	16	17	13	pragmatist
9	6R	8601871	2	3	4	14	14	19	reflector
10	6R	8602876	2	3	11	14	15	15	combination
11	6R	8604238	1	F	3	13	15	16	reflector
12	6Q	8604407	2	3	8	18	17	18	combination
13	6R	8604849	1	I	13	20	20	18	combination
14	6R	8605084	2	I	9	15	17	19	reflector
15	6R	8605157	2	3	14	15	13	12	theorist
16	6R	8606352	1	3	13	6	9	8	activist
17	6R	8607913	2	3	3	20	18	20	combination
18	6R	8608240	2	F	16	20	20	20	combination
19	6R	8608596	1	3	8	12	9	7	theorist
20	6R	8608825	1	3	14	16	19	13	pragmatist
21	6Q	8608974	2	3	7	14	9	16	reflector
22	6R	8700204	1	3	7	14	16	15	pragmatist
23	6R	8700389	1	3	15	7	5	8	activist
24	6Q	8700511	2	3	11	17	13	16	theorist
25	6Q	8700533	1	E	13	17	11	15	theorist
26	6R	8701261	1	3	17	6	8	12	activist
27	6Q	8701304	2	3	17	5	6	5	activist
28	6Q	8701443	2	4	4	15	15	19	reflector
29	6Q	8701454	2	3	6	10	9	14	reflector
30	6R	8701679	2	3	14	11	8	13	activist
31	6R	8701977	2	H	3	7	8	15	reflector
32	6R	8702137	2	F	9	10	13	19	reflector
33	6R	8702149	2	3	15	6	11	6	activist
34	6Q	8702152	2	3	11	13	13	19	reflector
35	6R	8702645	1	3	14	8	12	15	reflector
36	6R	8702954	2	3	12	13	10	17	reflector
37	6R	8703246	1	I	13	16	20	19	pragmatist
38	6R	8703892	1	3	9	15	17	13	pragmatist
39	6R	8703958	1	5	10	17	14	18	reflector
40	6R	8703967	2	3	2	18	19	20	reflector
41	6R	8704213	2	3	10	13	15	14	pragmatist
42	6R	8704251	2	3	19	9	11	11	activist
43	6R	8704300	1	3	18	5	8	13	activist
44	6Q	8704347	2	3	12	5	14	12	pragmatist
45	6R	8704460	2	3	11	14	13	16	reflector
46	6R	8704514	2	2	15	14	12	18	reflector
47	6R	8704588	2	3	10	8	7	18	reflector
48	6R	8704672	1	H	11	16	13	17	reflector
49	6Q	8704717	2	5	7	8	14	19	reflector
50	6R	8704953	1	3	14	10	10	6	activist
51	6R	8705069	2	3	13	20	11	17	theorist
52	6R	8705392	1	E	7	17	20	17	pragmatist
53	6R	8705814	2	3	13	6	13	11	combination
54	6Q	8705889	2	3	10	16	15	18	reflector
55	6R	8705911	2	3	4	15	10	16	reflector

SAS

OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
56	6Q	8706021	2	1	16	11	16	12	combination
57	6R	8706269	1	3	18	9	11	13	activist
58	6R	8706330	2	3	9	17	14	20	reflector
59	6R	8706434	1	3	9	9	5	15	reflector
60	6R	8706595	2	3	17	15	19	16	pragmatist
61	6R	8707105	2	3	13	13	16	14	pragmatist
62	6Q	8707147	2	3	12	13	12	19	reflector
63	6Q	8707191	2	3	9	11	12	18	reflector
64	6R	8707773	2	3	5	18	14	20	reflector
65	6R	8708074	2	G	13	16	16	17	reflector
66	6R	8708374	1	F	9	16	18	19	reflector
67	6R	8708428	2	3	9	8	8	15	reflector
68	6R	8709695	1	J	8	11	13	15	reflector
69	6Q	8710060	1	3	10	14	17	19	reflector
70	6R	8710094	2	3	14	13	11	15	reflector
71	6R	8800016	2	3	7	18	19	20	reflector
72	6R	8800120	2	3	11	7	4	16	reflector
73	6R	8800234	2	3	12	13	15	10	pragmatist
74	6R	8800277	2	3	11	11	13	15	reflector
75	6R	8800294	2	C	16	11	9	6	activist
76	6Q	8800315	2	H	10	13	7	15	reflector
77	6Q	8800374	2	F	7	11	16	18	reflector
78	6R	8800382	2	2	7	16	13	17	reflector
79	6Q	8800560	2	3	11	11	6	10	combination
80	6Q	8800591	2	3	13	16	11	16	combination
81	6R	8800897	2	3	6	18	16	20	reflector
82	6Q	8801053	2	I	11	18	15	20	reflector
83	6R	8801133	2	3	11	15	16	17	reflector
84	6R	8801198	1	3	12	14	14	20	reflector
85	6Q	8801202	2	I	13	15	15	18	reflector
86	6R	8801249	1	3	5	12	6	13	reflector
87	6Q	8801337	2	3	11	7	12	15	reflector
88	6R	8801359	2	3	9	14	13	13	theorist
89	6R	8801470	2	3	11	13	11	14	reflector
90	6R	8801832	2	F	14	15	17	17	combination
91	6Q	8801967	2	3	15	12	11	18	reflector
92	6R	8801969	1	3	11	11	11	17	reflector
93	6R	880_013	2	3	15	9	11	19	reflector
94	6Q	8802025	2	3	10	13	13	16	reflector
95	6R	8802225	1	5	16	14	17	14	pragmatist
96	6Q	8802275	2	7	15	10	12	16	reflector
97	6R	8802467	1	H	16	20	20	20	combination
98	6R	8802490	2	3	9	18	11	20	reflector
99	6R	8802509	2	3	5	14	15	20	reflector
100	6R	8802819	2	G	14	16	16	14	combination
101	6R	8802850	2	3	16	11	14	14	activist
102	6R	8802890	2	3	15	6	10	5	activist
103	6R	8802908	2	3	7	17	15	16	theorist
104	6R	8803144	2	F	11	18	11	13	theorist
105	6R	8803252	2	3	15	8	11	10	activist
106	6R	8803364	2	3	6	11	10	16	reflector
107	6R	8803543	2	3	14	9	11	16	reflector
108	6R	8803555	1	3	11	11	10	13	reflector
109	6R	8803660	2	3	14	15	15	16	reflector
110	6R	8803860	2	B	11	18	14	17	theorist



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OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
111	6R	8803901	2	3	12	9	12	14	reflector
112	6Q	8803916	1	3	11	15	13	17	reflector
113	6Q	8803980	1	3	8	15	16	18	reflector
114	6R	8804275	1	G	5	18	20	18	pragmatist
115	6R	8804297	1	3	6	17	16	19	reflector
116	6Q	8804320	1	E	5	11	11	19	reflector
117	6R	8804475	1	G	17	13	18	19	reflector
118	6R	8804482	1	3	14	13	15	15	combination
119	6Q	8804507	1	3	12	14	15	12	pragmatist
120	6R	8804568	1	3	12	8	6	14	reflector
121	6Q	8804627	2	5	7	5	10	16	reflector
122	6R	8804732	2	3	12	4	5	4	activist
123	6R	8804740	2	3	8	10	7	19	reflector
124	6Q	8804825	2	3	15	8	6	12	activist
125	6R	8804984	2	A	11	8	11	18	reflector
126	6R	8805027	1	G	16	16	13	16	combination
127	6R	8805045	1	3	12	13	19	16	pragmatist
128	6R	8805066	2	F	12	17	18	18	combination
129	6R	8805089	2	3	10	11	8	16	reflector
130	6R	8805139	2	A	9	13	11	20	reflector
131	6R	8805234	1	3	8	14	12	17	reflector
132	6R	8805253	1	3	13	9	7	14	reflector
133	6Q	8805310	2	3	14	10	12	13	activist
134	6R	8805329	1	3	11	12	16	13	pragmatist
135	6Q	8805370	2	3	13	5	12	12	activist
136	6Q	8805375	2	3	4	10	7	15	reflector
137	6Q	8805470	2	C	14	7	5	13	activist
138	6R	8805489	1	A	14	16	17	16	pragmatist
139	6R	8805530	1	A	10	12	5	16	reflector
140	6R	8805540	1	7	18	9	7	10	activist
141	6R	8805636	2	3	10	14	15	17	reflector
142	6R	8805700	2	3	13	15	13	17	reflector
143	6Q	8805711	1	E	15	15	15	20	reflector
144	6R	8805760	2	3	14	10	11	18	reflector
145	6Q	8805949	2	3	6	7	4	16	reflector
146	6R	8806057	1	3	19	5	5	9	activist
147	6Q	8806223	2	3	2	12	8	14	reflector
148	6R	8806290	2	3	8	9	10	9	pragmatist
149	6Q	8806323	1	II	19	7	15	5	activist
150	6R	8806364	2	3	13	6	4	8	activist
151	6R	8806582	2	3	10	8	9	16	reflector
152	6R	8806638	2	3	18	2	6	8	activist
153	6Q	8806781	2	3	10	12	11	14	reflector
154	6Q	8806791	2	3	9	17	11	14	theorist
155	6Q	8806854	2	3	16	10	13	18	reflector
156	6Q	8807266	2	3	9	12	11	18	reflector
157	6Q	8807338	2	3	7	10	13	11	pragmatist
158	6Q	8807371	2	I	8	13	10	14	reflector
159	6R	8807390	1	II	13	15	15	17	reflector
160	6Q	8807471	2	3	11	12	10	16	reflector
161	6R	8807542	2	3	9	14	17	18	reflector
162	6Q	8807544	2	3	8	18	15	18	combination
163	6R	8807575	1	2	16	17	15	20	reflector
164	6R	8807578	1	G	13	18	20	18	pragmatist
165	6R	8807628	2	3	14	11	12	17	reflector

(cont/... PAGE 4)

OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
166	6R	8807673	2	3	11	8	13	14	reflector
167	6R	8807729	2	3	18	15	13	20	reflector
168	6R	8808056	2	3	17	20	18	20	combination
169	6R	8808065	2	3	9	6	7	7	activist
170	6R	8808067	2	3	5	17	15	17	combination
171	6R	8808229	2	3	14	5	9	16	reflector
172	6Q	8808233	2	3	7	8	11	4	pragmatist
173	6Q	8808238	2	3	18	6	16	9	activist
174	6R	8808447	2	3	9	16	13	19	reflector
175	6R	8808772	2	3	9	15	13	17	reflector
176	6R	8808890	2	5	12	8	7	18	reflector
177	6R	8809098	2	A	13	17	16	19	reflector
178	6Q	8809136	2	5	8	13	11	14	reflector
179	6R	8809629	2	3	7	14	14	16	reflector
180	6R	8809686	1	I	11	18	17	18	combination
181	6R	8810021	2	3	10	10	12	17	reflector
182	6R	8810214	2	3	14	9	6	11	activist
183	6Q	8810429	1	II	8	17	17	19	reflector
184	6R	8810774	2	3	7	13	10	17	reflector
185	6Q	8810776	2	G	9	11	14	14	combination
186	6R	8810840	2	3	18	13	18	20	reflector
187	6R	8810999	2	3	7	9	5	19	reflector
188	6R	8811005	2	II	9	14	11	17	reflector
189	6Q	8811019	1	II	6	17	19	20	reflector
190	6R	8811060	1	F	9	14	13	16	reflector
191	6R	8811188	2	F	8	16	13	19	reflector

OBS	COURSE	STUDNUM	SEX	HOMELANG	AC	TH	PR	RE	STTYPE
166	6R	8807673	2	3	11	8	13	14	reflector
167	6R	8807729	2	3	18	15	13	20	reflector
168	6R	8808056	2	3	17	20	18	20	combination
169	6R	8808065	2	3	9	6	7	7	activist
170	6R	8808067	2	3	5	17	15	17	combination
171	6R	8808229	2	3	14	5	9	16	reflector
172	6Q	8808233	2	3	7	8	11	4	pragmatist
173	6Q	8808238	2	3	18	6	16	9	activist
174	6R	8808447	2	3	9	16	13	19	reflector
175	6R	8808772	2	3	9	15	13	17	reflector
176	6R	8808890	2	5	12	8	7	18	reflector
177	6R	8809098	2	A	13	17	16	19	reflector
178	6Q	8809136	2	5	8	13	11	14	reflector
179	6R	8809629	2	3	7	14	14	16	reflector
180	6R	8809686	1	I	11	18	17	18	combination
181	6R	8810021	2	3	10	10	12	17	reflector
182	6R	8810214	2	3	14	9	6	11	activist
183	6Q	8810429	1	H	8	17	17	19	reflector
184	6R	8810774	2	3	7	13	10	17	reflector
185	6Q	8810776	2	G	9	11	14	14	combination
186	6R	8810840	2	3	18	13	18	20	reflector
187	6R	8810999	2	3	7	9	5	19	reflector
188	6R	8811005	2	H	9	14	11	17	reflector
189	6Q	8811019	1	H	6	17	19	20	reflector
190	6R	8811060	1	F	9	14	13	16	reflector
191	6R	8811188	2	F	8	16	13	19	reflector