THE INTERACTION OF COGNITIVE STYLE, 
AS MEASURED BY THE MYERS-BRIGGS TYPE INDICATOR, 
AND STRUCTURE IN LESSON DESIGN IN AN 
ENGLISH LESSON 

by 

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ABSTRACT

This study tested the hypothesis that students who were identified as possessing an intuitive preference, or cognitive style, on the Myers-Briggs Type Indicator would learn most about a series of poetry concepts if they were in an environment which emphasized discovery learning and low levels of structure. Conversely, those students who were identified as possessing a sensing preference, or cognitive style on the indicator would learn most in a more directed and structured environment. Data was gathered on 167 Grade 8 students who had been randomly assigned to two treatment groups. Analysis of variance and linear regression revealed significant disordinal interaction for one of the two treatment methods. The interaction partially supported the hypothesis: "N" students achieved most in a discovery-learning environment (P<.005 and P<.001), while "S" students were not significantly advantaged in the more directed and structured environment.
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CHAPTER I

THE PROBLEM

Background of the Problem

Educators have intuitively recognized that individuals differ in learning style and that each learns in a highly specific and individual way. The following quotations support this notion:

"it is the (teacher's) ability to regard, upon occasion both himself and the child as just objects working upon each other in specific ways that compels him to resort to purely arbitrary measures, to fall back upon mere routine traditions of school teaching" (Dewey, 1900)

"individuals possess no such thing as a unitary learning ability" (Woodrow, 1946)

"each particular activity can best be performed (learned) by methods which to an important degree are particular to that activity ... to a degree varying with the individual" (Woodrow, 1946)

"one thing we can all be quite certain of: wherever in the vast realm of human learning we wish to look for individual differences, we surely will find them." (Jensen, 1967)

"no single instructional process provides optimal learning for all students." (Bracht, 1970)

These beliefs are not restricted to the education field. Support for the concept of individual differences, that individuals in fact do vary in many important and significant ways, comes from many different areas of research: from behavioral genetics to psychology. (McClearn and Meredith, 1966; Newell and Simon, 1972). These fields of study have generated theories to account for the differences researchers observed.
In the area of education, however, teachers have been faced with a lack of guidelines or principles to employ in developing strategies for individualizing instruction (Goldberg, Swartz and Stewart, 1977). Divesta (1974) echoed his frustration when he stated "a major source of our dissatisfaction has roots in a philosophy of education based on objectives that the child must adapt to education". He felt improvements in education would only come by "adapting education to the child". Tobias (1976) stated:

"There are few systematic attempts to adapt method of instruction to student characteristics, existing adaptations generally consist of varying instruction rate to student needs rather than instruction method".

In considering the search for instructional principles which take learner differences into account, Snow (1977) stated that until the 1950's there was "no place for individual differences in theories of learning" and there existed a distinct lack of instructional theory based on these differences. He urged researchers to individualize instruction by aiming at particular kinds of students, not the mythical "average" student. His work with Cronbach (Cronbach and Snow, 1977) has made possible a theoretical framework for individualizing instruction through the recognition that individual differences not only predict learning outcomes but also interact with the instructional treatment variables. This forms the basis of the Aptitude Treatment Interaction concept (ATI).

In the school environment, individual differences such as general intelligence, language development, psycho-motor skills, cognitive development, prior learning, self concept and attitude are recognized by teachers, administrators and counsellors as impacting directly on learning. Differences in cognitive style are generally not considered and since they are a relatively stable measure of individual differences, are
worthy of our study. A reliable test measure, the Myers-Briggs Type Indicator (MBTI) has improved our ability to identify cognitive style and provides a useful research tool for the purposes of this study.

Most education researchers recognize that a perfect teaching model does not exist (Joyce and Weil, 1980) and further that "no model of teaching is designed to accomplish all types of learning or to work for all learning styles" (ibid). Most teachers, having experienced ineffective teaching and poor performance from some of their students, have developed a repertoire of teaching strategies to consider individual differences. Difficulties arise when instruction is effective for some students and not others; a more serious consequence arises when instruction actually deters or hinders achievement for some learners.

The late curriculum theorist, Hilda Taba, (1965) discussed the active transactional aspect of learning when she considered the interaction between the individual in a learning environment and the data or information to be learned. She stated "the materials of instruction become available to the individual when he or she performs certain cognitive operations on them - organizing facts, relating points, generalizing or making inferences". (p.49).

Purpose of the Study

This study focuses on specific student differences as reflected by their particular cognitive style and the interaction with information presented to them using two different teaching models. Cognitive style is defined by Cronbach and Snow
(1977) as habitual patterns or preference strategies of information processing. The instrument used to measure these preferences is the Myers-Briggs Type Indicator. This indicator identifies four scales: Introversion-Extroversion (I-E), Thinking-Feeling (T-F), Intuitive-Sensing (N-S) and Perceptive-Judging (P-J). These terms will be defined in the following section. The two teaching models used in this study reflect different degrees of structure and are based on the theories of Bruner and Gagne. Bruner's model is less structured and allows the learner to discover relationships and concepts in the learning materials for himself. The model based on Gagne's approach is more structured and leads the learner through a step-by-step lesson where information builds on previously presented concepts. These models, and variations thereof, are commonly used by educators and curriculum developers. (Joyce and Weil, 1980).

A research design which involves the interaction between student differences and lesson design is referred to as "Aptitude Treatment Interaction". (Cronbach and Snow, 1969). This theory offers a framework from which educators might develop principles to match lesson design or instructional practices to learning style.

With these concepts in mind, the researcher sought to answer the following question:

Is there an interaction between the amount of structure in lesson design and the cognitive style of the learner, as measured by two scales of the Myers-Briggs Type Indicator (MBTI) which play a part in cognition, namely intuition and sensing, and perceiving and judging?
Theoretical Framework and  
Definition of Terms

This section describes the theoretical framework and defines the terms used in the study. Further clarification of the key concepts is given in the literature review, Chapter 2.

Joyce and Weil (1980) define a teaching model as a prescription for a learning sequence. They describe four basic families of teaching models and numerous models within each of these families. The author has chosen to focus attention on the information-processing family of teaching models because the lesson objectives in the experimental study dealt with the attainment of concepts and problem solving. Joyce and Weil (1980) described information processing as "the ways people handle stimuli from the environment, organize data, sense problems, generate concepts and solutions to problems" (p.9). Students acquire concepts when they are able to identify the critical attributes of a concept and therefore recognize examples and non-examples of the concept. A concept is defined by Houston (1986) as "a symbol or group of symbols that stands for a class, or group, of objects or events that possess common properties" (p.330).

Two teaching approaches were used by the author in a 30 minute lesson on elements of poetry using overhead transparencies and audio cassette tape. These approaches differed in the amount of structure implicit in each. Model A is a more structured version based on Gagne's principles (Gagne and Briggs, 1974) while Model B is less structured and is based on the notion of discovery learning proposed by Jerome Bruner (1967).
TABLE I

Schematic of Teaching Model A

1. Statement of Objectives

2. Modelled Performance

3. Provision of Definition

4. Presentation of Examples

5. Stimulus Presentation

6. Elicitation of Response

7. Feedback

8. Assess Learning (Posttest, PT), Delayed Posttest (DPT) outcomes

Teaching Model A is an adaptation of an approach to lesson design which presents a clearly outlined step-by-step sequence for learning suggested by Briggs (Gagne & Briggs, 1974 p.140-177). A step following statement of objectives calls for the provision of learning guidance by allowing the student to speculate on the meaning and nature of the concept to be defined, with an attempt made at definition. In the author's design, this step was eliminated in order to structure the lesson in a more deductive and less inductive manner. Essentially, Model A followed the steps outlined in Table 1 above.
Teaching Model B is based on Bruner's (1959, 1966) principles and reflects his belief that materials should have a low degree of structure in order that students are actively involved in concept learning. This approach did not provide a general introduction or statement of objectives, but each concept was named. Students were required to discover for themselves the attributes which were critical for each concept and then encouraged to discuss their findings before being given feedback. Essentially this model followed the steps outlined in Table 2 above.
Learning Outcomes

The effectiveness of each teaching model was measured by posttest immediately following instruction. A delayed posttest was administered one week later. Test items were the same on both tests, but the order of the items was changed. No test examples were taken from those used in classroom instruction. Students were required to identify examples of alliteration, assonance, consonance, onomatopoeia, metaphor, simile and personification on a two page written test.

Cognitive Style Variables

An individual’s cognitive style is described as his habitual pattern of perceiving the world or processing information (Cronbach and Snow, 1977). There are many models of cognitive style. The measurement instrument used to determine cognitive style in this study, the Myers-Briggs Type Indicator, is based on the psychological type theory of C.G. Jung (Myers 1962 and 1976; Jung, 1921, 1971).

Jung postulated that there are two basic orientations which he called aptitudes and labelled as introversion (I), and extroversion (E). This dimension identifies the basic orientation to life - either a preference for dealing with the external world of people and things (E), or a preference for dealing with the inner world of ideas and concepts (I). Jung also postulated that there are four functions (or mental processes), two relating to the gathering of data, namely sensing (S) or intuition (N); and two relating to the judging of the data, namely, thinking (T) and feeling (F).
According to Myers, gathering data or finding out can be done in either a sensing or an intuitive mode. People who prefer sensing (S), use their eyes and ears and other senses to gather information. Lawrence (1983) described an expertise in sensing as "a differentiated awareness of present experience, acute powers of observation, a memory for facts and detail and a capacity for realism .. a reliance on experience rather than theory." (p.7). People who use their intuitive function look for meaning, relationships and possibilities that are beyond the reach of the senses. Lawrence (ibid) described a strongly developed intuition function thus: "it provides insight into complexity, (it is reflected in) an ability to see abstract, symbolic and theoretical relationships .. (it is) a capacity to see future possibilities ... a reliance on inspiration rather than on past experience." (p.7).

The last scale of the MBTI was added by Myers (1962) and deals with an individual's attitude to the external world. A judging preference indicates the individual prefers to have things decided, judged, settled and planned. The drive is toward closure. A perceptive preference indicates a desire for flexibility and the drive is towards an open, unstructured environment.

The sub-scales of the indicator have been found to be independent of each other (Myers and McCaulley, 1985). However, there does tend to be a correlation between the N--S and P--J scale which Myers believed to reflect a fact about the types themselves. Sensing types, who reply on past experience tend to be more judging in nature (therefore reflecting a J preference) while intuitive types, who are more open to new ideas and possibilities tend to be more spontaneous in nature (therefore reflecting a P preference).
It is important to note that all individuals possess the characteristics identified by the MBTI, but they do not use them with equal liking, frequency, skill or preference. The indicator, therefore, sorts individuals on four scales.

(I) Introversion — Extroversion (E)
(N) Intuition — Sensing (S)
(T) Thinking — Feeling (F)
(P) Perceiving — Judging (J)

Of particular interest to the researcher and relevant to this study are two of the scales most concerned with cognition. These are the N—S scale and the P—J scale. Both these sub-scales were used by Eggins (1979) in her study on concept attainment. The literature review in Chapter 2 further supports the relevance of these sub-scales in the educational environment and the impact of a deductive and inductive teaching approach on the achievement of individuals exhibiting either a N—P or N—J and a S—P or S—J preference.

Aptitude-Treatment Interaction

Aptitude-Treatment Interaction (Cronbach and Snow, 1969), Trait-Treatment Interaction (Berliner and Cahen, 1973) or Attribute Treatment Interaction (Tobias, 1976) are terms used for a research design which attempts to determine the interaction of learner characteristics (aptitude) with teaching model or strategy (treatment). Three possible relationships found in the research are: no interaction, ordinal interaction or disordinal interaction. These are presented graphically in Figure 1 below.
Of concern to the researcher are those instances of disordinal interaction. In these cases, one instructional treatment is found to be significantly better for students exhibiting a certain trait, ability or aptitude, (e.g Sensing) and another treatment is found to interfer with or hinder learning for that student. (Berliner and Cahen, 1973; Cronbach and Snow, 1977).

Delineation of the
Research Problem

A lesson based on elements of poetry and following the two teaching models outlined above was prepared using overhead transparencies and audio cassette tape. Both presentations were approximately 30 minutes in length and contained as many of the same sample items as was possible. The same voice was used on both tapes and an
effort was made to keep tone consistent. One hundred and sixty-seven Grade 8 English students in seven intact classrooms were randomly assigned to one of the teaching treatments. Learning outcomes were measured by a thirty-seven item immediate posttest and a delayed posttest given seven days later. The delayed posttest contained the same items, but in a different order.

Attribute, in this case, cognitive style, was defined using the 126 item forced choice pencil and paper test called the MBTI. The tests were scored using a computer program and students were identified on four scales:


The N–S and P–J sub-scale were used in this study.

The questions to be answered by this study are:

1. is instruction for the S (sensing) and N (intuitive) attribute as effective using either model (i.e. will the results show no interaction?)

2. is instruction for N's better under Model B than for S's when the effect of the J preference is withheld (i.e. will the results show disordinal interaction?)

3. is instruction for S's better under Model A than for N's when the effect of the J preference is withheld (i.e. will the results show disordinal interaction?)
It was anticipated that students who scored high on the J scale of the indicator (defined as the need for order, judging and closure) would perform well on either method, regardless if they were N or S, because of an anticipated higher preference for accomplishment and achievement. This is generally supported by the research literature.

It was anticipated that students who indicated an N preference would perform best under Model B when the effect of the J preference is withheld, since this approach encourages learners to use their own analytical powers in the learning process. It was also anticipated that students who indicated an S preference would perform best under Model A when the effect of the J preference is withheld, since this approach is less inductive in nature and presents the material in a highly structured and concrete manner. This is also generally supported by the research literature.

**Statement of Hypothesis**

There will be an interaction between student preference on the MBTI scales of S–N and the outcomes of the teaching models as measured by immediate and delayed posttest, when the effect of the J preference is not included in the data analysis.
CHAPTER II

REVIEW OF RELATED LITERATURE

For purposes of this study, literature which is relevant to the problem of how structure in learning treatment, or lesson design affects the performance of particular learners will be reviewed. The following sections relate to the literature search:

1. ATI concept — an overview

2. Recent Trends in ATI Research

3. Learning Structure as treatment

4. Cognitive Style — an overview

5. Cognitive Style as aptitude

6. Other Research on Cognitive Style and the Interaction with Learning Structure

7. MBTI research in education
   Sensing/Intuition
   Judging/Perceiving
The ATI Concept — an overview

The ATI (Aptitude Treatment Interaction) paradigm was the product of Cronbach’s (1957) attempt to bring together the correlational and experimental approaches to the study of how individuals learn.

Specifically ATI studies search for an interaction between the characteristics of a learner and teaching styles or strategies. The notion is that when an educator considers learner characteristics he may find that some treatments are much more beneficial to the learner than others. Berliner and Cahen (1973) reviewed the historical background of the ATI philosophy and noted that educators as early as Charcot in 1887, (cited in Carrier and McNergney, 1979) recommended capitalization on the preferred learning mode of students. Charcot identifies learners as "audile" and "visile". Lewin, 1935, (cited in Carrier and McNergney, 1979) also suggested that different learners and different treatments may interact to produce different outcomes. In the classical interaction statement, he defined behavior as being a function of both person and environment. Woodrow (1946) among others began to search for individual differences and how these affected achievement in the school environment. The trend of education research of the early 1960’s saw an emphasis on individual differences, as educators began to look beyond the mechanistic approaches to education suggested by Skinner and, researchers who advocated programmed instruction and other educational technologies as optimal learning strategy. Mumford in 1964 (cited in Torkelson, 1977) discussed the social, intellectual and humanistic consequences of the ‘automation of knowledge’ and urged educators to consider the possible dehumanizing effects of large-scale use of automation in the education system. Hoban, in 1970, (cited in Torkelson, 1977) in a similar manner, urged educators to evaluate very carefully the "big technologies" - television, computers and
auto-instruction because he suggested they were "depersonalizing". Saettler, (1967, cited in Torkelson, 1977) urged that the focus of research into instructional methods should move away from one centered around "technical accomplishments" to one embracing a "behavioral science concept" which would consider 1) what to teach; 2) to whom; 3) in what way. Many researchers began to consider the interaction of student characteristics and educational treatment as a viable alternative.

Despite the intuitive sense of "rightness" of these ideas and their potential usefulness to education practice, research reviews indicated some problems existed with the research which investigated interactions. Bracht and Glass (1968) for example, reported many disappointing results and conceptual as well as methodological problems. Bracht's (1970) review of 90 research articles found only five which showed disordinal interaction.

Cronbach and Snow (1969) suggested approaches to strengthening ATI by focusing attention on the elimination of design weaknesses such as haphazard treatments, poorly defined aptitudes and incorrectly reported data. They went on to suggest that early research to detect ATI was restricted by statistical designs which often did not reveal interactions. (Cronbach and Snow, 1977). They reported that the use of regression analysis and the setting of confidence levels are two widely used statistical techniques that have, since the mid 1970's, detected interactions with more surety.

Berliner and Cahen's (1973) review found that the ATI concept was being applied to other fields of study apart from education. They found applications to such diverse fields of social science as medicine, anthropology, pharmacology and special education. They also report a diversity of terminology - aptitude treatment
interaction, first coined and used by Cronbach and Snow (1969), attribute - treatment interaction, used by Tobias (1969) and trait - treatment interaction which they preferred (Berliner and Cahen, 1973). These findings tend to support the generalizability of the concept to other areas of research, and the variations in focus by some researchers.

The extensive survey of ATI research conducted by Cronbach and Snow (1977) reviewed social, philosophical, methodological and educational aspects of aptitude and instruction. Their review included all areas of student characteristics, including abilities, (Alvord, 1966; Bunderson, 1967; Gagne and Paradice, 1961; Yeager and Kissel, 1969), cognitive styles (Hunt and Sullivan, 1974; Stannes and Gordon, 1973; Grippin, 1974), personality traits (Harvey, 1970; Cattell, Guildford and Zimmerman, 1966; Whitehall and Jipson, 1970), and intellectual processing skills (Goldman, 1972; Greeno and Mayer, 1972). Their review of treatment includes studies on programmed instruction (Roebuck, 1970; Bushman, 1971; and Berliner and Melanson, 1971 (cited in Cronbach and Snow, 1977)) as well as discovery methods and other innovative curriculum (Olander and Robertson, 1973; Barish, 1970; Rizzuto, 1970). Statistical methods and research designs are also presented in this review. Their conclusions were that aptitude treatment interactions exist. They stated, however, that no interactions were so well confirmed that they could be used directly as guides to instruction. They called for more research which defines clearly what is meant by learner differences and which uses statistically sound analysis of data. Holtan (1982) reports that the use of analysis of variance and regression techniques are now being widely adopted.
Recent Trends in ATI Research

Ausburn and Ausburn (1978) suggested that in order for ATI research to yield results which have significance for education practice, it must consider the interaction of learner characteristics, task requirements and instructional variables. Hart's 1985 ATI study used a media attribute approach and found ATI. Kyllonen's (1984) study showed the importance of including characteristics of task items on treatment effect. Certainly as the use of educational media increases this would appear to be a valuable area for further study.

Another area of research includes locus of control, where emphasis is placed on the learner's choice and use of educational options. (Peterson, Janicki and Swing 1981). Tobias (1984) studied student selection of macroprocess to improve learning in a lesson about data processing. Her study indicated students were often not aware of what microprocesses were best for them and therefore often did not benefit from their use.

Slavin and Oickle (1980) investigated the social conditions involved and interacting with learning. His treatments included team assisted individualization, ability group active teaching and an untreated control group. Achievement and attitudinal effects were compared. Teacher role and interaction of teaching style was investigated by Marshall and Weinstein (1985) and Paradise and Block (1984) and the importance of student-teacher congruity, in terms of cognitive style and other personality factors was demonstrated.

Another important trend in ATI research is Snow's work on aptitude. (Snow and Lohman, 1984). Their aptitude theory seeks a grounding of individual differences
in general psychological terms in order to explain the nature of cognitive aptitude in learning from instruction. This reflects Snow's hope that the end result of research into ATI would be a theory of cognitive process. (Snow, 1977).

Despite the problems experienced by ATI research, Cronbach and Snow (1977) supported this approach with the belief that:

"to abandon the aptitude-treatment interaction model is to assume there is only one path toward educational developmental, and that individual differences have no implication save the fatalistic one, of telling the educator that some pupils will advance more rapidly than others no matter what he does". (p.193).

**Learning Structure as Treatment**

The two teaching methods used in this study differed from one another in respect of the type and degree of structure. Method A contained the most structure and began with a presentation of rules, principles or definitions and then moved towards application and practice. In this respect this approach may be considered an example of a deductive sequence. (Shavelson and Ebrahimb, 1978). Method B imposed much less structure on the learner and began with the presentation of specific cases and examples, moving from the specific to the general rules or principles. In this respect this approach may be considered an example of an inductive sequence (ibid).

The literature on teaching methods in ATI tends to pair instructional methods for purposes of comparison. There are five main categories of comparison: (1) methods and sequences of programmed instruction, (2) programmed vs. conventional
instruction, (3) mastery vs. conventional instruction, (4) more verbal vs. less verbal instruction (5) inductive vs. deductive instruction. This review will concern itself with the last category.

Many studies have been conducted which attempt to assess the relative effectiveness of inductive vs. deductive instruction (Gagne and Paradise, 1961; King, Roberts and Dropp, 1969; Remstad, 1969; Sakmyster, 1972; Steve and Tennyson, 1974; Dossey, 1975; Douglas and Kahle, 1977). More relevant for our purposes are those studies concerned with the specific interactions of learner characteristics and deductive vs. inductive approaches.

Sobel (1956) conducted a study to assess concept attainment for grade 9 Algebra students. Using general mental ability as the aptitude, the inductive method was found to be more effective for the highs while no difference was found between treatment type for the lows.

A similar ordinal interaction was found by Maynard and Strickland (1969) who compared a lecture or guided discovery sequence with a self discovery sequence. Students scoring high in mental ability did better on the discovery method, lows showed no difference.

Trown (1970), in a study assessing the interaction between a personality construct and structure in learning materials found introverts benefitted from the deductive sequence, extroverts from the inductive sequence.
Mayer and Greeno (1972) found that college students of high crystallized ability performed better on a treatment emphasizing meanings of concepts. Students with low crystallized ability performed better on a treatment emphasizing algorithms.

Egan and Greeno (1973) also working with crystallized ability found that a deductive approach was most beneficial to low ability college students than was the inductive approach, which benefitted the high ability student.

Branch (1973) used a personality construct, analytical style (defined by Siegel and Siegel, 1965) in his ATI research. The inductive treatment was found to be better for the lows, while no difference was found between treatment methods for the highs.

Mayer (1974) found disordinal ATI in his study. Results showed that low ability (crystallized ability aptitude) performed best in the deductive treatment while highs performed best in the inductive treatment.

Catanyano and Goodwin (1977) also found inductive sequences more effective for high crystallized ability college students and the deductive approach best for the low ability students.

A study by Rizzuto (1970) conducted over one month of instruction used inductive and deductive instruction in English. The Grade 8 students were tested for verbal ability (SCAT) as one aptitude measure. The other measure was student sex. Three classes received formal and precise instruction, following a deductive approach while the other three were structured more inductively with the teacher acting as the catalyst and fielding many open-ended questions. His study extended over twenty - 45 minute class periods. Although results for ability x treatment were not significant, he
found that sex of the student was significant. Girls did much better on the inductive treatment than did boys. In reviewing the study by Rizzuto, Cronbach and Snow (1977) report that the statistical approach diluted the results, and a much more significant disordinal interaction may, in fact, have been produced. They were unwilling to accept the null hypothesis and consider the study to be inconclusive.

Storm and Hocwar (1982) found course structure interacted with personality attributes. Those who preferred moderate to high structure were identified as dependable, cooperative, resourceful and adaptable on the Adjective Check List scale (ACL).

McGivern and Levin (1983) used fifth graders identified as having either high or low levels of vocabulary knowledge. Three treatment designs, varying in amount of structure were used to test for ATI. Interaction was found which showed that degree of structure made far less difference for high knowledge than for lows. Lows were considerably disadvantaged in the low level structure treatments.

Several studies were found to be inconclusive with respect to interactions with deductive/inductive sequences (Brown, 1963; Becker, 1967; Rector and Henderson, 1970; Barrish, 1970; Olander and Robertson (1973).

It would appear that some studies did produce inconclusive results, of these, however, only Olander and Robertson's research used a large sample size (374 students). Many ATI's were found between structure in learning materials and different student aptitudes. Neither an inductive nor a deductive approach was found to be best for all learners.
Cronbach and Snow (1977), found that the studies in this area often did not report interactions with general mental ability and lesson design. Studies subsequent to their review have found that complex interactions may exist (Tobias, 1984), and that researchers must look beyond main effect or first order interactions.

Cognitive Style – an overview

There has been much research done which attempts to define how individuals process information. Lowenfeld (1945) identified learners as Visual/Haptic perceptual types. Witkin (1950) defined learners as Field Dependant or Field Independent based on their ability to perceive objects distinctly from an imbedded background. Kagan (1966) defined a cognitive style dimension in terms of the tempo of hypothesis testing. He identified learns as reflective or impulsive. Santostefano (1964) elaborated on the work of Holzman (1954) and Gardener (1959) and suggested Levelling/Sharpening as a measure of cognitive style. He later redefined this trait as constricted/flexible control (Santostefano, 1971). Goldman (1972) classified learners as logical (those learning from rational processes), or mnemonic (those learning from examples).

The researcher's choice of the Myers-Briggs Type Indicator as a test to determine cognitive style is predicated on the findings in many recent research studies which have implications for effective teaching. The MBTI classifies learners as one of sixteen possible types - that is the result of the various permutations of the four scales (E/I, N/S, T/F, P/J). This classification system allows much more scope in accounting for learner differences than a theory which identifies only two types of learners.
Correlations have been found between some of the scales of the MBTI and other measures of Cognitive Style. Eggins (1978), for example, found that S/N correlated with Witkin's field dependent and field independent types.

Cognitive Style as attribute

Cronbach (1967) called for a new definition of aptitude which would consider styles of thought and personality traits as well as ability. The rationale for this approach was that the traditional ATI research which focused on ability failed to expose the processes which generated individual differences. This researcher has elected to use the term attribute as defined by English and English (p. 39) and favored by Tobias (1969). Cognitive style is defined as "an habitual pattern or preferred style of information processing" (Cronbach and Snow, 1977, p. 375). Some researchers used the term to refer to processes distinct from abilities and personality traits, although there is no logical or empirical basis for this distinction.

The Myers-Briggs Type Indicator and its 16 different type styles is considered a cognitive style in this study, since at least two of its four scales identify preferred modes of gathering and processing information. These are N–S and P–J and they are used in this study. Eggins (1979) defined the MBTI as a personality trait measure. A review of the literature, however, shows that personality traits belong to a large category which include such relatively unstable attributes as anxiety, (Spense and Spense, 1966, Myers and Dunham, 1971, Walters and Tobias, 1985) neuroticism, (Leith and Wisdom, 1970) and dogmatism (Rehn, 1985), as well as more stable attributes such as extroversion and introversion (Amaria and Leith, 1969). In addition, numerous ATI studies have been conducted which use such well established Personality Tests as the
Omnibus Personality Inventory (Mayer, 1974) and the Gordon Personality Profile (Tallmadge and Shearer, 1971) to identify how learners process information. There seems to be no clear distinction between personality trait and cognitive style. This researcher has used Cronbach and Snow's definition of cognitive style and has considered that the constructs of the MBTI do in fact represent attributes which reflect an habitual, consistent and preferred mode of processing information.

Other Research on Cognitive Style and the Interaction with Learning Structure

Hunt and Hardt (1967) defined a learner difference they called conceptual level (CL). They found that high CL students performed best in a flexible environment, low CL students needed more structure. Hunt and Sullivan (1974) confirmed these findings in further research. Other studies with respect to CL and structure include Hunt and Tomlinson (1971) and Hunt and Noys (1972).

Grieve and Davis (1971) compared expository/discovery teaching in a Grade 9 geography class. The results on a posttest were analyzed separately for sex and students from the extremes of field dependence - independence range were included. ATI was not significant for girls, but field dependant boys were found to have benefitted most from the discovery approach. Witkin (1976) stated this was due to the fact that a more intensive, personal and concrete experience with a more congenial social context was provided in the discovery approach. McLeod and Adams (1980) investigated aptitude treatment interactions in the area of mathematics instruction using expository and discovery methods and found interaction. Decreasing the level of structure benefitted high achievers and disadvantaged low achievers. Their earlier
work (McLeod and Adams 1979) used field dependence/independence as aptitude and varying levels of guidance (more or less structure) in mathematics education. They also detected interaction between field independence and a lower level of teacher guidance.

A number of ATI studies using field dependence and field independence as the attribute measure and structure as the treatment have not produced significant results. (Kennels, 1970; Grippen, 1973; Anglin, 1979; Schwen, Bednar and Wolfe, 1979). It is important to note, however, that further developments in data analysis have indicated ATI where none were initially reported. (Cronbach and Snow, 1977).

MBTI Research in Education

The Myers-Briggs Type Indicator was published in 1962 by the Educational Testing Service (ETS). Large scale studies to examine aptitude and achievement patterns in over 3,000 high school students and 8,000 college students have also been conducted in conjunction with ETS. Carlynn (1977) has produced intercorrelation, reliability and validity data on the MBTI which demonstrates its usefulness as an instrument. McCaulley (1981) confirmed these findings. More recently, test-retest reliability showed correlations generally in excess of .8. (Myers and McCaulley, 1985). It was also found that significant correlations existed between MBTI dimensions and such well established tests as the 16PF (16 Personality Factor), the MMPI (Minnesota Multi-Phasic Inventory), the OAIS (Opinion Attitude Interests Survey) and the Allport-Vernon-Lindzey study of values. (Myers and McCaulley, 1985).
The MBTI is being widely used on learning and study skills centres to help students learn to understand their own particular learning style and to help teachers understand what teaching method, strategy or style is best for them. (Lawrence, 1984).

This review focuses on the research done in two of the four scales of the MBTI - those which are relevant to this study. Much of the research identifies learning preferences and their impact on achievement, as the following research review indicates.

**Intuition/Sensing**

McCaulley and Natter (1974) reported that television and audiovisual aids were most appreciated by sensing types. Sensing types were also found to have benefitted most from this type of instruction (Golanty-Koel, 1978). They preferred laboratory exercises and demonstrations (Golliday, 1975; Roberts, 1982), and found memorizing an easy task. (Hoffman, Waters and Berry, 1981). This type of learner tended to be slower to generalize from examples to concepts (Yokomoto and Ware, 1981); or from reading material to real life (Golanty-Koel, 1978). They preferred not to work independently and appreciated opportunities to practice new skills. They were also found to set modest academic goals for themselves, (Grant, 1965; McCaulley and Natter, 1974; Sachs, 1978). McCaulley (1976) addresses the issue of higher performance of the intuitive student in school and notes that academic aptitude tests tend to emphasize symbolic and abstract thinking and de-emphasize practical intelligence and common sense (the strengths of the sensing student). McCaulley and Natter (1974) found that sensing students tried to meet academic goals by planning their time and working in a systematic way.
Carlson and Levy (1973), McCaulley and Natter (1974), and Smith, Irey and McCaulley (1973) found that intuitive types preferred to work on their own initiative. Intuitive types preferred to work with modules which were self paced and enabled them to avoid extensive practice. They were found to prefer learning activities which involved experimental or interpersonal laboratories, rather than step-by-step laboratory exercises or demonstration. (Golliday, 1975; Roberts, 1982). They also reported to feeling academically superior to other students and expected to achieve higher grades (Grant, 1965; Sachs, 1978). Research, in fact, does indicate that intuitive types score higher on academic aptitude measures than sensing types (Myers, 1962, Reynolds and Hope, 1970). Essay questions were favored by intuitives (Grant, 1965) and teachers tended to see them as more insightful and making more meaningful comments in class discussions (Carskadon, 1978).

Judging/Perceiving

Judging types to a significant degree reported that they work efficiently according to their schedules, get their assignments in on time (McCaulley and Natter, 1974) and preferred to learn from clearly organized materials (McCaulley and Natter, 1974; Carlson and Levy, 1973, Smith, Irey and McCaulley, 1973). Students of the judging type were found to achieve slightly better than perceptive types — their characteristics of compliance with rules and their systematic approach to work are seen as much more conducive to study skills. Perceptive types were found to be more likely to start late on assignments, let their work pile up and consequently need to cram at the end of a course before the final examination (McCaulley and Natter, 1974). The spontaneous and flexible approach of the perceptive type may clash with a
highly structured authoritarian approach. Shymansky (1978) found that a reduction in structure and the guidance of a non-authoritarian and non-directive teacher was more compatible with the perceiving learner.

The literature reviewed indicated that most data collected from MBTI research was used to correlate type and achievement. Only one ATI study was found which used the MBTI as a measure of attribute. The study by Eggins (1979) is relevant to the author's work. This study used the ATI concept with the MBTI constructs of Intuition—Sensing and Perceiving—Judging as one of several attribute measures, and the type of classroom instruction method as treatment.

This research study dealt with the teaching of a Science concept using slides and an audio tape to 350 Grade 6 students. The three lesson designs were structured using different models of teaching: an inductive approach; a didactic approach; and a highly structured and concrete approach. Students were randomly assigned to one of the three methods of teaching. In addition to the MBTI, crystallized intelligence (as measured by reading comprehension), fluid intelligence (as measured by the Figures Analysis Test) and field independence/field dependence (as measured by the Group Embedded Figures Test) were used for aptitude measurement. Concept attainment was measured by immediate posttest and by a delayed posttest ten days later.

Eggins found that field dependent as well as field independent intuitive types benefitted most from the less structured, inductive approach. The structured, concrete method was most effective for the sensing types, if they were field dependent. The didactic approach was more effective for field independent sensing types. Students with high crystallized intelligence received scores above the mean on the posttest, regardless of teaching method. Perceiving types of high crystallized intelligence
performed best on the more structured method. The didactic method was more effective with the low crystallized intelligence perceiving type of learners. The Sensing–Judging and Intuitive–Judging types succeeded with all three models. The Sensing–Perceiving types and the Intuitive–Perceiving types were significantly affected by the instructional design. The Intuitive–Perceiving types benefitted by the inductive approach. It was found that they remembered significantly less if taught by the highly structured method. The Sensing–Perceiving types, who are most often underachievers in school, were most successful with the structured lesson design.

Summary

This literature review has focused on how structure in learning treatment affects the performance of particular learners. The research tends to suggest that different amounts of structure (deductive vs. inductive, guided vs. unguided, concept vs. algorithm, high structure vs. low structure) does impact on the performance of different types of learners. On the whole, the less structured inductive type of approach was best suited to those individuals who were identified as exhibiting these characteristics: high mental ability, extroversion, high crystallized ability, or low analytical style. The research on the educational applications of the Myers-Briggs Type Indicator supports its value as a tool to predict learning style preferences and achievement. The study by Eggins (1979) used an ATI concept and found significant interaction between learner attributes on the Sensing (S) and Intuitive (N) scale and the amount of structure in lesson design. Essentially she found that N types preferred and achieved most in a low structure discovery learning environment than did S types who were more successful in a structured environment.
CHAPTER III

PROCEDURES

Introduction

The experiment began with all students being tested using the Myers-Briggs Type Indicator Form G. The test was administered and scored in late November, 1986. In January, 1987 all students were given a survey test to determine the nature and extent of familiarity with poetry concepts. As a result, eight poetry concepts were chosen. These included four methods of creating sound: alliteration, consonance, assonance and onomatopoeia; and three methods of making comparisons: metaphor, simile and personification. Although several students indicated that some of the concepts seemed familiar, none were able to define or label examples of the concepts. The survey also contained concepts which were not chosen for the experiment. The survey was administered one month before the actual lesson and posttest were given to avoid contamination. The concepts used in the experimental lesson were all within the scope and sequence of the Grade Eight Language Arts curriculum.

In mid-February, 1987, classes were randomly assigned to one of the treatment lessons. Instruction was given and the posttest administered. A delayed posttest was given one week later.
Experimental Design

This experiment followed a modification of Campbell and Stanley’s "Posttest-only no control group design" No control group was used, but comparisons were made between the effects of the two treatments. Figure 2 below shows the design:

![Experimental Design Diagram]

The experimental design in this study follows the format used in the Eggins (1979) study, but the author’s study makes use of a survey test. It should be noted that this survey was used only to determine the concepts used in the lesson content, rather than as a method for assigning students to a specific treatment group.

Sample

Permission was obtained from the Principal of Delview Junior High, North Delta, B.C. and the Department Head of English to conduct the experiment using all
Grade 8 English students at the school (187) in seven different classes. (The
difference between sample size, 167, and total enrollment was due to absences.)

After absentee students were eliminated from the study, sample size for
Treatment A was 68 students and for Treatment B, 98 students. The smaller number
for Method A resulted from the fact that the seven classes were kept in tact and
Method A was administered to only three classes. It was felt that keeping classes
intact would be the least disruptive to the students and the school timetable.

Cronbach and Snow (1977) suggest that at least 100 students be used for each
treatment group. The smaller sample sizes in this study is seen as a limitation of the
research.

Students who were absent during MBTI testing were allowed to participate in
the lesson and post-test, but results were not included. Students who were absent for
the lesson and post-test were not included. Those absent for the delayed post-test were
not included.

**Development of Treatments**

The overhead transparencies and audio tape presentations conformed to these
criteria:

1. Poetry concepts were classified as sound device techniques: alliteration,
   consonance, assonance and onomatopoeia; and methods of comparison:
   metaphor, simile, personification.
2. The programs developed were a modification of the principles outlined by Bruner (1967) and Briggs and Gagne (1972).

3. As many poetry examples as possible were common to both groups.

4. The length of each presentation mode was approximately 30 minutes in length.

5. The narrator took care to maintain the same voice tone and level for both presentations.

6. The presentation material was within the comprehension level of Grade 8 students. Examples were taken from regular school textbooks.

7. Materials covered followed the scope and sequence for Grade 8 English as outlined by the Ministry of Education, in the Language Arts Curriculum.

8. Both treatment groups used overhead transparencies and audio cassette tape.

9. Background music used for both groups was Stivell's Renaissance of the Celtic Harp.

The researcher, with an assistant, presented the instructional sequence to each English class in its regular timetable slot. Instructions were given to each group and information regarding the purpose of the study was also provided. Students were encouraged to ask questions before the program was started, since there was no opportunity to do so after the program began.
Method A, the more structured approach, began with a statement of objectives and moved from the concrete to the more abstract examples of each concept. This sequence is a modified version of the principles set out by Briggs and Gagne (1974). Chapter I gives a more detailed description and schematic. A sample sequence is summarized in Table 3.

Method B had a much less structured approach. Two features of the program were typical of Bruner's ideas: (1) students were given the opportunity to discover which critical attributes are essential for each concept, (2) students were given the opportunity to discuss their ideas with another student. Feedback was then given about the critical attributes of each concept. Chapter I also gives a more detailed description of this approach with a schematic. A sample sequence is summarized in Table 4.
TABLE III

Sample Sequence - Method A:

Concept - Consonance

<table>
<thead>
<tr>
<th>AUDITORY SEQUENCE</th>
<th>OVERHEAD TRANSPARENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>(* indicates verbal instruction)</td>
<td></td>
</tr>
</tbody>
</table>

* Notice the repetitive sound in these examples:

1) Hip, Top, Skip, Flop went the frog, grinning a winning smile...

[Overhead read]

[Overhead read]

2) **Consonance** is the repetition of final consonant sounds in neighbouring words.

[Overhead read]

Lets look at three more examples on your worksheet, underline what words create consonance.

* Again, you will have about 20 sec.

* The "ing" sound in stopping, humming, swallowing, creates consonance in example 1

3) ...without stopping, **humming** or swallowing his lifesaver...

[MUSIC]

...without stopping, **humming** or swallowing his lifesaver...

...with one sharp chop and a whop...

...with wicked and hooded eyes...

* The repetition of the "p" sound in example 2, and

* The "ed" sound in example 3 also creates consonance

...with one sharp chop and a whop...

...with wicked **ed** and hooded **ed** eyes...
TABLE IV

Sample Sequence - Method B:

**Concept - Consonance**

<table>
<thead>
<tr>
<th>AUDITORY SEQUENCE</th>
<th>OVERHEAD TRANSPARENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Overhead is read]</td>
<td>1) This is an example:</td>
</tr>
<tr>
<td></td>
<td>...without stopping, humming or swallowing</td>
</tr>
<tr>
<td></td>
<td>his life saver...</td>
</tr>
<tr>
<td>* Again, with your partner try and determine what consonance is all about. Remember, you are looking for sound devices</td>
<td>This is an example:</td>
</tr>
<tr>
<td></td>
<td>...with wicked and hooded eyes</td>
</tr>
<tr>
<td>[MUSIC]</td>
<td>This is not an example:</td>
</tr>
<tr>
<td></td>
<td>...he rode across the purple moor...</td>
</tr>
</tbody>
</table>

- 37 -
Development of the Posttest and Delayed Posttest

The learning level achieved by students was measured by posttest and delayed posttest. These tests were scored out of 37 possible marks. Both tests contained the same items: 10 true/false, 20 examples to be labeled and seven definitions. The order of the test items was changed for each test. The following guidelines were followed in test construction:

1. all test items were clear and concise examples of the concepts taught;

2. none of the test items were examples used during the instructional sequence.
3. each treatment group was given 20 minutes to complete posttest and the delayed posttest.

4. the test measure was reviewed with the Head of the English Department and another English teacher staff member.

Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator, Form G, consists of 126 forced-choice items. Parts I and III require the student to choose from alternatives prepared to represent the preferences of each of the typeologies outlined by Myers and based on Jung's theory. Part II represents word-pair items and the student chooses the most appealing. Final scoring gives the student a position on each of the four continuous scales measured by the MBTI. Table 5 provides sample items from each part of the test. The reader is referred to Chapter 2 which provides the related literature review of this measure.
# TABLE V

**Sample Test Items - MBTI**

## Part I

* Do you usually get along better with:
  - (A) imaginative people, or
  - (B) Realistic people

* In a large group, do you more often:
  - (A) introduce others, or
  - (B) get introduced

* Does following a schedule:
  - (A) appeal to you, or
  - (B) cramp you

* Is it a higher compliment to be called:
  - (A) a person of real feeling, or
  - (B) a consistently reliable person

## Part II

* (A) statement concept (B)
  - (A) systematic casual (B)
  - (A) uncritical critical (B)
  - (A) sociable detached (B)

## Part III

* On most matters, do you:
  - (A) have a pretty definite opinion, or
  - (B) like to keep an open mind

* Would you be more willing to take on a heavy load of extra work for the sake of:
  - (A) extra comforts and luxuries, or
  - (B) a chance to achieve something important

* Do you usually:
  - (A) enjoy the present moment and make the most of it
  - (B) feel that something just ahead is more important

* Which mistake would be more natural for you:
  - (A) to drift from one thing to another all your life
  - (B) to stay in a rut that didn’t suit you

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Reliability and Validity

Test-retest reliability showed correlations generally in excess of .8. (Myers and McCaulley, 1985). Since the Myers-Briggs Type Indicator was designed to implement Jung's theory of psychological types, its validity is determined by its ability to demonstrate factors predicted by the theory. Behaviors are overt indicators of the effects of the basic preferences and these should therefore be consistent with the predictions of the theory. Rich (1972) found correlations ranging to .68 among the MBTI and two other Jungian Instruments, the JTS (Jungian Type Survey) and the Grey-Wheelwright, which suggests that the instruments are tapping the same constructs.

The MBTI has also been correlated with other measurement scales of personality, interest surveys and academic tests. It should be noted that correlations are limited in terms of evidence for construct validity since they report on each dimension separately and not on each of the sixteen types as a dynamic entity. However, significant correlations were found between MBTI dimensions and specific factors measured by such well established tests as the 16 PF (16 Personality Factor), the MMPI (Minnesota Multi-Phasic Inventory), the OPI (Omnibus Personality Inventory), the OAIS (Opinion Attitude Interests Survey), and the Allport-Vernon-Lindzey Study of Values. (Myers and McCaulley, 1985). Table 6 provides a sample listing of the Intuition/Sensing correlations with the above-mentioned measures.
### TABLE VI

Correlations of Sensing and Intuition with other measure

<table>
<thead>
<tr>
<th>TEST</th>
<th>SENSING TYPE (S)</th>
<th>INTUITIVE TYPE (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16PF</td>
<td>Factor G: Proper, rule bound</td>
<td>Factor B: Intelligence</td>
</tr>
<tr>
<td>Personality Factor Test</td>
<td>Factor N: Shrewd, worldly</td>
<td>Factor E: Assertive</td>
</tr>
<tr>
<td></td>
<td>Factor Q₁: Controlled</td>
<td>Factor I: Tender Minded</td>
</tr>
<tr>
<td>OPI</td>
<td>PO: Practical Outlook</td>
<td>Factor M: Imaginative</td>
</tr>
<tr>
<td>Omnibus Personality Inventory</td>
<td>MF: Masculinity-Femininity</td>
<td>Factor Q₁: Experimenting</td>
</tr>
<tr>
<td></td>
<td>IDC: Intellectual disposition</td>
<td>Independence</td>
</tr>
<tr>
<td></td>
<td>for practical learning</td>
<td>Creativity</td>
</tr>
<tr>
<td>OAIS</td>
<td>Business</td>
<td>TI: Thinking introversion</td>
</tr>
<tr>
<td>Opinion Attitude Interests Survey</td>
<td>Biological Sciences</td>
<td>TO: Theoretical orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TS: Estheticism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CO: Complexity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AU: Autonomy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RO: Religious Orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IE: Impulsive Expression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AM: Altruism</td>
</tr>
<tr>
<td>ALLPORT-VERNON-LINDZEY STUDY OF VALUES</td>
<td>Economic</td>
<td>Esthetic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* All correlations are significant to $p < .001$.
N varies from 66 - 645
CHAPTER IV

ANALYSIS OF THE DATA

Analysis

The hypothesis, stated operationally in Chapter I, defines the area of interest in this study. The researcher sought to determine if there was any possible interaction between student characteristics and the degree of structure in lesson design.

Prior to testing of the hypothesis, analysis were done to check for potential confounding effects as set out below.

1. **Comparison of Treatment Group Means**

A primary requirement of aptitude treatment interaction, attribute treatment interaction or trait treatment interaction research is that the means for each treatment group be similar, that is, that no significant difference exists which may be attributable to treatment alone. Table 7 and 9 indicate that means are similar for both groups on the posttest and delayed posttest. The one way analysis of variance for the two treatment groups on both test measures is presented in Tables 8 and 10. The analysis indicates that there were no significant differences.
TABLE VII

Means and S.D. for Both Teaching Methods on P.T.

<table>
<thead>
<tr>
<th>METHOD</th>
<th>n</th>
<th>MEAN</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>68</td>
<td>22.97</td>
<td>8.84</td>
</tr>
<tr>
<td>B</td>
<td>99</td>
<td>23.33</td>
<td>8.23</td>
</tr>
<tr>
<td>TOTAL</td>
<td>167</td>
<td>23.19</td>
<td></td>
</tr>
</tbody>
</table>

TABLE VIII

One Way Analysis of Variance for the Two Treatment Methods on P.T.

<table>
<thead>
<tr>
<th>SOURCE OF VARIANCE</th>
<th>D.F.</th>
<th>S.S.</th>
<th>M.S.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>5.23</td>
<td>5.23</td>
<td>.0718</td>
</tr>
<tr>
<td>Within Groups</td>
<td>165</td>
<td>12019.46</td>
<td>72.85</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>166</td>
<td>(P=.7891 - not significant)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TABLE IX**

Means and Standard Deviations for both Teaching Methods on D.P.T.

<table>
<thead>
<tr>
<th>METHOD</th>
<th>n</th>
<th>MEAN</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>68</td>
<td>23.32</td>
<td>7.75</td>
</tr>
<tr>
<td>B</td>
<td>99</td>
<td>22.99</td>
<td>6.89</td>
</tr>
<tr>
<td>TOTAL</td>
<td>167</td>
<td>23.12</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE X**

One Way Analysis of Variance for the Two Treatment Methods on D.P.T.

<table>
<thead>
<tr>
<th>SOURCE OF VARIANCE</th>
<th>D.F.</th>
<th>S.S.</th>
<th>M.S.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>4.39</td>
<td>4.39</td>
<td>.0825</td>
</tr>
<tr>
<td>Within Groups</td>
<td>165</td>
<td>8783.99</td>
<td>53.24</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>167</td>
<td></td>
<td></td>
<td>(P=.7743 - not significant)</td>
</tr>
</tbody>
</table>
2. **Comparison of Treatment Outcomes Over Time**

This analysis was done to ensure that the learning effect had not changed significantly over time.

Tables 11 and 12 provide the means and standard deviations for Methods A and B on the posttest and delayed posttest. A one-way analysis of variance was also performed on the posttest and delayed posttest scores for Treatment A and Treatment B separately. Again no significant difference was found. The results are analyzed on Tables 13 and 14.

<table>
<thead>
<tr>
<th>Method A n = 68</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest</td>
<td>22.97</td>
<td>8.84</td>
</tr>
<tr>
<td>Delayed posttest</td>
<td>23.32</td>
<td>7.75</td>
</tr>
<tr>
<td>Total</td>
<td>23.15</td>
<td></td>
</tr>
</tbody>
</table>

Pearson Product Moment Correlation established reliability between the posttest and the delayed posttest at $r=0.78$. 
TABLE XII

Means and Standard Deviations for Method B on P.T. and D.P.T.

<table>
<thead>
<tr>
<th>METHOD B</th>
<th>MEAN</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>23.33</td>
<td>8.23</td>
</tr>
<tr>
<td>Delayed posttest</td>
<td>22.99</td>
<td>6.89</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23.16</td>
<td></td>
</tr>
</tbody>
</table>

Pearson Product Moment Correlation established reliability between the posttest and the delayed posttest at $r=.82$.

TABLE XIII

One Way Analysis of Variance for Treatment A on the Posttest and Delayed Posttest

<table>
<thead>
<tr>
<th>SOURCE OF VARIANCE</th>
<th>D.F.</th>
<th>S.S.</th>
<th>M.S.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>4.17</td>
<td>4.27</td>
<td>.0595</td>
</tr>
<tr>
<td>Within Groups</td>
<td>134</td>
<td>9398.15</td>
<td>70.14</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>136</td>
<td></td>
<td></td>
<td>(P=.8077 - not significant)</td>
</tr>
</tbody>
</table>
TABLE XIV

One Way Analysis of Variance for Treatment B on the Posttest and Delayed Posttest

<table>
<thead>
<tr>
<th>SOURCE OF VARIANCE</th>
<th>D.F.</th>
<th>S.S.</th>
<th>M.S.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>5.72</td>
<td>5.72</td>
<td>.0983</td>
</tr>
<tr>
<td>Within Groups</td>
<td>196</td>
<td>11405.30</td>
<td>58.19</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>198</td>
<td></td>
<td></td>
<td>(P=.7542 - not significant)</td>
</tr>
</tbody>
</table>

3. Validity of The Test Instruments

An attempt to establish validity of the posttest and delayed posttest was made through consultation with the head of the English department and another staff member of that department. Three questions were subsequently eliminated from the tests as these questions, in the opinion of the staff members consulted, were felt to be ambiguous. The tests were therefore scored out of a maximum score of 37. Reliability of the tests was established through correlation of test scores with the recently administered (January, 1987) cross-grade mid-term examination scores. The researcher did not participate in the construction of the cross-grade test. The Pearson-Product Moment Correlations were established at r=.71 for the posttest on Method A, r=.71 for the posttest on Method B, and r=.62 and r=.74 on the delayed posttests respectively. Results are set out in Tables 15 and 16.
TABLE XV

Correlations of Posttest Scores with Mid-term Scores

<table>
<thead>
<tr>
<th>METHOD</th>
<th>n</th>
<th>CORRELATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>68</td>
<td>.7053</td>
</tr>
<tr>
<td>B</td>
<td>99</td>
<td>.7092</td>
</tr>
</tbody>
</table>

TABLE XVI

Correlations of Delayed Posttest Scores with Mid-term Scores

<table>
<thead>
<tr>
<th>METHOD</th>
<th>n</th>
<th>CORRELATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>68</td>
<td>.6198</td>
</tr>
<tr>
<td>B</td>
<td>99</td>
<td>.7369</td>
</tr>
</tbody>
</table>

4. Comparison of Treatment Group Attribute Distributions

To ensure that student attribute had been randomly distributed in each treatment group, a comparison of the means and standard deviations of the continuous scores of the S–N and J–P construct of the MBTI for Method A and Method B was performed. The results are presented in Table 17. A one-way analysis of variance presented in Tables 18 and 19 indicated that no significant difference was found.
TABLE XVII

Comparison of the Means of the Continuous Scores of the S-N and J-P Constructs for Method A and B

<table>
<thead>
<tr>
<th>CONSTRUCT</th>
<th>METHOD A (n=68)</th>
<th>METHOD B (n=99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/N</td>
<td>100.06</td>
<td>98.92</td>
</tr>
<tr>
<td>J/P</td>
<td>112.85</td>
<td>109.40</td>
</tr>
</tbody>
</table>

TABLE XVIII

Analysis of Variances of S-N Preferences in Treatment A and B

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>D.F.</th>
<th>S.S.</th>
<th>M.S.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>52.35</td>
<td>52.35</td>
<td>.1330</td>
</tr>
<tr>
<td>Within Groups</td>
<td>165</td>
<td>64939.32</td>
<td>393.57</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>167</td>
<td>(P=.7158073 - not significant)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE XIX

Analysis of Variances of J-P Preferences in Treatment A and B

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>D.F.</th>
<th>S.S.</th>
<th>M.S.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>479.50</td>
<td>479.50</td>
<td>.7312</td>
</tr>
<tr>
<td>Within Groups</td>
<td>165</td>
<td>108210.14</td>
<td>655.82</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>167</td>
<td></td>
<td></td>
<td>(P=.3937344 - not significant)</td>
</tr>
</tbody>
</table>

These data indicate that no significant differences exist which could be attributable to treatment alone, to the decay of learning over time, to lack of validity of the instrument or to differences in attribute distribution.

Hypothesis

The hypothesis is stated in the null form in four parts to permit statistical analysis of possible interaction between either or both scales used from the MBTI and the outcomes of the two treatment methods:

Hypothesis:

a. There will be no significant interaction between the S–N scales of the indicator and treatment A as measured by immediate and delayed posttest.
b. There will be no significant interaction between the S–N scales of the indicator and Treatment B as measured by immediate and delayed posttest.

c. There will be no interaction between the S–N scales of the indicator and Treatment A (when only those individuals expressing a P preference are considered) as measured by immediate and delayed posttest.

d. There will be no interaction between the S–N scales of the indicator and Treatment B (when only those individuals expressing a P preference are considered) as measured by immediate and delayed posttest.

To test parts (a) and (b) of the hypothesis, a linear regression and T-test were performed on the data. Two statistical computer packages were used to analyze the data, EPISTAT and LOTUS 1-2-3. The regression analysis data is summarized in Table 20 and the graph in Figure 3 shows disordinal interaction between the attributes and the treatment methods. For treatment A and the S–N scales of the indicator, no significant correlation was found on the posttest (r = .0933, T = .7613 and P = .4492). For treatment B and the S–N scales of the indicator, a significant correlation was found on the posttest (r = .2941, T = 3.0306, P = 3.1295489E-03 or P < .005 with 97 d.f.)
Figure 3: Disordinal Interaction of S–N Preference and Treatment A and B on the Posttest
TABLE XX

Regression Output for S--N Preference Interaction on Treatment A and B on Posttest

<table>
<thead>
<tr>
<th>Treatment A Regression Output:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>18.9363</td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>8.9304</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.0087</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>68.0000</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>66.0000</td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td>0.0403</td>
</tr>
<tr>
<td>Std Err of Coef.</td>
<td>0.0529</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment B Regression Output:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.8633</td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>7.9447</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.0865</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>99.0000</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>97.0000</td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td>0.1261</td>
</tr>
<tr>
<td>Std Err of Coef.</td>
<td>0.0416</td>
</tr>
</tbody>
</table>
TABLE XXI

Regression Output for S—N Preference Interaction on Treatment A and B on the Delayed Posttest

<table>
<thead>
<tr>
<th></th>
<th>Treatment A</th>
<th></th>
<th>Treatment B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regression Output:</strong></td>
<td></td>
<td><strong>Regression Output:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.0436</td>
<td>Constant</td>
<td>0.1379</td>
<td></td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>0.0463</td>
<td>Std Err of Y Est</td>
<td>0.0336</td>
<td></td>
</tr>
<tr>
<td>R Squared</td>
<td>18.9569</td>
<td>R Squared</td>
<td>9.3445</td>
<td></td>
</tr>
<tr>
<td>No. of Observations</td>
<td>68.0000</td>
<td>No. of Observations</td>
<td>99.0000</td>
<td></td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>66.0000</td>
<td>Degrees of Freedom</td>
<td>97.0000</td>
<td></td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td></td>
<td>X Coefficient(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std Err of Coef.</td>
<td></td>
<td>Std Err of Coef.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4 indicates similar results were obtained on the delayed posttest. The regression output is summarized in Table 21. Again, no significant correlation was found for Treatment A and the S—N scales of the indicator \( (r = .1153, T = .9423, p = .3491) \), but a significant correlation was again found between the S—N scale of the indicator and Treatment B \( (r = .3843, T = 4.0997 \text{ and } P = 8.550132E-05 \text{ or } P < .001 \text{ with } 97 \text{ d.f.}) \)

Parts (c) and (d) of the hypothesis were designed to investigate the significance of the effect of the "J" subscale of the indicator. As was reported in the literature review in Chapter II, research indicated a correlation between school success and
Figure 4: Disordinal Interaction of S–N Preference and Treatment A and B on the Delayed Posttest
achievement and individuals expressing a J preference on the MBTI. These students were eliminated from the analysis of the data summarized below. The same procedure was used to test these parts of the hypothesis as was used for parts (a) and (b).

The regression output is summarized in Table 22 and the graph in Figure 5 again shows disordinal interaction between the aptitudes of S—N and the treatment methods (but now with the effect of the J preference eliminated). Again, no significant correlation was found on the posttest for Treatment A and the S—N preference \((r = .1609, T = -1.0565\) and \(P = .2968\)). For Treatment B and the S—N scales of the indicator, a significant correlation was found on the posttest \((r = .3615, T = 3.0032\) and \(P = 3.891051E-03\) or \(P < .005\) with 60 d.f.)

**TABLE XXII**

Regression Output for S—N Preference Interaction on Treatment A and B on the Postest (with the effect of the J Preference Eliminated)

<table>
<thead>
<tr>
<th>Treatment A</th>
<th>Regression Output:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>14.8416</td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>8.7618</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.0259</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>44.0000</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>42.0000</td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td>0.0696</td>
</tr>
<tr>
<td>Std Err of Coef.</td>
<td>0.0659</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment B</th>
<th>Regression Output:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.1738</td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>7.7591</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.1307</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>62.0000</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>60.0000</td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td>0.1521</td>
</tr>
<tr>
<td>Std Err of Coef.</td>
<td>0.0506</td>
</tr>
</tbody>
</table>
Figure 5: Disordinal Interaction of S—N Preference and Treatment A and B on the Posttest without the Effect of J
Figure 6 indicates similar results were found on the delayed posttest. Regression output is summarized in Table 23. No significant correlation was found on Method A and the S–N scale ($r = .2588, T = 1.7363$ and $P = .0898$). However, the most significant correlation of the study was found between Method B and the S–N scale ($r = .5353, T = 4.990, P = 7.152558E-06$ or $P < .001$ with 60 d.f.)

TABLE XXIII

| Regression Output for S–N Preference Interaction on Treatment A and B on the Delayed Posttest (with the effect of the J Preference Eliminated) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Treatment A     | Regression Output: |                |                |                |                |                |
| Constant        | 12.3557          | Std Err of Y Est | 7.8001          | R Squared      | 0.0670          | No. of Observations | 44.0000          |
| X Coefficient(s) | 0.1019           | Std Err of Coef. | 0.0587          | Degrees of Freedom | 42.0000          |
| Treatment B     | Regression Output: |                |                |                |                |                |
| Constant        | 3.8649           | Std Err of Y Est | 5.7229          | R Squared      | 0.2865          | No. of Observations | 62.0000          |
| X Coefficient(s) | 0.1832           | Std Err of Coef. | 0.0373          | Degrees of Freedom | 60.0000          |
Figure 6: Disordinal Interaction of S–N Preference and Treatment A and B on the Delayed Posttest without the Effect of J
When the effect of the J preference is not included in the data analysis, no significant interaction is found between the S—N preference and Treatment A. The hypothesis cannot be rejected for part (c) based on the results noted on the posttest and the delayed posttest.

In Treatment B, the data again indicates that the interaction between the S—N preference is significant and the hypothesis therefore is rejected for part (d), based on the results of the posttest and the delayed posttest.

**Findings**

The results and analyses made in this chapter are considered in this section. Findings are subject to the limitations outlined below.

**Interaction of S—N and Treatment Method**

An interaction between the sensing — intuitive scale of the MBTI and Treatment B was found. Although Figures 3-6 show disordinal interaction between the two treatment groups and the S—N attribute, the slope of the line of regression for Treatment A indicates no significant difference was found. The lines cross in roughly the middle of the attribute scale, a requirement for disordinal interaction. There are significant difference between the attribute measure and Treatment B. The slope of the regression line indicates that S types were disadvantaged on Method B while N types were advantaged and scored higher than N types on Method A. Intuitive types scored higher than sensing types on either method, but Method B was most advantageous.
TABLE XXIV

Most Advantageous Treatment Method for S -- N Students

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>TREATMENT METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuitive</td>
<td>B (significant)</td>
</tr>
<tr>
<td>Sensing</td>
<td>A (not significant)</td>
</tr>
</tbody>
</table>

These results were consistent with those of the delayed posttest.

Research indicates that scales of the MBTI are independent of each other, but a small correlation does exist between --N and --J. The J preference has also been correlated with school achievement since these individuals prefer organized approaches which emphasize closure. For this reason "J" types were not included in the data analysis for parts (c) and (d) of the hypothesis. The results were consistent with those obtained above when both J and P were considered, with slightly lowered scores for S--N under both methods being observed. This tends to support the research which notes the correlation between the J scale and achievement.

Again, the most advantageous method for N types is Method B with S types being disadvantaged. S types scored higher on Treatment A then they did on B, but not significantly so.
Additional Findings

Another observation often made by English teachers in their classrooms is that girls perform much better than do boys in this subject. The researcher investigated a possible sex effect and found a significant effect for girls under both treatment methods. Figures 7 and 8 indicate the results of the linear regression and the interaction between attribute and treatment for males and females. The regression output is summarized in Tables 26 and 27. Under Treatment A girls performed much better if they were sensing (S) types and were very disadvantaged if they were intuitive (N) types. The stronger the N preference, the lower the performance. Conversely, the "S" type female was very disadvantaged under Treatment B. The "N" types performed best under Treatment B and the stronger the preference, the higher the score.

The possible reasons for this effect were not investigated in this study since the literature reports no correlation between sex and the intuitive—sensing or judging—perceiving preferences. These two subscales relate most directly to cognition and concept attainment as reported by Eggins (1979).

The researcher (McCaulley and Myers, 1985) does report a difference between sex and the feeling (F) and thinking (T) subscales of the indicator. Generally 75% of males are "T" types and only 25% of females are "T" types. Conversely, 75% of females are "F" types and only 25% of males are "F" types. There may be a culturally determined bias with respect to the distribution of this attribute among males and females. Table 25 indicates the findings of this research to be consistent with the theory.
### TABLE XXV

Percentages of Male and Female
Thinkers and Feelers

<table>
<thead>
<tr>
<th></th>
<th>MALES n=89</th>
<th>FEMALES n=78</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>71.9%</td>
<td>28.2%</td>
</tr>
<tr>
<td>F</td>
<td>28.1%</td>
<td>71.8%</td>
</tr>
</tbody>
</table>
Figure 7: Disordinal Interaction of Male S–N Preference and Treatment A and B on the Posttest
Figure 8: Disordinal Interaction of Female S–N Preference and Treatment A and B on the Posttest
TABLE XXVI

Regression Output for Male S--N Preference
Interaction on Treatment A and B on the Posttest

<table>
<thead>
<tr>
<th></th>
<th>Treatment A</th>
<th></th>
<th>Treatment B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>8.2122</td>
<td>Constant</td>
<td>14.2725</td>
<td></td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>8.7452</td>
<td>Std Err of Y Est</td>
<td>8.8387</td>
<td></td>
</tr>
<tr>
<td>R Squared</td>
<td>0.0862</td>
<td>R Squared</td>
<td>0.0165</td>
<td></td>
</tr>
<tr>
<td>No. of Observations</td>
<td>42.0000</td>
<td>No. of Observations</td>
<td>47.0000</td>
<td></td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>40.0000</td>
<td>Degrees of Freedom</td>
<td>45.0000</td>
<td></td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td>0.1290</td>
<td>X Coefficient(s)</td>
<td>0.0695</td>
<td></td>
</tr>
<tr>
<td>Std Err of Coef.</td>
<td>0.0664</td>
<td>Std Err of Coef.</td>
<td>0.0799</td>
<td></td>
</tr>
</tbody>
</table>
TABLE XXVII

Regression Output for Female S--N Preference Interaction on Treatment A and B on the Posttest

<table>
<thead>
<tr>
<th></th>
<th>Treatment A</th>
<th></th>
<th>Treatment B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regression Output:</td>
<td></td>
<td>Regression Output:</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>37.0384</td>
<td>Std Err of Y Est</td>
<td>13.0639</td>
<td>Std Err of Y Est</td>
</tr>
<tr>
<td></td>
<td>7.7058</td>
<td>R Squared</td>
<td>6.6878</td>
<td>R Squared</td>
</tr>
<tr>
<td></td>
<td>0.0840</td>
<td>No. of Observations</td>
<td>26.0000</td>
<td>No. of Observations</td>
</tr>
<tr>
<td></td>
<td>24.0000</td>
<td>Degrees of Freedom</td>
<td>52.0000</td>
<td>Degrees of Freedom</td>
</tr>
<tr>
<td>X Coefficient(s)</td>
<td>-0.1086</td>
<td>Std Err of Coef.</td>
<td>0.0732</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.1216</td>
<td></td>
<td>0.0447</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER V

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Introduction

A strong personal interest in maximizing the effectiveness of instruction as well as an interest in the differences that learners bring to the learning environment motivated this study. There are few guidelines for educators to use when designing instruction to consider the personological differences which impact on performance and achievement. Instruction is often planned for the average student, with the rate of instruction being the variable for the slower student. This study used a well established test, the Myers-Briggs Type Indicator, to assess learner differences. The test is easy to administer and score and therefore could be used by teachers to identify learner attributes. The possible interaction between the attributes identified by the MBTI and the two treatment methods which varied in the amount of structure (a more structured, deductive-type treatment and a less structured, discovery-type treatment) was examined. The researcher's hope is that the results generated by the study might provide guidelines for teachers who seek to make instruction more efficient by consideration of individual differences.

The treatments used in this study followed the principles established by Gagne and Bruner. Method A used a modified version of a Gagne and Briggs sequence which followed a more deductive approach, while Method B was based on Bruner's theories of discovery learning and followed a more inductive approach. Both treatments used overhead transparencies and audio tape, in order to ensure consistency of treatment and eliminate presentation variables.
Method A began with a clear statement of objectives and a step-by-step sequence with took the learner from a clear presentation of the expected performance, (e.g. the identification of simile), through practice, restatement, concept definition and test of the learning.

Method B, on the other hand, was less structured and allowed the learner to "discover" the relationships in the learning materials by identifying the critical attributes of each concept to be learned. Students shared their ideas with a partner and then were given feedback. The learning outcomes of both treatments were measured by immediate and delayed posttest.

The results of the study were analyzed using a regression model to detect aptitude treatment interaction. All analyses were done using a computer package, except the ANOVA tables, which were scored by hand.

Discussion

The analyses of the results, as outlined in Chapter IV indicate that the aspects of cognitive style investigated in this study, namely sensing (S) and intuition (N) do interact with the two teaching methods used. Students were found to perform best under the treatment method which was most consistent with their preferred mode of data gathering as measured by the Myers-Briggs Type Indicator.

The structured approach of Treatment A which presented the information to be learned in small, concrete steps and provided an opportunity to practice the learning
was preferred by the sensing types who consistently scored higher under this method. This finding is consistent with the theory which describes these students as "hands-on" learners who need to "do" to learn effectively. They also need to collect many facts and details in order to master concepts. It would be expected that these learners would be disadvantaged in a learning environment which focused on speculation, hypothesis testing and the relationships between ideas.

The sensing type of learner often has difficulty in a school environment where the emphasis so frequently is not on "practical" skills or common sense learning. Many subjects, such as English, are inherently difficult for them. The study of poetry, and other forms of literature, require the student, for example, to be able to generate ideas, to see relationships, to understand symbols and to draw subtle comparisons. To take this information and put it into a written format - another skill requiring the manipulation of ideas and symbols - can be very difficult for them to master. They may well, with a good deal of effort, produce an acceptable paragraph or essay, but the originality of ideas and the depth of insight that English teachers look for, often is lacking in their work. They simply do not perceive the world in the same manner as an intuitive student.

The intuitive learner performed best under the less structured approach of Treatment B. This method provided the opportunity for students to speculate, hypothesize and generally search for possibilities and relationships. This treatment is consistent with the intuitive's preferred mode of data gathering. They are "insightful" learners who may become quite frustrated in learning environments which demand they accumulate many details and facts before the broad picture is glimpsed. Treatment A, which emphasized the slow methodical accumulation of facts and details
disadvantaged these learners. The researcher observed that a student in Treatment A, who was later identified as a high intuitive type, became quite restless. He was heard to remark to a neighbor "...this is boring!"

The intuitive type usually does well in a school environment, and usually performs much better than the sensing type in the English classroom. They tend to be "readers", whereas sensing types tend not to like this medium. In class discussion their comments are more sophisticated and insightful and their written work also reflects this tendency. McCaulley and Myers (1985) found that in a population of 530 writers and journalists, 73.58% were intuitive types. Another sample of writers, artists and entertainers (n = 208) revealed that 86.08% were intuitives. (p. 151).

The S–P learners were found to be severely disadvantaged under Treatment B. This student type has been referred to as the "underachiever" in schools. Often their achievement scores are lower than what scholastic aptitude and other test measures indicate as their ability. This would tend to suggest that their strengths and weaknesses are not being considered when instruction is planned. Perceiving learners are flexible and spontaneous but may need guidance in controlling their spontaneity. The S–P's may need structure to exercise their skills in observation of details and their fact-oriented approach to learning. Method B would not capitalize on their strengths, and would be a difficult environment for them in which to learn.

Limitations of the Study

Readers wishing to make generalizations about this study or to use it as a basis for further research must keep in mind the following limitations of the study:
1. the study used only one type of instructional media, and this type of media is not often used in the English classroom.

2. teaching Method B used a total of 54 overheads, Method A used only 39. This was necessary due to the use of examples and non-examples for concept identification in Model B.

3. the study was limited in terms of the sample size (n=167). The number of students in treatment A was 68, and treatment B was 99. Cronbach and Snow (1977) recommended at least 100 students per treatment group.

4. there may be interaction between cognitive style and the form of questions used on the posttest measures.

5. there was a lack of absolute control over students' communication between class treatments as well as between the immediate and delayed posttest.

6. the delayed posttest was administered by the regular classroom teacher, rather than by the author, as it was least disruptive to the class schedule.

Of special concern to the author was the elimination of presentation variables. Treatment A was presented to three separate classes, treatment B to four. For this reason overhead transparencies and audio-tape were chosen.
Also important was the minimization of disruption to the regular school system. The author administered all MBTI tests, presented all lessons and administered the initial posttest. The regular classroom teacher administered the delayed posttest since it was felt to be least disruptive to the classes and required only 20 minutes to complete. School timetables were not affected, even though the time between presentations may have resulted in some loss of control over students’ history.

The lesson content was chosen because learning is easily demonstrated and measured. The topic is also suited to the presentation mode (large type-style was used on the transparency examples), and is within the teaching repertoire of the researcher. Elements of poetry is a basic part of the poetry curriculum. The appreciation and understanding of poetry is enhanced when students have acquired these concepts.

Conclusions and Recommendations

Further testing is required of these findings, but the results indicate that three principles could be generated for teachers to consider when individualizing instruction:

1. The low structure discovery-learning method (as was reflected in Method B) is less likely to be effective for S learners, and even less likely for S—P learners. This learner type needs the structure and guidance of a more deductive type of instruction (as was reflected in Method A).
2. Intuitive learners perform well under different conditions, especially if they are N–J learners. The low structure level of the discovery learning method (as was reflected in Model B) was best suited to them.

3. Intuitive learners, especially N–P's may not perform well under highly structured, concrete methods of instruction which emphasize facts and details.

Implementation

The Myers-Briggs Type Indicator, when used as a measurement tool, provides a guide for teachers to help identify the cognitive style of their students. This is useful, for example, in identifying which students would benefit most from a low structure, discovery method of learning and which students would be disadvantaged by this approach. It could also be used to identify those learners which require more structure and guidance in order to achieve in school.

In addition, teachers might also use the indicator to determine their own cognitive style and the implications this might have on their teaching methods. A highly sensing teacher, for example, may have difficulty in presenting materials in a manner which allows the "N" learner to speculate and generate creative solutions to problems. Similarly, a highly intuitive teacher may have difficulty teaching at the level of her more sensing students, who would require more details and facts than she might feel necessary to generate. The congruency between teacher-student is, therefore, another area of research which might be investigated in order to generate guidelines to make education more efficient for both learners and educators.
The findings of this research and other studies into how instruction can be individualized could provide principles to use in a number of ways. For example, principles could be developed which would provide teachers with guidance in planning instruction which would capitalize on the preferred learning mode of the learner, compensate for deficiencies in an individual's cognitive system, and/or remediate by focusing on skills or preferences not well developed in an individual. All three of these approaches are viable models for more effective education.

The literature reviewed and the interactions found in this study, as well as the observations made by teachers in their own classrooms, indicate that the process of efficient education is one which should take into account those differences which make us unique. To quote Isabel Myers-Briggs:

"an understanding of the gifts of diversity may eventually reduce the misuse and the non-use of those gifts. It should lessen the waste of potential, the loss of opportunity, and the number of dropouts and delinquents." (p. 211).
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