1984

An Investigation of the Relationship Between Learning-style and Temperament of Senior High-school Students in the Bahamas and Jamaica

Owen Anthony Roberts

Andrews University

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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN
LEARNING-STYLE AND TEMPERAMENT OF
SENIOR HIGH-SCHOOL STUDENTS IN
THE BAHAMAS AND JAMAICA

A Thesis
Presented in Partial Fulfillment
of the Requirements of the Degree
Master of Arts

by
Owen Anthony Roberts
August 1984
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APPROVAL BY THE COMMITTEE:

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July 23, 1954
Date approved
ABSTRACT

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN LEARNING-STYLE AND TEMPERAMENT OF SENIOR HIGH-SCHOOL STUDENTS IN THE BAHAMAS AND JAMAICA

by

Owen Anthony Roberts

Chairman: Jerome D. Thayer, Ph.D.
ABSTRACT OF GRADUATE STUDENT RESEARCH

Thesis

Andrews University
School of Education

Title: INVESTIGATION OF THE RELATIONSHIP BETWEEN
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THE BAHAMAS AND JAMAICA

Name of researcher: Owen Anthony Roberts

Name and degree of faculty adviser: Jerome D. Thayer, Ph.D.

Date Completed: August 1984

Problem

The purpose of this study was to determine whether senior high-school students' temperaments are considered a significant factor which affect their learning-style.

Method

An e.-post facto research design was used. Two standardized instruments (Learning Style and Temperament inventories) were administered to a total of 326 senior high-school students in the Bahamas and Jamaica.
Results

1. Significant correlations were found between the scales of the *Learning Style* and *Temperament* inventories.
2. Each temperament type is characterized by a linear combination of learning-style variables.
3. Differences exist between (a) males and females on the learning-style variables, and (b) Bahamian and Jamaican students on the learning-style and temperament variables.
4. A significant canonical correlation exists between the scales of *Temperament* and *Learning Style* inventories.

Conclusions

1. Students can identify their preferred style of learning.
2. Students' learning-style is a function of their temperament type.
3. Sex differentiation should be considered when applying learning-styles to individualized and group instructions.
4. Demographic differences between the Bahamian and Jamaican students contributed to the differences in learning-styles and temperaments.
# TABLE OF CONTENTS

LIST OF FIGURES .............................................................. vii
LIST OF TABLES ............................................................... viii
ACKNOWLEDGEMENT .......................................................... x

Chapter

I. INTRODUCTION .......................................................... 1

Statement of the Problem .................................................. 2
Purpose of the Study ....................................................... 3
Need of the Study ........................................................... 3
Background of the Problem .............................................. 6
  Jamaica ........................................................................... 7
  Bahamas ........................................................................ 11
Model-Building Statements ................................................ 14
Hypotheses ....................................................................... 14
Definition of Operational Terms ......................................... 15
  Emotionality (Neuroticism) ........................................... 15
  Extroversion/Introversion ............................................ 15
  Field Independence versus Field Dependence ................. 16
  Learning-Styles .......................................................... 16
  Senior High School ..................................................... 17
  Temperament ............................................................. 17
  Delimitations of the Study ............................................ 17
  Limitations of the Study .............................................. 18
  Basic Assumptions ....................................................... 18

II. REVIEW OF THE LITERATURE ........................................ 20

Theories and Theorists of Temperament ......................... 21
  Development of Temperament Construct ......................... 22
    The conception ....................................................... 23
    The birth of modern thoughts .................................... 25
    Factor analytic contributions .................................... 27
  Summary ........................................................................ 31
Review of the Relevant Dimensions of Temperament ........ 31
  Extroversion-Introversion .......................................... 32
  Extroversion and behavior .......................................... 33
LIST OF FIGURES

1. Relationship between the Classical Four Temperaments and Results of Modern Factor Analytic Methods of Personality Description .......................... 29
2. Graph on Arousal and Performance ................................. 35
3. LSI and TI Correlations Which Are Significant .......................... 109
4. "Best" Subset Model Selection ................................. 136
# LIST OF TABLES

1. Dictionary Definitions of Individualization and Related Educational Implications .......................... 55
2. Continental European Tradition of Learning Theory ......................................................................... 57
3. Anglo-American Tradition of Learning Theory ....... 60
5. List of High School According to Location, Ownership, and Geographical Area ....................... 81
6. **LSI Test/Retest Reliabilities for 100 Subjects** .............................................................. 88
7. Zero-Order Correlation Coefficients of Selected **TI and LSI** Variables ........................................... 108
8. "Best" Significant **LSI** Descriptors of Melancholics .......................................................... 112
9. "Best" Significant **LSI** Descriptors of Cholerics ........................................................................... 112
10. "Best" Significant **LSI** Descriptors of Phlegmatics ................................................................. 113
11. "Best" Significant **LSI** Descriptors of Sanguines ............................................................... 114
12. Comparison of LSI Descriptors of with Each **TI** Variable ....................................................... 115
13. Standardized Discriminant Function of LSI Variables in Discriminating between Males and Females ................................................................. 119
14. Standardized Discriminant Function of LSI Variables in Discriminating between Jamaican and Bahamian Students ....................................... 121
15. Standardized Discriminant Function of TI Variables in Discriminating between Jamaican and Bahamian Students ............................ 123

16. Comparison of LSI and TI Variables as They Discriminate between Sexes and Islands .................................................. 124

17. Canonical Correlation and Bartlett's test of Significance ................................. 126

18. Canonical Correlation of LSI and TI Variables ...................................................... 127
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CHAPTER I

INTRODUCTION

The subject of learning-style has been the topic of many research studies, educational conferences, and teacher-forums during the past forty years. However, during the last decade there has been a renaissance in educational research which focuses on the need for individualizing instruction at the elementary and secondary levels. This area of study has provided much information that has proven useful to teachers, counselors, education specialists, and educators.

The subject of temperament has also received much attention. Several studies have indicated that an individual's temperament is a major factor in influencing his/her attitudes, interests, and general life-style.

Much of the research concerning learning-style and temperament, however, has focused on the North American population. This present study is concerned with the relationship between temperament and learning-style of grades 11 and 12 Jamaican and Bahamian senior high-school students with implications for scholastic performance,
teaching methodologies, career guidance, and teacher education.

Statement of the Problem

The problem to which this research addresses itself is that of investigating the relationship between temperament and learning-style of grades 11 and 12 Jamaican and Bahamian senior high-school students. The aim of this study is to provide an understanding as to how a representative sample of the population of students learn, and to enable better planning by teachers and school counselors with regards to program placement, instructional strategies, and career guidance.

The task of educating youths to be functional literates in order to fill the employment needs of these young developing West Indian communities is a challenging one which requires educated planning and strategies. Efforts are being made on the part of the Jamaican and Bahamian governments to meet the continuing challenge, particularly at the primary and secondary levels.

The problem of fitting youths for higher scholastic performances and ultimately for the world of work will be made easier and more effective if the educators of the West Indies are aware of the personalized ways in which students learn and how learning is affected by modes of temperament. By this awareness, program offerings and teaching methodologies can be designed to meet the needs of
students. In addition, students could be channeled through career guidance to pursue careers compatible with their personalities and national professional needs and interests.

Since no previous studies have been done to investigate the relationship of temperament to learning-style of Jamaican and Bahamian senior high school students, the present study could prove useful to educational planners for the secondary level and secondary teacher education.

**Purpose of the Study**

The purpose of this research was to investigate whether grade 11 and 12 Jamaican and Bahamian senior high school students' temperament had a significant relationship with their learning-style, and whether temperament and learning-style differed significantly between the sexes and between Jamaican and Bahamian students.

**Need for the Study**

Individualizing or personalizing instruction simply focuses the emphasis of the instructional process on each individual student--his/her skills, abilities, interests, learning-styles, motivation, goals, rate of learning, self-discipline, problem-solving ability, degree of retention, participation, strengths, weaknesses, and prognosis for moving ahead in various curriculum areas and projects. The teacher becomes more professional and assumes the functions
of learning facilitator, guide, consultant, professional
diagnostician and prescriber of learning resources,
activities, evaluation procedures, and total learning
packages for each student. The process places more respon-
sibility for learning on the student and makes better use
of his/her individual interests, goals, and strengths.

Once Bahamian and Jamaican educators in general
recognize that children are different from each other in
their ability to learn, their interests and motivation,
their ability to sustain concentration and be self-
disciplined, and in their perceptual strengths and
weaknesses, they would be one step on their way to better
understand each child's peculiar learning-style.
Eventually, they would gear instruction and the total
learning environment to effectively fulfill the needs and
interests of each child.

The need for individualizing instruction has been
apparent for many years. The process of achieving it,
however, is less obvious and not fully realized. Schools
throughout the English-speaking West Indies seem to be
definitely in need of an educated diagnostic and
prescriptive approach to learning and the total education
of their youths in order to achieve four major goals:

1. To provide an educational environment in which
learning can be individualized; that is, each student
become an active participant in the educational process
which changes and shapes his/her behavior by virtue of
his/her interests, skills, abilities, learning-style, motivation, personal and social goals, rate of learning, and self-discipline.

2. To make learning experiences more creative and self-actualizing as a means to facilitate intrinsic motivation and maximize educational achievement for each student.

3. To be used as a tool by educational planners and practitioners in steering the educational policies, program, and processes of the school system in fulfilling personal and national needs.

4. To give a more definite meaning to acculturated West Indian education as opposed to the traditional, neo-colonial British-oriented education.

A later chapter describes how an understanding of students' learning-style and temperament can contribute to achieving these goals.

Finally, one last point must be made to further substantiate the need for this study. For many years now there has been a growing concern by students, parents, teachers, and the Ministries of Education with regards to the high percentage of failures in the General Certificate of Education (GCE) examination Ordinary level and more recently the Caribbean Examination Council (CXC) General and Basic examinations. The statistics of Jamaican students in appendix A indicate that, for the years 1976-1981, the median percentage pass for the subjects listed in...
the appendix for the GCE O'Level is 38.80 percent, while on the CXC for the period 1979-1981 it is 37.03 percent.

The extent to which such academic performance (i.e., the high rate of failure in the GCE and CXC) is the result of a single variable or a set of variables is undetermined (UNESCO Report, 1983, pp. 112-114). However, this study has proposed that an understanding and application of learning-style principles may help to improve the current academic trend.

**Background of the Problem**

An overview of the secondary-school system in Jamaica and the Bahamas puts into context the problem which is the focus of this study. This discussion is limited to Jamaica and the Bahamas since they were the two islands selected for the study and are representative of the socio-economic, cultural, political, and educational mosaic of West Indian life. For clarity, it must be understood that the researcher has no intention to equate Jamaica + Bahamas = West Indies, nor is the West Indian community homogenous so that it can be defined with respect to two West Indian nations. Instead, the researcher having lived in both countries and being exposed to many other West Indian islands assumed that both countries together possess sufficient significant characteristics which are common to English-speaking West Indian islands.
A salient and striking feature of secondary education in Jamaica is its multiplicity of forms. One finds not one but several secondary systems. These are the High Schools, the All-Age Schools, the Agricultural High Schools, and the Trade and Vocational Schools. Each one of these types of secondary schools caters to a different clientele, has a different curriculum and different entrance requirements, and offers different chances of employability and trainability to grades 11 and 12 leavers.

The reason for this diversity can be attributed to the historical development of education in Jamaica, along with the pressing social demands of the past ten to fifteen years. Historically, the Christian church has played a major role in the development of education in Jamaica. Through its leadership, education developed and grew into the elementary-school system, later taken over by the government. Secondary, fee-charging private schools grew from the need to educate the children of the upper and middle class who could not go "Home", i.e., to Europe, to school. This dual system of education continued for some time and its influence is still being felt, although many changes have been instituted within the last century. The present All-Age School is a true descendant of the elementary school and the High School has as its ancestor the classical-oriented, academic, fee-charging school.
Originally, many of these schools were run by churches and trusts. Initially aided by grants from the government, they were later completely funded by the government. The influence of the original bodies (church or trust) can now only be felt through the composition of the school boards and the impact of the board itself on the life of the school.

For many years, the curriculum of the High Schools was strongly influenced by what was taught in the school system in England--Latin, French, English, history, geography, and some science. At the end of five years, the students sat for the coveted Cambridge School Certificate Ordinary Level and a mere handful went on to the Cambridge Higher School Certificate which was taken two years later. Naturally, over the years, there has been a shift towards a more West Indian-oriented curriculum.

In the late 1950s, social pressures and the commitment of the Minister of Education to expand secondary education led to an introduction of the Common Entrance Examination by which many more children aged 11+ were given the opportunity for post-primary education. The majority of children aged 12-15 were still in the All-Age Schools.

From the post-emancipation period, educators in Jamaica have been concerned with agriculture and technical education. It was felt that in a then predominantly agricultural country, agriculture should be taught at all levels, but just how and to what end was never clearly
stated. It was not until the 1920s and 1930s that there was any all-out attempt to introduce technical education at the secondary level. The tremendous growth in technology throughout the industrialized countries had inevitably affected Jamaica. Skilled workmen were needed to service and repair machinery and other trained persons were required to fill jobs in industry. In the 1960s, the development of industry with its job opportunities for a wide variety of technicians found the country seriously lacking in these areas. The existing secondary technical schools had to be up-graded and other technical schools had to be built to satisfy this need.

Because of the desire for secondary education, private schools have always flourished in Jamaica. They run the gamut from very bad to excellent. They are called "independent" because they get no grant from the government but have to subsist entirely on fees paid by the pupils. The better schools can usually attract well-qualified teachers by paying higher salaries than the public schools plus other perquisites to boost salaries. Normally, the fees charged by these schools are correspondingly high. In the poorer schools, the quality of the teachers leaves much to be desired. Previously, there was little or no government control of these schools, but with increased staff in the Ministry, there has been a determined effort to ensure that adequate educational standards be maintained. In 1973, the Independent Schools Regulation

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was passed. This is an attempt "to guarantee that education of equal quality is available to every child (Prime Minister 12/11/1974)". All independent schools have to apply to be registered. They are visited and, if approved, they are then registered.

With the granting of independence in the 1960s, the need for unifying the people became even more urgent. Education itself with its dual system had been a divisive factor. The Common Entrance Examination had made it possible for a growing number of children to go to Secondary High School but this benefited mainly middleclass students. The pressure for more secondary-school places increased. There were a few Senior Schools where some secondary work was being taught. This was not enough. In 1967, about forty Junior Secondary Schools (grades 7-9) were created to give more pupils drawn from a wider social spectrum the opportunity for secondary education. The curriculum in these schools was designed to give students some academic and some vocational training in preparation for the world of work. These students would normally leave the system after grade 9, but the Grade Nine Achievement Test, at that time, allowed a few students to enter High Schools.

In the 1970s, although employers were desperate for skilled workers, technicians, and all categories of workers, the products of the educational system were unable to supply these needs either qualitatively or
quantitatively. New strategies were needed. In 1974, grades 10 and 11 were added to the Junior Secondary Schools which were renamed New Secondary Schools. The curriculum for these two grades had been carefully prepared by the Ministry. This was a set of guidelines based on vocational and prevocational choices. The integration of work and study was the basis of this program.

Probably the single most apparent weakness of this system was the lack of a unified, clearly defined secondary curriculum, which resulted in a number of educational malpractices (UNESCO Report Jamaica: Development of Secondary Education, April 1983, p. 6-7).

In appendix B is illustrated the organizational structure of the Jamaican educational system.

Bahamas

The overview of the secondary-school system in the Bahamas is based on two available sources.

The Bahamian secondary-school system faced the inherent educational drawbacks and impediments of an alien system which narrowed learning and learning experiences to the traditional colonial ideals (White Paper on Education, 1972). Steps are being taken at present to develop a system which embraces a philosophy which is characteristic of the nation's ideals, values, beliefs, and customs.

Currently, the Ministry of Education and Culture is taking decisive steps to develop a unified comprehensive
and flexible secondary curriculum for New Providence and the family islands (Secondary-School Syllabi and Bahamas Junior-Certificate Syllabi).

The secondary-school system is divided into two levels: Junior Secondary Schools and Senior High Schools. The basic characteristics of the junior secondary-schools are:

1. There is no selection for entry to junior secondary-school.

2. All pupils at the junior secondary stage are provided with the same basic curriculum and learning experiences which are a continuation of primary education. The overall curriculum aim here remains the continuation of a general education for all pupils.

3. At the end of the junior secondary stage, there are national examinations (Bahamas Junior Certificate, BJC), testing, and assessments of attainment, interests, and potential for all pupils. This assists the transfer to and provision of proper pre-vocational education in senior High Schools.

The aims of the senior High Schools is to provide students with a variety of immediate goals and experiences so as to help them identify and develop their needs, interests, talents, and abilities, bearing in mind the socio-economic needs of the nation.

The senior High Schools have the following basic goals:
1. The programs of these schools are endeavoring to cater to the complete range of abilities and aptitudes so that they reflect and administer to the needs and aspirations of the lower stratum of the society.

2. The programs provide experiences which include academic and fine arts courses as well as pre-vocational experiences.

3. At the end of the senior high school stage, pupils are required to write the General Certificate of Education examination (GCE) Ordinary Level (*White Paper on Education*, 1972).

In appendix B is illustrated the organizational structure of the Bahamian educational system.

Both educational systems are under extensive revision so as to make each one more efficient and effective in accomplishing its respective goals.

In accomplishing the objective of this study four model-building statements and five research hypotheses were formulated.

The four model-building statements examine the linear combinations of learning style variables which "best" describe each temperament variable, namely, melancholic, choleric, phlegmatic, and sanguine. The five hypotheses are tested in order to determine if significant differences and relationships exist between the learning style variables and the temperament variables.
Model-Building Statements

1. There is a significant linear combination of learning-style variables which best describes melancholies.

2. There is a significant linear combination of learning-style variables which best describes choleric.

3. There is a significant linear combination of learning-style variables which best describes phlegmatic.

4. There is a significant linear combination of learning-style variables which best describes sanguine.

Hypotheses

1. There is a linear combination of the learning-style variables which significantly discriminates between males and females in grades 11 and 12.

2. There is a linear combination of the temperament variables which significantly discriminates between males and females in grades 11 and 12.

3. There is a linear combination of the learning-style variables which significantly discriminates between Bahamian and Jamaican students in grades 11 and 12.

4. There is a linear combination of the temperament variables which significantly discriminates between Bahamian and Jamaican students in grades 11 and 12.

5. There is a significant relationship between the temperament and learning-style of Bahamian and Jamaican senior high-school students in grades 11 and 12.
Each research hypothesis was tested statistically to determine whether or not differences existed.

**Definition of Operational Terms**

**Emotionality (Neuroticism)**

Emotionality is a personality trait which refers to the degree of sensitivity controlled by the neuro-hormonal mechanism of an individual in response to internal or external stimulation. Eysenck and Eysenck (1975) indicated that such sensitivity may be predisposition and hence is linked to hereditary.

**Extroversion/Introversion**

Extroversion and Introversion are two extreme phenomena along a continuum which operates as a function of personality. Their tendencies appear earlier in childhood and evidence more stability through the developmental years. The typical extrovert is outgoing, that is, sociable, has many friends, needs to have people to talk to, is group-oriented, craves excitement, is impulsive, carefree, optimistic, highly kinesthetic, tends to be aggressive, and does not keep his feelings under tight control.

The typical introvert is reserved, that is, a retiring sort of person, introspective, fond of books rather than people, is not impulsive, takes matters of everyday life with proper seriousness, keeps his feelings
under close control, is reliable, somewhat pessimistic, and places great value on ethical standards.

Field Independence versus Field Dependence

Field-independence is an analytical approach in perceiving items or elements as discrete from their backgrounds and therefore overcomes the influence of an embedding context, while field-dependence is a global approach in which the embedding context is perceived to be congruent with the items or elements (H. A. Witkin, 1962).

Learning-Styles

Learning-styles are the unique ways in which an individual searches for meaning. They consist of distinctive, observable behaviors that provide clues to the functioning of people's minds and how they relate to the world. Individuals are affected by five types of variables: (1) environmental (sound, light, temperature, and the need for either a formal or informal design); (2) emotional (motivation persistence, responsibility, and the need for either structure or options); (3) sociological (self, pair, peer, team, adult, or varied); (4) physical preferences (perceptual strengths, need for intake, time of day or night, and need for mobility); and (5) psychological (analytic or global, cerebral dominance, and impulsive or reflective).
Senior High School

Senior High School is an educational institution which provides secondary education from grades 10 through 12. In the Bahamas, senior high-schools are separate from junior high-schools, while in Jamaica, secondary-schools are referred to as High Schools, New Secondary Schools, Technical High Schools, or Comprehensive High Schools, all of which are inclusive of grades 7 through 12. Therefore, senior high-school in Jamaica refers to the senior levels (grades 10-12) of each of these types of secondary schools named.

Temperament

Allport's (1937) first definition of temperament is comprehensive for the purpose of this study.

Temperament refers to the characteristic phenomena of an individual's nature including his susceptibility to emotional stimulation; his customary strength and speed of response, the quality of his prevailing mood, and all the peculiarities of fluctuation and intensity of mood, these being phenomena regarded as dependent on constitutional make-up, and therefore largely hereditary in origin. (1961, p.34)

Delimitations of the Study

This study is concerned only with students in government and independent high-schools in Bahamas and Jamaica. This is a preliminary study for a final study which will investigate the findings of this study relative to the sampled students' performances on the examinations specified below. The sample was selected from students in
grades 11 and 12 who were currently preparing to write the General Certificate of Education (GCE) and/or the Caribbean Examination Council (CXC) examinations.

Limitations of the Study

The limitations of this study are as follows:

1. Due to the complex nature of relevant variables (e.g., socio-economic, type of school attended, parental attitude toward school, etc.) which might have a significant effect on the learning styles of senior high-school students in Jamaica and the Bahamas and the financial constraints of this study, only two demographic variables (sex and island), a set of learning-style variables, and a set of personality variables (temperament) were identified to be studied.

2. The structure and operation of the schools sampled and time had a constraining influence on the representativeness of the students selected.

Basic Assumptions

This study makes the following assumptions:

1. That Bahamian and Jamaican grade 11 and 12 students can clearly indicate their learning-styles and temperaments when asked to do so on the research instruments.

2. That Bahamian and Jamaican 11 and 12 grade students will provide reliable information concerning their
learning styles and temperaments when asked to respond to the items on the two research instruments.

3. That Bahamian and Jamaican grade 11 and 12 students both possess a sufficient degree of maturity and intelligence (i.e., there are no intelligence and age differences) to respond accurately on the research instruments.

4. That the selected sample is representative of the socio-economic strata typical to the Bahamas and Jamaica.
CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature pertaining to this study on the relationship between temperament and learning-style of Jamaican and Bahamian senior high-school students is divided into four sections.

The first section of the review reports on theories and theorists of temperament as conceptualized by such temperament researchers and theorists as Cattell, Guilford, Eysenck, Smekal, Zimmerman, Hippocrates, and others.

The second section deals with related research on temperament that has relevance to personality constructs and learning.

The third section is concerned with theories and theorists of learning-style as conceptualized by such learning-style researchers as Canfield and Lafferty, Dunn, Dunn and Price, Gregore, Hill, Hunt, Kolb, Shchmeck, Ramirez and Castaneda, and others.

The fourth section focuses on related research done in the United States and a few other countries on various aspects of learning-style pertaining to high-school students in particular. Such research is in relation to
personality traits, academic performance, and instructional strategies.

Theories and Theorists of Temperament

Temperament is a basic feature of man's vital activities, intimately involved wherever the purposes and well-being of the person are engaged. Perception, memory, motivation, creativity, learning, and the whole range of man's complex activities show the directing and sustaining force of temperamental involvement. This fundamental role of temperament in human life was compellingly stated by William James (1902) as he described the impact of emotion, which is inseparable from temperament:

... Conceive yourself, if possible, suddenly stripped of all the emotion with which your world now inspires you, and try to imagine it (as it exists), purely by itself, without your favorable or unfavorable, hopeful or apprehensive comment. It will be almost impossible for you to realize such a condition of negativity and deadness. No one portion of the universe would then have importance beyond another; and the whole character of its things and series of its events would be without significance, character, expression, or perspective. Whatever of value, interest, or meaning our respective worlds may appear endowed with are thus pure gifts of the spectator's mind. The passion of love is the most familiar and extreme example of this fact. ... So with fear, with indignation, jealousy, ambition, worship, (learning). If they are there, life changes. ... the practically real world for each one of us, the effective world of the individual is the compound world, the physical facts, emotional values, (moral standards, and self-concept) in indistinguishable combination. (pp. 150-151)

Despite the undeniable importance of temperament in all human experience, until recently psychologists had not advanced far in its comprehensive formulation.
Development of Temperament Construct

The structure of temperament may be conceived of as being three-component, two-dimensional, or pluralistic. Supporters of each position are:

1. Three component: Kretschmer (1936); Sheldon (1940).

2. Two dimensional, which together yield a four-part typology: Hippocrates (ca. 400 B.C.); Galen (ca. A.D. 150); Kant (1789); Wundt (1903); Heymans and Wiersma (1906-1909), and their successors, the LeSenne School psychologists: Eysenck (1947; 1967); Buss and Plomin (1975); Cruise, Blitchington, and Putcher (1980).

3. Pluralistic: Cattell (1946); Guilford and Zimmerman (1956)

Although each theory has substantive support, this study has focused on the two-dimensional/four-part typology approach of temperament. Factor analyses have revealed that this approach provides "the most straight-forward and parsimonious explanation of temperament" (Cruise et al., 1980, p. 943). Since the two-dimensional/four-part approach to temperament is used, the review of the development of temperament construct traces the development from this conception. Views of the development of temperament construct have been presented by several writers (e.g., Eysenck, 1973, pp. 3-11; Eysenck & Eysenck, 1969, pp. 11-45; Roback, 1952). Eysenck's outline (1973)
is presented here in a condensed form as a listing of theorists who were major contributors to the development of temperament theory.

The conception

A discussion of the conceptual development of temperament begins with a study of the semi-scientific, humoral-psychology theory, which was an explanatory approach to the study of human individuality and was initiated by Hippocrates and Galen (Roback, 1952, p. 4). The theory called for an explanation of typical traits of motivational and emotional behavior in the individual. Galen propounded the theory that the body's humors determined the individual's temperament which, in turn, gave evidence to intertwining motivational and emotional traits.

An essential fact to note is that humoral psychology theory provides several germinal concepts which are a vital part of modern psychological thought. First, the term "temperament", as used in this theory, has remained relatively constant throughout time. In fact, "temperament" has progressively become more easily defined. The term has even passed into everyday language to the point where people on the street use the term to characterize types of behavior (Allport, 1968, p. 37; Eysenck, 1973, pp. 4, 5; Roback, 1952, p. 41).

Secondly, although the explanation that the humors of the body cause temperament difference has been abandoned
in the light of modern endocrinology, the principle psychophysical correspondence remains (Allport, 1937, pp. 33, 63, 64). The most common conception of temperament, as here outlined, is that it is determined largely by the glandular secretions of the body and is, therefore, hereditary. Although this is a position held by a number of writers (Allport, 1937, p. 34; Buss & Plomin 1975; Eysenck & Eysenck, 1969, p. 12; Lester, 1974, p. 20; Smekal, 1975, etc.), in some instances their research or research on their test instruments by others does not establish heritability as a fact. Eysenck, for instance, defines temperament with an inherited component. The best known variable of his theory is extroversion, a composite of sociability, impulsivity, and perhaps several other components.

Smekal (1975) not only takes the position that temperament is inherited, but also notes the work of researchers who have successfully tested it. He adds that Soviet differential psychology has proven that neuro-physiological mechanisms have the most important role for heritability of temperament (p. 13).

Essentially, when discussing the position of the above theorists, evidence was presented about the inheritance of temperament as measured by testable dimensions or types. Heritability is a central issue for temperament because it is what distinguishes it from other personality constructs (Jordan, 1983, p. 43). According to
Eysenck (1973, pp. 5, 6), the next major contributor to the theory was Wundt (1903). Wundt translated the four categorical types into two continuous dimensions. He accomplished this by pointing out that Melancholies and Phlegmatics both shared the characteristic of being unchangeable, while Cholerics and Sanguines were changeable. Further, he observed that Melancholies and Cholerics were characterized by high emotionality, while Phlegmatics and Sanguines were characterized by low emotionality.

The birth of modern thoughts

The Austrian theorist Otto Gross (1902, 1909) made significant contribution to modern temperament theory. His emphasis on the causal factors in temperament place him as a pioneer of modern thought. Gross attempted to give a physiological basis to the temperament dimension of introversion/extroversion by introducing concepts of "primary" and "secondary" function (introversion and extroversion were not known as such terms at that time). "The concepts refer respectively to the hypothetical activity of the brain cells during the production of any form of mental content, and to the hypothetical preservation of the nervous processes involved in this production" (Eysenck & Eysenck, 1969, p.19). This notion of a primary and secondary set of functions was adopted by the Dutch workers, G. Heymans and E. Wiersma (1906-1909; Heymans, 1929), who promoted the theory in their school and
among the French Le Senne School psychologists. The result was that the theory was strengthened in the direction of maintaining that individual differences rest on a three-dimensional system. Factors of the system were: emotionality or emotional instability, activity or general drive, primary and secondary function, referred to by Eysenck and Eysenck as extroversion/introversion (1969, p. 25).

The next psychologist to be included as a contributor to the theory of temperament was Jung (1923). Although he never mentioned the work of Heymans and Wiersma, he outlined his temperament types in a manner that was substantially the same as theirs (Spearman 1932, p. 44). Jung's main contribution was his suggestion that extroversion was linked "with the hysterical group of neurotic disorders," and that "introversion was linked with the psychasthenic group (dysthymic-anxiety, reactive depression, phobias obsessive—compulsive disorders)" (Eysenck, 1973, p. 8). The identification of this observation with normal personality types was important to understanding how temperament was related to abnormal behavior.

Kretchmer (1925) was the next theorist who contributed to the theory of temperament. His continuing recognition rests on his insistence that constitutional (body-built) factors are important in the study of temperament.
Factor analytic contributions

The introduction of factor analysis into psychology was made by Spearman (1927). Factor analysis is a statistical method for analyzing patterns of intercorrelation among variables. Using factor analysis, Spearman was the first statistician to "demonstrate the existence of the two factors strictly defined and measured, of emotionality-neuroticism and of extroversion-introversion" (these were referred to as "w" and "c", respectively, in his terminology). This methodological contribution was crucial in transplanting Heyman's and Wiersma's work to Anglo-American researchers.

The contribution of Guilford (Guilford & Zimmerman, 1956), whose work also was directed at the two-dimensional/four-part typology approach to temperament, was to examine in a new light the problem he set out to solve. Specifically, he focused on developing suitable questionnaires in a time when such instruments were considered failures.

Guilford's great contribution was the realization that the intercorrelations between inventory items, and the factor analysis of these intercorrelations, constitute indispensable steps in the isolation of stable personality factors and the construction of suitable questionnaires (Eysenck, 1973, p. 10).

It is fair to state that the Russian writer and experimenter, Teplor, is to be credited with the refinement
of the theory on temperament (Gray, 1964). He combined Pavlov's notions of "weak" and "strong", which were analogous to the terms "introversion" and "extroversion," respectively. He applied this set of notions to the nervous system and used Pavlov's theoretical framework to build up a series of studies on individual difference which Eysenck (1973, p. 10) found impressive.

R. E. Cattell (1946; 1957) was also considered a major contributor to the two-dimensional structure of temperament (Eysenck, 1973; Eysenck & Eysenck, 1969, pp. 32-36). Eysenck (1973, p. 11) and Eysenck and Eysenck (1969, p. 36) consider Cattell's results a constant, valuable, and welcome verification of the fundamental hypothesis on which extroversion-introversion, introversion and emotionality (neuroticism) are based.

The Eysencks are the next natural choice to treat here, in terms of their contribution to temperament theory (Eysenck, 1947; 1957; 1967; Eysenck & Eysenck, 1963; 1969). Their widely used test, the Eysenck Personality Inventory (EPI) (1963), measures two orthogonal dimensions of personality: introversion/extroversion (E) and high/low neuroticism (N). The two dimensions combined comprise four temperaments which are comparable to Hippocrates' Melancholy, Choleric, Phlegmatic, and Sanguine types. In summarizing his contribution, Eysenck (1973, p. 11) writes that what he has tried to do has been to continue the
three-fold approach of the Dutch writers, Heymans and Wiersma, as adapted by Spearman (1932).

Presented in figure 1 is a summarization of these results.

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Introverted ---------'--------------- Extroverted

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STABLE

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Fig. 1. Relation between the classical four temperaments and results of modern factor analytic methods of personality description.


According to figure 1, introvert is quiet and passive while the extrovert is talkative and active; the Melancholic is sober and reserved while the Sanguine is lively and outgoing. Phlegmatic is controlled and reliable while Choleric is excitable and changeable. Also the extrovert
is aggressive and changeable and the introvert is careful and reliable.

Buss and Plomin (1975) have engaged in an extension of the Eysenck and Eysenck method (1969) in their own treatment of temperament combinations. Essentially, they note that Eysenck Personality Inventory respondents are placed in one temperament category only, thus restricting the chance that they might score on any of the other temperament categories. Buss and Plomin (1975) record respondents' scores on each of their four temperaments separately. "Thus, their method allows one to look at an individual's separate scores on each of their four temperaments" (Cruise et al., 1980, p. 945). This approach has also been called "more compatible with both reality and clinical experience than Eysenck's approach" (Cruise et al., p. 945).

The most recent contributions to temperament theory are Cruise and Blitchington (1977), who have merged what they considered the best psychometric and experimental contributions of psychology into the development of a temperament test. They combined the four-temperament theoretical approach of Eysenck and Eysenck (1969) with the temperament-combination procedural contribution of Buss and Plomin (1975). The result was the Temperament Inventory (TI), a test which they believe provides "more information for understanding individual personalities" in
further temperament research (Cruise et al., 1980, p. 946).

**Summary**

This review has traced the development of the two-dimensional, four-part typology approach to temperament from its earliest conception until the latest psychometric and experimental contributions being made in the 1980s. All the primary theories and theorists throughout the development have been represented in the context of a discussion of the work produced by the outstanding writers and researchers of each identifiable period.

**Review of the Relevant Dimensions of Temperament**

There is a restricted criterion for including a work in this review. Only work which utilized both concepts of temperament and learning is considered in this section. The works reviewed are delimited by this writer to studies that have been either written in or translated into English.

Since, from the review of the literature, the extroversion-introversion and emotionality (neuroticism) components of the four-part typology construct of temperament are the most stable and clearly defined components when measured (Eysenck, 1973, p. 10; Eysenck & Eysenck, 1969, p. 36), these two components are examined with respect to learning and learning characteristics.
Extroversion-Introversion

Extroversion-introversion is one of the most widely researched and discussed temperamental dimensions. It is central in the work of Eysenck and Cattell, and important, although in a somewhat different form, in the work of Guilford. Extroversion-introversion scales appear on virtually all major temperament and personality tests (Wakefield 1979).

Eysenck (1975) describes extroverts and introverts as follows:

The typical extrovert is sociable, likes parties, has many friends, needs to have people to talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer, and generally likes change. He is carefree, easy-going, optimistic, likes to laugh and be merry. He prefers to keep moving and doing things, tends to be aggressive and to lose his temper quickly. His feelings are not kept under tight control, and he is not always a reliable person.

The typical introvert is a quiet, retiring sort of person, introspective, fond of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, "looks before he leaps", and distrusts the impulse of the moment. He does not like excitement, takes matters of everyday life with proper seriousness, and likes a well-ordered mode of life. He keeps his feelings under close control, seldom behaves in an aggressive manner, and . . . He is reliable, somewhat pessimistic, and places great value on ethical standards. (p.5)

The term ambivert is commonly used for those who are intermediate between the two extremes. Ambivert is a more appropriate terminology to describe such persons, instead of "normal", since the entire range of extroversion-introversion is usually considered normal.
Extroversion and behavior

The two most characteristic differences between extreme extroverts and extreme introverts are their degrees of sociability and impulsivity (Eysenck, 1967). A highly extroverted person tends to seek out people and enjoys their company. The introverted person avoids people and is socially uncomfortable in their presence, especially when the person is the center of attention. Also, the extroverted person tends to say and do the first thing that comes to mind. The introverted person, on the other hand, is inhibited. The consequences of actions and statements are thought through carefully before saying or doing anything.

The different approaches extreme introverts and extroverts take to work situations are important. The more extroverted person usually works more quickly than introverted persons. In fact, the extrovert may seem to sacrifice accuracy for speed, making more errors than introverts. The introverted person, on the other hand, sacrifices speed for accuracy. The introvert works slowly, but makes few mistakes. This difference is consistent with the extrovert's tendency to be impulsive and the introvert's tendency to consider behavior carefully before acting (Eysenck, 1967).

The introverted person usually seems to be more highly motivated to perform well in a variety of tasks than does the extroverted person. Such a person reports higher
levels of aspiration than the extroverted person and tends to persist longer at a task than the extrovert. The introvert maintains attention on tasks for long periods, while the extrovert requires relatively frequent breaks and changes of activity (Eysenck, 1967).

Extroversion and arousal

The differing levels of arousal result in behavioral and attitudinal preferences and tendencies. Assuming that each person desires and functions best at a moderate level of arousal most of the time, it follows that introverts should most often be found seeking a reduction of external stimulation, inasmuch as external stimulation increases arousal; whereas extroverts should be found most often seeking an increase in stimulation from the environment. Furthermore, a high arousal level facilitates learning in the presence of noxious stimuli, which are particularly arousing and thus particularly aversive to introverts (Morris, 1979, p. 7). The theoretical explanation for this difference involves three statements concerning the person's level of arousal. First, introverted persons are more aroused in general. Second, arousal enhances performance only up to a certain (intermediate) level—a person who is too little aroused does not try very hard, while one who is too highly aroused is too rigid, cautious, and nervous to perform as well as he might. Third, external stimulation raises a person's arousal level. Therefore, with a relatively unaroused
extrovert, external stimulation raises the arousal level, resulting in improved performance. With the already aroused introvert, external stimulation pushes the arousal level past the optimal point and results in poorer performance (Eysenck, 1967; M. Eysenck, 1976).

Figure 2 illustrates the relationship between arousal and performance (cf. Eysenck, 1976). Point A1 represents the initial arousal level of an extrovert. Arousal level is low and the quality of performance on some task is intermediate. If the arousal level is raised by means of external stimulation performance should improve (point A2). Point B1 represents the initial arousal level of an introvert. Arousal level is high and the quality of performance on some tasks is intermediate. If the arousal level is raised by means of external stimulation, performance will probably become worse (point B2).

Figure 2. Arousal and Performance

Two other factors must be taken into account when considering the use of external stimulation with introverts and extroverts. The first factor is the person's level of
emotionality (neuroticism). This variable also influences arousal and is related to task performance, in that a person who is high on emotionality is more easily aroused than a person who is low on this dimension. Persons who are high on emotionality need a reduction in external stimulation when given a task, as opposed to those who are low, who need to be externally stimulated.

The second factor is the difficulty of the task. Task difficulty influences the optimal arousal level—the easier the task, the higher the optimal arousal level. For a very easy task (that is, easy for the person doing it), the optimal arousal level is extremely high, possibly higher than the initial arousal level of any person, introvert or extrovert. For very difficult tasks the optimal arousal level is very low, possibly lower than anyone's initial arousal level. Therefore efforts should be made to have everyone (introvert or extrovert) as relaxed as possible (Eysenck, 1967).

In the light of the present study the above research findings have significant implications for motivation, one of the components of learning-style as measured by the Learning Style Inventory (LSI) and which is discussed later in this paper.

Extroversion and learning

Two characteristics of learning vary with extroversion-introversion. The first is rate of conditioning. Under certain conditions, introverts learn
(condition) more quickly than extroverts. These conditions include (a) weak stimuli, (b) partial (rather than continuous) reinforcement, and (c) short intervals between stimuli that are to be associated. The extent to which the effect of these conditions describe a classroom determines if the introverts will have an advantage over extroverts. Where these conditions are reversed, introverts have no advantage, and may even be at a disadvantage (Eysenck, 1967).

The second characteristic is that the difference in learning between introverts and extroverts mean that exactly the same sequence of lessons is learned differently by two learners. The extroverted learner learns the major points from a lesson (global learner), i.e., those that are strongly presented, but does not learn the minor (weak) points (analytical learner) as well as the introverted learner. Similarly, the extroverted learner learns when reinforcement (or feedback) is given after every trial, whereas the introverted learner performs well with only occasional feedback. Both differences mentioned above make the learning of the extrovert seem more general and that of the introvert more detailed.

One advantage the extrovert may have is in associating concepts presented at different times, that is, with a long interval between the stimuli. This may result in the learner's ability to extract or synthesize things the teacher had not intended to teach. In moderation, this
tendency may be judged "creative", although it may make the student's work seem disjointed if he is not encouraged to explain clearly where the information came from and how it is related.

Another advantage extroverts have has been referred to as "reminiscence" (Eysenck, 1967). Reminiscence refers to a person's performance on a learned task, for example, a list of memorized words, improving after a rest period during which there is no practice on the task. Reminiscence is characteristic of extroverts. Introvert's performance is usually at its best immediately after learning.

Based upon studies done by Entwistle (1972), Honess and Kline (1974), and Neylor (1972), it is stated that extroverts achieve more than introverts up to the age of about 13 or 14 years. From that point on, introverts achieve more than extroverts. A possible explanation for this observation is that the conditions in the early grades favor extroverts while those in the more advanced grades favor introverts. Therefore, it seems reasonable that extroverts would perform well in the elementary class which typically allows a good deal of individual attention, continuous feedback, group work, and short lessons. Instruction in high school tends to be more impersonal, requiring longer periods of studying alone, and greater attention to detailed work (i.e., weakly presented stimuli).
which are conditions favoring the more introverted students.

**Extroversion-introversion**

and **field-dependence**

**field independence**

A final area which is worthy of attention in this section of the review is the dimension of field dependence versus field independence as related to extroversion-introversion.

Much research in this area defines, perceptually, field-dependent individuals as those who are dependent or reliant on external cues to an extreme degree, whereas field-independent individuals are able to rely at least partially on internal cues in their perceptual processes. Witkin and Goodenough (1977) hold that field-dependent persons in an ambiguous situation are more attentive to social cues, have an interpersonal orientation, and are more socially skilled than field-independent persons, who in turn have greater cognitive analysis skills. On the basis of the foregoing description, field-dependent individuals should clearly be extroverted and field-independent persons should be introverted. Lester (1974) reaches the same conclusion based on a common physiological element in the two personality traits.

However, numerous studies have shown no relationship between the two variables. Such was the case with Cegalis and Leen (1977) using the Myers-
Briggs Type Indicator: Ghuman (1977) who administered Cattell's Children's Personality Questionnaire to 11 and 12 year olds; Lester (1976c), in three separate studies utilizing small groups of college students; and Mayo and Bell (1972). Fine (1972) presents data from seven different samples, all of which indicate no relationship between field-dependence and extroversion. Eysenck's extroversion scale was used in some of the samples and the Minnesota Multiphasic Personality Inventory (MMPI) social introversion scale in others.

Educational and Vocational Achievements of Extroverts and Introverts

Academic performance

Insight into some of the variables that are important predictors of academic performance come from a detailed longitudinal study of 345 boys, covering the ages of 11 to 15 (Banks & Finlayson, 1973). School-examination performance was studied in relation to Junior Eysenck Personality Inventory scores. In general, introverts performed better, especially in two schools where ability and aspiration levels were higher. The relationship between introversion and performance increased with age, particularly for students with higher neuroticism scores. Results were also strengthened when extreme over- and under-achievers were considered. There were two clusters of variables in the study that were related to successful academic performance. One centered around achievement
motivation, whereas introversion was an important element of the other. Included with introversion were (1) intellectual curiosity, (2) homework orientation, (3) parental warmth and support, combined with (4) dependence and conformity on the part of the boy, and (5) a slower development of interest in girls.

Apparently the transition period from introversion to extroversion occurs over a fairly lengthy period of time and is seen most clearly in the basic sciences. A study by Sedden (1975) used 741 15 to 19-year-old chemistry students at various educational levels. Employing multiple regression analysis, he found that extroversion-introversion was not related to IQ but was related to achievement in chemistry. For the sample as a whole there was a negative correlation of extroversion with chemistry achievement, an indication that for these students the transition had already occurred. More important, however, there was an interaction between extroversion and age that indicated that the negative correlations of extroversion with performance increased at each age level so that the prediction of the superiority of introverts over extroverts continued to increase with each year of experience. A few weeks after the above data were collected, the same subjects were exposed to a nine-session self-instructional chemistry program (Seddon, 1977). According to pretest and posttest scores on a background chemistry test, there was
an interaction as in the earlier data between extroversion and chronological age.

Goh and Moore (1978) found generally negative correlations between extroversion and grade-point average among 78 university students, 48 vocational technical-institute students, and 49 high-school students in the United States. There was no difference between groups on Eysenck Personality Questionnaire extroversion scores, indicating that differential correlations were not the result of different levels of extroversion at the three educational levels. The negative correlation between extroversion and achievement was significant only at the university level and was much higher for a group of science students than for social studies students.

One study conducted with black Ugandans (Honess & Kline, 1974) and another with South Africans (Orpen, 1976) seem to pinpoint the transition point at a slightly later age. With black rural Ugandans aged 14, 15, and 17, the only relationships between extroversion and achievement occurred in the younger girls, for whom there were positive correlations with three of the five academic subjects used. Orpen's comparison was between rural South African blacks and Afrikaans-speaking rural whites. The results were the same for both groups. In a group of 14-year-olds of both races the correlation between extroversion and achievement was positive, whereas in a group of similar students of both races at the college level the relationship between
extraversion and achievement was negative. In both cases achievement was based on performance on regular year-end examinations.

In general, however, studies conducted in other cultures indicated that either the transition to introvert superiority occurs considerably later or that there is simply no relationship between extraversion-introversion and scholastic performance in those cultures. Paramesh (1976) found no relationship between extraversion or neuroticism (Eysenck Personality Inventory) and performance in seven different subject areas among 155 high-school boys in India; and Mehryar, Khajavi, Razavieh, and Hosseini (1973) found no relationship between college achievement and extraversion in Iran. They correlated an Iranian version of the Eysenck Personality Inventory as well as a psychoticism scale with college entrance exams. Only a small positive relationship of extraversion with IQ was found, and no relationship between extraversion and either math or natural science scores. This is the only study which was found involving psychoticism. The research found that it is a powerful variable which correlated negatively with achievement in Iranian university students.

Other minor related findings include a study by Griffiths and Crocker (1976) who found only a slight tendency for introverts in Newfoundland to make better grades in first-year college chemistry. Actually these investigators were attempting to relate personality
differences to different teaching methods, but found no interaction between individualized and conventional approaches to teaching chemistry to first-year college students. Mann and Rizzo (1972) explored the relationship of extroversion as measured by the 16PF to a specially designed scale for the prediction of collegiate academic success. This scale was the achiever personality scale of the Opinion, Attitude, and Interest Survey. According to the authors, scores on this achiever personality scale correlated .35 with college grade-point average even though it does not correlate with the usual highschool predictors of academic success in college. The findings from this study were that the extroversion scale of the 16PF correlates negatively with the achiever personality scale with subjects consisting of 480 male freshmen. Mehryar, Hekmat, and Khajavi (1975) asked U.S. university students, "Do you regard yourself as an academically successful student?" The group that answered the question yes was compared with the group that answered the question no on the Psychoticism-Extroversion-Neuroticism Scale and on Lanyon's Psychological Screening Inventory. In this study there were no differences between groups on extroversion (expression) for either scale. Hogan (1976) found a small positive correlation between subjective introversion and self-estimated IQ scores among 167 college students. Organ (1975) pinpointed some of the study-habit difference between introverts and extroverts that may be connected
with their different achievement at advanced educational levels. Subjects were fifty graduate business students in each of three classes who were given an opportunity in the course to earn bonus points with high scores on pop quizzes. There was a negative correlation between extroversion and bonus points earned that was not accounted for by aptitude difference: this implies that introverts have more consistent study habits and respond more appropriately to the reinforcement contingencies in the college environment.

Vocational preferences

The personality dimension of extroversion-introversion is a major variable in the study of vocational behavior. Costa, Pozard, and McCrae (1977) administered the Strong Vocational Interest Blank to more than 1,000 adult males, factor analyzed the scale, and extracted five factors of vocational interests. The factor accounting for the most variance was labeled person-versus-task orientation. The most person-oriented vocations were community recreation administrator, YMCA secretary, chamber of commerce executive, credit manager, business administrator, rehabilitation counselor, social worker, and social science teacher. The most task-oriented professions were architect, physicist, mathematician, engineer, artist, chemist, and dentist. These subjects were also given the 16PF, the scales of which were related to the five vocational factors extracted. The primary extroversion scales on the 16PF related clearly to the person-versus-
task orientation factor on the SVIB. That is, those subjects preferring person-oriented vocations also rated themselves as being out-going, happy-go-lucky, venturesome, and group oriented, whereas subjects preferring task-oriented vocations scored low on those variables. There are four of the five 16PF scales that define the second-order extroversion factor.

Similar results were found with the California Psychological Inventory, which was administered along with the SVIB by Johnson, Flammer, and Nelson (1975) to 359 male college freshmen. The CPI was factor analyzed, with extroversion being the second of five factors extracted. This factor reflected primarily high scores on the dominance, sociability, and sense of well-being scales and was clearly the most important of the five factors extracted in terms of relationship to occupational scales. Extroverts preferred dentist, architect, physicist, chemist, engineer, carpenter, farmer, and printer. Interest in business and sales was not related to either.

The relevance of this personality dimension is further underscored by the usefulness of the Occupational Extroversion-Introversion Scale (Johansson, 1970) consisting of a recombination of items of the SVIB. This scale correlated satisfactorily with other extroversion scales (Goodyear & Frank, 1977; Johnson, Nelson, Nolting, Roth, & Taylor, 1975). Johnson et al. found that extroversion scores on this scale were associated with
vocational scales tapping physically active, outgoing, and administrative interests, and Goodyear and Frank (1977) found introversion to be related to the vocations of engineer, physicist, mathematician, and farmer. In contrast extroversion was related to YMCA secretary, chamber of commerce executive, and community recreation leader. In addition these authors found physical science, biological science, and engineering majors in college to be more introverted than business administration majors.

Interestingly each of these studies involved males and none utilized Eysenck's scale of extroversion-introversion. However, an older study of Bendig (1963) administered the Maudsley Personality Inventory and the SVIB to both male and female first-year college students. Social introverts of both sexes indicated more of an interest in vocations as architect, physicist, engineer, and chemist. However, extrovert women and men had different interests, extrovert men preferring social service occupations and extrovert women preferring sales occupations. Although these results with males are consistent with later studies, it is unlikely that the same results would occur again with female students twenty years later.

Holland's (1973) theory of vocational choices, in which he delineates six vocational personality types, does not utilize a single extroversion-introversion dimension, but several authors have noted some obvious semantic
similarities. At face value it appears from Holland's descriptions that extroversion is included in both the social and enterprising personality types, whereas introversion is related primarily to the investigative personality type but is also involved in the conventional and realistic personality types. The artistic type is not clearly related. A word of caution is in order in taking these descriptions at face value because of the results of Ward, Cunningham, and Wakefield (1976). They administered Holland's Vocational Preference Inventory to 425 college students and found that neither the social nor the investigative scales showed the expected relationship with the 16PF scales known to be related to extroversion-introversion. However, these investigators used primarily females as subjects whereas most of the work that has been done on vocational interests involves primarily male populations. Good correlational studies among established measures of extroversion and Holland's six vocational personality types are in order. Nevertheless the point is that when one talks about vocational interests in this area one needs to be aware of the recent studies indicating, on the one hand, an important genetic influence on vocational types (Grotevant, Scarr, & Weinberg, 1977; Roberts & Johansson, 1974) and, on the other, important paternal effects (DeWinne, Overton, & Schneider, 1978).

The studies just described have approached vocational choices solely from the standpoint of
preferences and interests without dealing explicitly with the influence of ability or educational achievement. However, it should be clear from the content presented earlier in the chapter that introverts have a tendency to achieve higher educational and professional training levels than extroverts because of their superiority at advanced educational levels. Such differences undoubtedly influence preferences for occupations for which advanced degrees are required. At the same time academic excellence in these professional areas (e.g., physics) may depend on one's interest, toleration, or fascination with the subject matter. Finally individuals who become interested in various occupational and academic pursuits may experience personality changes as a result.

Summary

The extroversion-introversion dimension and its relationship with behavior, arousal, learning and field-dependence were reviewed. The extroversion-introversion component of temperament is integral within the dynamics of behavior, arousal, and learning. Extroversion is inversely related to arousal. Extroverts usually have lower arousal than introverts. Arousal usually has a curvilinear relationship with performance, so that persons who are moderately aroused perform better than those who are extremely aroused or extremely unaroused. The relationship of arousal and extroversion with learning and the practical implications for teaching were discussed.
Emotionality (Neuroticism)

Neuroticism is the principal dimension of emotional normality-abnormality. Persons on one end of this dimension are thought of as emotionally normal, and those on the other end are thought of as nervous, maladjusted, or over-emotional (Eysenck, 1967).

Sometimes the term neurotic is misunderstood with two other terms: psychotic and mentally retarded. It is therefore necessary to distinguish these terms. Neurotics are highly emotional people who usually report being unhappy and show adjustment problems. Psychotics are cognitively disordered, showing speech and thought problems and often aggressive behavior problems. Neurotics do not, as a rule, become psychotics. Mentally retarded persons are those who are low on the intelligence dimension which is also generally unrelated to neuroticism (Eysenck, 1973).

Emotionality (Neuroticism) as being dealt with in this section of the research review is restricted to its implication for learning.

Emotionality and behavior

The most characteristic difference between emotional (high neuroticism) and stable (low neuroticism) persons is their reactions to emotional stimuli. Stable persons have very little reaction to emotional stimuli. Highly emotional persons, on the other hand, react strongly to emotional stimuli.

Within the classroom, therefore, the learner's
degree of emotionality is likely to have significant effect on his/her sociability and certain elements of the personal way in which he/she learns.

**Emotionality and arousability**

A person's neuroticism reflects a degree of arousability. A person who is high on neuroticism is more easily aroused than a person lower on this dimension. Different arousal levels of people along the neuroticism dimension are distinguished from their different arousal levels along the extroversion dimension in that arousal along the extroversion dimension results from sensory input and problem-solving activity rather than from emotional stimuli (Eysenck, 1967).

External stimulation interacts with neuroticism in about the same manner as it interacts with extroversion. External stimulation applied to a person who is low on neuroticism (low arousal) usually results in better performance. That is, the poorly motivated person may "try hard" when given an additional external reason to perform well (Eysenck, 1967).

Test anxiety is often a problem for students who are high on neuroticism. In contrast with the discussion above, when they are told that a test is extremely important or that there are serious consequences for poor performance on a test, they usually are unable to perform well. When they are given the test as a "game" or a rather inconsequential "exercise" they perform much better.
Extremely stable students, on the other hand, show little if any debilitating test anxiety. They usually perform better on tests that are presented as being important (Eysenck, 1967).

Summary

The neuroticism dimension and its relationship to behavior and learning were reviewed. Neuroticism indicates emotional arousability and the effects of arousability on learning and behavior. A list of specific recommendations is presented in appendix B.

Theories and Theorists of Learning Style

This section of the review focuses primarily on works which have relevance to the context of this study, that is, with respect to the characteristic learning pattern of students. The review is limited to works published in English or translated into English.

Teachers notice many behaviors by the way students approach learning. They notice that some dive headlong into every activity whereas others go more slowly. Some look for adventure, others for security. Some like to work in groups, others like to work alone. Some like to read, others like to work with their hands. Some like noise and movement: others like quiet and order. One could go on and on with this train of contrast as to personalized ways students learn. These personal differences with respect to learning exemplify a construct called "learning style". In
the literature the term "learning style" alludes to personalized ways of approaching learning situations, that is, the intimate ways in which an individual becomes engaged with his learning experiences and gives meaning, relevance, and a practical value to it. Related terms include "cognitive style" which refers mainly to what goes on in the mind, and "sensory modalities" which refers to the senses (hearing and touching, etc.) that individuals prefer to use when engaged in earning experiences (Charles, 1980, p. 64).

The first section, deservedly very brief, derives instructional implications from dictionary definitions of the term "individualization" and in a more definite way learning style. The second section presents in an illustrative manner the historical development of learning theories from the continental and Anglo-American traditions and synthesizes the movements. It points out how instructional practices follow from psychological theories about the child's nature and growth. The third section focuses on relevant research which qualifies the nature of the current learning-styles paradigms. The fourth section addresses the nature of individual differences which indentify factors that contribute to variance in individual learning styles.

Dictionary Definitions

The term "individualization" is, of course, related to "individualism--a social theory advocating the liberty,
rights, or independent action of the individual," which contrasts with collectivism and institutionalism, according to Webster (1970). Since the common meaning of such abstract words evolved through generations, they can cause great misunderstanding unless they are made explicit and operational. Within the context of learning theories, "individualization" derived a meaning of personalized ways in which an individual approaches learning.

Table 1 shows Webster's definitions of "individualization." The instructional implications derived from the definitions suggest a number of questions: Does the child possess native individuality, or must he/she be made individual? Are the same or different means of education appropriate for different children? Are the same or different educational ends suitable for different children? Who determines the ends and means? The answers may seem obvious, and the questions themselves may seem to be semantic niceties. But some of the large controversial questions in educational practice today hinge upon the answers given. This study does not propose to give an answer to each question, but rather cites these questions as they are potent to an understanding of learning styles.

The psychological traditions related to learning theories reflect the historical development of individualizing learning and show that what appears wholly new today is usually either a new combination of ideas or a
revival of older patterns, notwithstanding some technological innovations.

**TABLE 1**

DICTIONARY DEFINITIONS OF INDIVIDUALIZATION AND RELATED EDUCATIONAL IMPLICATIONS

<table>
<thead>
<tr>
<th>Definition</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. a. To make individual in character; invest with individuality.</td>
<td>Implies instructional activity aimed at a predetermined end determined end unique to each individual but not necessarily determined by him. Might deny both equality of result and opportunity. Might deny initial individuality of student in implying that he must be made individual.</td>
</tr>
<tr>
<td>b. To treat or notice individually; particularize, specify.</td>
<td>&quot;To treat&quot; is not specific with regard to ends or means nor with regard to opportunity for or result of instruction. The remainder of the definition and definition 1c both imply passive perceptions and and are even less specific.</td>
</tr>
<tr>
<td>c. To distinguish</td>
<td></td>
</tr>
<tr>
<td>2. To put into the hands or management of an individual.</td>
<td>Suggests allowing the student to develop by himself the means and ends of his education. Might deny teacher and parent preference and allow collectivist or standardized means and ends in conflict with definition 1a.</td>
</tr>
<tr>
<td>3. To adjust or adapt (as a treatment of justice) to the needs or special circumstances of an individual.</td>
<td>Implies alternative means but leaves open the possibility of fixed ends, possible collectivist or standardized. Might deny student a role in the determination of ends and means.</td>
</tr>
</tbody>
</table>

Tables 2, 3, and 4 are analyses of Riegel's (1972) review of some influences of ideology on developmental psychology with supplementary points from Boring (1957) and others from 1938-1974.

The Continental Tradition

Table 2 represents the continental European tradition which was derived from Socrates and Plato. The tradition emphasizes the uniqueness of the child and qualitative, structural models of mental growth. It has led to educational applications that are child-centered or child-directed in varying degrees and different forms; Rousseau's romantic ideal of the child's inherent nobility is one extreme of the tradition. From the continental perspective, the child's progress is based on standards relevant to his needs, age, culture, and experience, and the structuring and integration of knowledge (Talmage 1975). This tradition in the forms of Gestalt psychology (emphasizing cognitive structures) and dynamic psychology (emphasizing affective structures) had significant influence in the formulation of current learning-style construct.
## TABLE 2

### CONTINENTAL EUROPEAN TRADITION OF LEARNING THEORY

<table>
<thead>
<tr>
<th>Source</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Descartes (1596-1650)</td>
<td>Sharp Platonic dualism of ideas and observables; subjective introspection of innate ideas; because knowledge develops from within the child, the teacher is superfluous.</td>
</tr>
<tr>
<td>Leibniz (1646-1716)</td>
<td>Stages of developmental progression of individual and cultural development; generation and cultural differences emphasized.</td>
</tr>
<tr>
<td>Hegel (1770-1831)</td>
<td>Child as &quot;noble savage&quot; to be educated and evaluated in view of peer group standards; since adult society corrupts the child's inherent goodness, his natural state should be preserved; also, men as equals in primitive society.</td>
</tr>
<tr>
<td>Rousseau (1712-1778)</td>
<td>Logical a priori categories of human understanding that order objects of external reality.</td>
</tr>
<tr>
<td>*Kant (1724-1804)</td>
<td>Education appropriate to the individual child; specially trained teachers required.</td>
</tr>
<tr>
<td>Pestalozzi (1746-1827)</td>
<td>Child as unfolding flower; teacher as gardener providing conditions for unhindered growth; child-centered approach to kindergarten; in practice, however, some of his instructional methods might be termed &quot;prescriptive.&quot;</td>
</tr>
<tr>
<td>Froebel (1782-1852)</td>
<td>Acquisition of mental structures by steps (id, ego, superego) through resolution of psychosexual conflicts in childhood; mental mechanisms such as repression and sublimation; diversity and deviance such as slips and blocks present and even necessary in &quot;normal&quot; development.</td>
</tr>
</tbody>
</table>
TABLE 2—Continued

<table>
<thead>
<tr>
<th>Source</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montessori (1870-1952)</td>
<td>Rationalistic, goal-directed but child-initiated, child-paced education; self-correcting instructional materials reveal structure of external reality.</td>
</tr>
<tr>
<td>Spranger (1882-1963)</td>
<td>Diversity of individual and cultural values; education based on phenomenology, empathy, and sensitivity; child not to be evaluated on basis of adult society; youth led by youth.</td>
</tr>
<tr>
<td>Piaget (1968)</td>
<td>Child characterized not by continuous development but by development by steps or stages, each of which must be developed by steps or stages, and which must be evaluated by its own standards; emphasis on progression through maturation and interaction with natural environment rather than contrived stimulation such as instruction.</td>
</tr>
</tbody>
</table>

Note: For living theorists, reference dates are given rather than years of birth and death. Names with asterisks have been added to Riegel's lists.

The Anglo-American Tradition

Table 3 presents some leading theorists and ideas in the Anglo-American tradition which derives from Aristotle's notion of learning.

The Anglo-American model of mental growth and learning theory emphasizes continuous amassing of elements of response potential, often on a single standard such as intelligence or achievement. Many theorists appear to believe that the child will progress naturally in the
conventional environments of the home and school without extraordinary interventions, or that the child himself can help shape his environment (Talmage, 1975). This tradition has contributed to the dimension of hereditary influence in learning theories.

**Synthetic Movements**

Table 4 contains syntheses of parts of the Continental and Anglo-American traditions of developmental psychology which influenced learning theories with its amalgamation of cognitive and affective learning-styles. Also as a result of these movements, probably for the first time, behavioral and cognitive psychologists agreed that learning is a function of both "nature" and "nurture," that is, the learning process and experience of an individual is an interactive and reactive operation in which both hereditary potentials and environmental factors co-operate to produce a desired result.

Having briefly reviewed the early learning theories which had an impact on the formulation of individualized instructions and hence learning-style construct, this section focused the attention on the research which are relevant to an understanding of learning style.
<table>
<thead>
<tr>
<th>Source</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hobbes (1588-1679)</td>
<td>Individuals, egotistically motivated and engaged in a struggle against one another, required a &quot;social contract&quot; to establish security, property rights and a measure of freedom.</td>
</tr>
<tr>
<td>*Lock (1632-1704)</td>
<td>Mind as &quot;blank tablet&quot;; development and education as acquisition and association of elements or items of knowledge.</td>
</tr>
<tr>
<td>Darwin (1809-1882)</td>
<td>Species improve over many generations through competition and selection; the survivors are ideally suited to the environment.</td>
</tr>
<tr>
<td>Spencer (1820-1903)</td>
<td>Ideal cultures and ideal individuals compete, survive, and dominate nonstandard groups, and deviant individuals are defective; children are seen as incomplete adults.</td>
</tr>
<tr>
<td>Summer (1840-1910)</td>
<td></td>
</tr>
<tr>
<td>Pearson (1857-1936)</td>
<td></td>
</tr>
<tr>
<td>Galton (1822-1911)</td>
<td>Heredity determines measurable human and group quality.</td>
</tr>
<tr>
<td>Hall (1846-1924)</td>
<td>Individual shaped mainly by genetic factors until adolescence and by environment thereafter; hence both are important.</td>
</tr>
<tr>
<td>*Thorndike (1874-1949)</td>
<td>Curriculum divided into elements; educational growth measured by items on objective tests.</td>
</tr>
<tr>
<td>Gesell (1880-1961)</td>
<td>Hall's student who continued research in the Galton vein and developed quantitative behavioral norms and psychometric standards.</td>
</tr>
</tbody>
</table>

Note: Names with asterisks have been added to Riegel's list.
TABLE 4

MOVEMENTS TOWARDS SYNTHESIS OF CONTINENTAL AND ANGLO-AMERICAN TRADITIONS OF LEARNING THEORY

<table>
<thead>
<tr>
<th>Source</th>
<th>Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Herbart (1776-1841)</td>
<td>Mind as interplay of external and internal ideas; instruction as assimilation of new ideas into totality of conscious ideas or &quot;apperceptive mass.&quot;</td>
</tr>
<tr>
<td>*James (1842-1910)</td>
<td>Consciousness as personal and changing; each conscious state a function of the entire psycho-physical reality; mind as cumulative rather than recurrent.</td>
</tr>
<tr>
<td>Uexkull (1864-1944)</td>
<td>Ecology as study of interaction of organism with natural environment.</td>
</tr>
<tr>
<td>Lewin (1890-1944)</td>
<td>Psychology as study of person in relation to &quot;life-space&quot; and surrounding perceptual environment.</td>
</tr>
<tr>
<td>Piaget (1968)</td>
<td>Child development as product of the dialectic of accommodation of child to object and assimilation of object to child leading to successive adaptations. Since learning proceeds in irreversible stages, two types of instruction are futile: that which centers on a stage later than one the child has not completely mastered and that which centers on the stage the child has already completely mastered.</td>
</tr>
<tr>
<td>*Murray (1938)</td>
<td>Importance of both the &quot;objective&quot; environment as observed by the psychologist and the subject's perception in understanding personality development.</td>
</tr>
<tr>
<td>Brunswik (1949)</td>
<td>Importance of distal and proximal stimuli and subject's subjective perception of them.</td>
</tr>
<tr>
<td>Source</td>
<td>Theory</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Baker and Wright (1951)</td>
<td>Adaptation of subject to changing stimuli in the &quot;behavior setting&quot;; adaptation of setting to subject.</td>
</tr>
<tr>
<td>*Cronbach (1957)</td>
<td>Psychology must integrate separate traditions of individual differences and stimulus qualities; education can exploit &quot;aptitude-treatment interaction,&quot; tendencies for different treatments to benefit different students differentially.</td>
</tr>
<tr>
<td>*Cronbach and Snow (1974)</td>
<td></td>
</tr>
<tr>
<td>Bloom (1963)</td>
<td>Impact of environment greatest on individual development during the early and most rapid periods of growth; importance of home environment during the first six years of life for intellectual development.</td>
</tr>
<tr>
<td>*Walberg (1971)</td>
<td>Person-environment interaction; different home environments produce different growth patterns of multiple abilities in different children; student and teacher as collaborative judges of appropriateness of environment and of instructional means and goals.</td>
</tr>
<tr>
<td>*Walberg and Marjoribanks (1974)</td>
<td></td>
</tr>
</tbody>
</table>

Note: For living theorists, reference dates are given rather than years of birth and death. Names with asterisks have been added to Riegel's list.

**Related Research on Learning Style**

Over forty years of research has been devoted to the understanding of learning-style and factors related to it in order to work more effectively with different kinds of students (Charles, 1980).
Throughout the research literature the learning-style construct has been identified under various labels. Bruner (1956), for example, concluded in his research on concept formation that students could be classified as conservative focusers or gambling focusers, depending on their approach to a given task. Gamblers take chances. They leap ahead. Conservatives prefer to get everything into perspective and alter only one detail at a time.

Gardner has used terms from classical Gestalt psychology to describe tendencies toward "leveling" and "sharpening" (Gardner, 1959, pp. 22-30). A learner who sharpens puts emphasis on significant parts of what is being learned, so that those parts stand out as larger or more important than might be warranted. They tend to remember details of the newly learned better than they do the total context. Levelers, on the other hand, tend to make features of new learning blend together, become compatible, and merge into one to a greater degree than might be justified. They tend to remember the total situation better than its details.

Guilford (1959), in his studies of the structure of the intellect, has identified "convergent production" and "divergent production" as separate facets of intellectual functioning. Convergent production refers to the production of ideas along a single plane and to the finding of single, correct solutions to problems. Divergent production refers to the production of ideas along varying
planes and to finding several different appropriate solutions to problems. People are capable of both these kinds of intellectual activity; but some (the intuitive dreamers?) seem inclined towards divergent production, whereas others (the logical realists?) seem more inclined toward convergent production.

Kagan (1964), in studying the ways learners form concepts, concludes that some learners seem to be more "impulsive" in their approach, whereas others seem to be more "reflective." Impulsive learners move quickly to conclusions, often settling on the first response that occurs to them. Reflective learners, if not slower-gaited, at least spend more time carefully considering various possibilities.

In addition to the impulsive and reflective styles, Kagan noted styles he called "analytic" and "thematic." The analytic-style learner notes and sorts out all the details of material being learned, attempting to identify them and see how they fit together. The thematic-style learner acquires a global cognition of material being learned, concerning himself not so much with the various parts and their relationships as with overall impression, meaning, and impact.

Witkin (1962), in his studies into cognitive functioning as it relates to personality characteristics, identified two styles of learning that seem to have special importance for teachers--the field-dependent person
requires strong support from others around him. He tends to be fearful and anxious. He has difficulty taking the initiative and working on his own, and tends to be submissive to others, especially those in positions of authority. The field-independent person functions in quite a different way. He can take initiative and organize. He often assumes a dominant role. He shows confidence and self-assurance. This finding was supported by Linn and Kyllanen (1980) who used high-school seniors to study the field dependency-independency construct. Cluster and factor analyses of the data revealed that field dependency-independency dimensions measured cognitive and perceptual preferences.

In an extensive study, Witkin and associates (1964) followed 1548 college students from entry into college through graduate and professional study. They found (1) that students tended to shift into areas of study compatible with their own cognitive style, and (2) that students achieve slightly better in areas of study compatible with their cognitive style.

Runner (1979) reports several studies that have been carried out by other investigators. Two of these investigations that have special importance for teachers were done by Torrance. In one study Torrance (1977) identified college students as "freedom-oriented" or "control-oriented." He had them perform tasks on a test of originality. Then he gave them two different types of
feedback—"evaluative feedback" and "creative feedback." Upon repeating the test of originality, the freedom-oriented groups made great gains after creative feedback, but only small gains after evaluative feedback. Conversely, the control-oriented groups made greater gains when given evaluative feedback than when given creative feedback.

In a similar study, Wiederanderrs and Harvey (1977) explored the relationship between student learning styles and types of feedback from their teachers. They found that students who were oriented to authority and personal relationships responded better to personal feedback. Students who were abstract task-oriented responded better to impersonal feedback.

Other studies have investigated the relationship between learning-style and achievement. Coop and Brown (1970) divided college students into two style groups—"analytic" and non-analytic." They provided both groups with two kinds of instruction identified as "teacher structured" and "independent problem solving." They found that the teacher-structured method produced superior achievement gains for both groups.

At this point in the review, attention is given to the Learning Style Inventory (LSI) (Dunn, Dunn, & Price, 1978) and related research which used the LSI. This aspect is treated separately, since the LSI was used as a measure of learning-style in this study, and the researcher sought.
to establish reliable evidences for the learning-style paradigm that it measures.

The Learning Style Inventory was developed in response to the need for identifying how students prefer to learn when provided an opportunity to choose from among environmental, sociological, and physical conditions. Specifically, it was designed for use in conjunction with several alternative approaches to individualized instruction--Contract Activity Packages (CAPs), Learning Activity Packages (LAPs), programmed learning, and/or multisensory instructional packages (Dunn & Dunn, 1975).

In reviewing the literature to determine how children learn it was repeatedly verified that different students learn in many different ways. The research work of Dunn and Dunn (1974) suggested eighteen areas that were important in identifying what affects learning. These included: (1) immediate environment (sound, heat, light, and design); (2) own emotionality (motivation, responsibility, persistence, and structure); (3) sociological needs (self, peers, pairs, teams, adults and/or varied); and (4) physical needs (perceptual preferences, time of day, food intake, and mobility) (Dunn & Dunn, 1974). Each of the above-mentioned dimensions of this learning-style paradigm is dealt with below.

**Environmental elements**

Well-designed and well-conducted research studies verified that, regardless of age, intelligence, socio-
economic status, or achievement level, individuals respond uniquely to their immediate environment when they are trying to learn something new—particularly if it is difficult (Dunn & Dunn, 1978).

Sound

Several studies have given evidence for the relationship between sound in the environment and achievement (Glass, Cohen, & Singer, 1972; O'Malley & Poplowsky, 1971; and Samtur, 1969).

Dunn (1981) noted that many students required absolute silence when they are concentrating; other can block out distractors and absorb information; and some cannot learn in silence. Individuals in the last group are so sound sensitive that when their surroundings are quiet, they hear all the extraneous noises of which they are not usually aware, and those sounds actually prevent them from thinking. One recent investigation isolated students who could not tolerate sound when concentrating and others who required it. Statistically, both groups achieved significantly better when their preferences for quiet or sound (recorded music, etc.) were matched correctly. Both groups did statistically less well when their preferences were mismatched. These findings were also supported by Pizzo (1981) in an investigation of the relationship between selected acoustic environments and sound, as they affect students' reading achievement and attitudes.
Light

Students also respond differently to varying degree of light intensity as indicated by Arehart-Treichel (1974) and Olmeda (1972). Some students need brightly lit areas to learn, whereas others become fidgety, nervous, or hyperactive when the light is too bright for them. Dunn (1981) stated that some individuals became aprosexia or sleepy when lights are dim, and others are not able to internalize information until the lights are soft enough to permit relaxation.

Temperature

Several studies have indicated that individuals are affected by the thermal environment when learning (Givoni & Rim, 1962; Griffiths & Boyce 1971; Holmber & Wyon, 1969; Hansen, 1966; and McCardle, 1966). Dunn and Dunn (1978) wondered, since tolerance to temperature varies with students, how can one determine what might be the best thermometer setting for each classroom? Obviously one cannot, for there is no "best" setting. One needs to be aware of which sections of each room provide the most and the least warmth at various times of the year and then permit students to sit in those positions that are complementary to their learning-style requirements. It is important to note also that unless students are in harmony with their environment, it is difficult for them to engage in effective and productive learning.
Design

Some individuals can only focus on what they are learning if they study in a "formal design"—sitting on a straight chair at a desk or table as found in a classroom or a library. Others concentrate better and remember more when they study in an "informal design"—relaxing on a lounge chair, couch, or beds or on the floor. These arguments are substantiated by studies conducted by Blitz (1973), Dunn and Dunn (1972), and Wheeler (1971).

The preference for quiet or sound, and the ability to block out noise are related to an individual's hearing sensitivity. Similarly, the need for bright, average, or dim light is a function of eye sensitivity, while temperature reactions depend on the thickness or thinness of one's skin. Whether a person remembers more when concentrating in a formal, rather than an informal, environment is undoubtedly an outgrowth of bodily needs. These environmental elements of learning style are hence thought to be biological and related to one's physical makeup (Dunn, 1981).

Emotional elements
Motivation, persistence, and responsibility

Maslow (1968) has done extensive work in the area of motivation on learning and school achievement. In supporting studies (Naar, 1972; Barton & Barnard, 1972; and Waters, 1972), Maslowian theories on motivation, the
elements, persistence, and responsibility were related to learning. These works revealed that students who are unmotivated and neither persistent nor responsible should be taught differently—in fact, by diametrically opposite methods—from those who are.

Motivated, persistent, responsible students should be told what they are required to learn (their objectives), what they may use as resources, how they may show that they have mastered their objectives, and where to get help if they need assistance. They appreciate feedback and deserved praise after their tasks have been accomplished. Unmotivated, less persistent, and irresponsible pupils, on the other hand, require short assignments, with very few objectives, frequent feedback, a great deal of supervision, and genuine praise as they are performing the task (Dunn, 1981).

Structure

Structure is another important element of learning-style. Students who require specific directions, sequential tasks, frequent feedback, and continuing support usually achieve well with a very structured instructional method, particularly if they are highly visual or visual/tactactual and are able to work alone. If they are tactual/kinesthetic or peer oriented, on the other hand, a structured instructional method may not hold their attention (Dunn 1981).
The emotional elements of learning style appear to be an outgrowth of both environment and each person's emotional makeup.

**Sociological elements**

Many researches have been conducted to investigate the effect of learning alone, with peers (i.e., groups comprised of peers), in pairs, with an adult, or in several ways on classroom learning. Mention is made of some of the major works. Mack (1976), Walberg (1969) and Walberg and Ahlgren (1970), Poirler (1970), and Schmuck (1971) indicated the effects of learning alone, team (pair) learning, and peer learning on classroom achievements, respectively. The first three studies mentioned provided evidence for learning alone. Such students may benefit more from working with computers, videotapes, films, filmstrips, and the like. The latter studies provided evidences for pair and peer learning. Small-group techniques such as circle of knowledge, brain-storming, case studies, or group analysis are effective teaching strategies for those who are peer- or pair-oriented. Such students are more concerned with what their classmates think than they are with their teachers' or parents' reactions.

Brophy and Good (1974) and Rosenthal (1971) provided evidences related to adult- and teacher-oriented learning. Some students gain very little from even the more charismatic or eloquent teacher or well-planned
lesson: while others need this adult-relationship to facilitate their learning.

**Physical elements**

**Perceptual Strengths**

Perceptual strengths are by and large related to Piagetian and Eriksonian development theories. Dunn (1981) suggested that perceptual strengths appear to develop on a continuum, with kindergartners tending to be strongly tactual/kinesthetic. By about third or fourth grade, visual strengths begin to develop, and by fifth or sixth grade, most children begin to become auditory. Several studies provide evidences related to the visual, auditory, and tactile preferences of students when engaged in a learning experience (Gingold, 1971; Reilly, 1971; Reinert, 1976; Dunn & Dunn, 1977).

**Intake**

Another physical element in learning styles is intake, or oral ingestion. Some individuals eat, drink, or chew gum while they are engaged in cognitive activities, either to replace the nutritional energy that their concentration uses up or to relax them from the tension of learning (Dunn, 1981).

**Time**

The new science of chronobiology verifies the empirical observation that each person enjoys different peak energy times during the day or night. Extending this
concept to the classroom suggests that students should be taught their most important subjects during the time when they are most alert (Dunn, 1981). In fact, one study found that when students were scheduled for classes at a complementary time of day, school records showed a reduction in chronic truancy and lateness (Lynch, 1981).

Mobility

This element of learning-style either facilitates or inhibits learning. The desire for mobility is a conglomerate function of one's physical, emotional, and environmental reactions, but most students cannot easily control their need to move while learning. Students who require extreme mobility should be assigned to an informal setting where their frequent changes of position will not interfere with either the way the teacher is teaching or other learners' need to learn (Dunn, 1981).

Summary

One can no longer afford to assume that all students learn through whichever strategy the teacher prefers to use. Recognizing the importance of adapting curriculum and instruction to learners' aptitude, Keefe (1979) movingly states:

Learning style diagnosis opens the door to placing individualized instruction on a more rational basis. It gives the most powerful leverage yet available to educators to analyze, motivate, and assist students in school. As such, it is the foundation of a truly modern approach to education. (p. 35)
This section of the review dealt with: (1) the dictionary definitions of individualization and their implications for instruction, (2) an historical development of learning theories from the Continental and Anglo-American traditions and Synthetic movements, as the basis for the theories of learning-style; and (3) a focus on related research which qualified the learning-style characteristics.

Finally, this review would be incomplete without some attention to a comparison of the various learning style instruments and their defined learning-style paradigms. This comparison is presented in an illustrative manner in appendix C.
CHAPTER III

METHODOLOGY

This chapter describes the methodology used in the investigation of the relationship between temperament and learning-styles of Bahamian and Jamaican senior high-school students. The methodology involved: (1) the approach taken in conducting the study which was "ex-post facto" in nature; (2) the research design employed in the investigation of the dependent variables, that of learning-styles; (3) the selection of the population of high-school seniors and the sampling of this population; (4) instruments used in the collection of data; (5) the procedures for the execution of the study which involved obtaining permission from the Jamaican and Bahamian governments; (6) the procedures used in the collection of data using the TI and LSI instruments; and (7) the analysis of the data by means of computer programs.

Approach

Since the study involved not only the collection and description of data but also the establishment of relationships between variables investigated, the "ex-post
causal-comparative design was chosen as the most appropriate form of classification for this research.

According to Isaac and Michael (1976), the "ex-post facto" approach is suitable to both aspects of this study. Causal-comparative research is "ex-post facto" in nature, which means the data are collected after all the events of interest have occurred. The investigator then takes one or more effects (dependent variables) and examines the data by going back through time, seeking out causes, relationships, and their meanings (p. 22).

Isaac and Michael also agree with Van Dalen (1966) that the causal-comparative method is appropriate in many circumstances where the more powerful experimental method is not possible. That is to say, the causal-comparative method is used where selecting, controlling, and manipulating factors necessary to study cause-and-effect relationships directly are not always possible.

Best (1977) states:

Descriptive research describes what is. It involves the description, recording, analysis, and interpretation of conditions that now exist. It involves some type of comparison or construct and may attempt to discover relationships that exist between existing nonmanipulated variables. (p.15)

Sax (1981) justifies the use of the "ex-post facto" approach by defining it as a "cross between a descriptive and an experimental design" (p. 376).

The present study satisfied the definition of a causal-comparative design in that it sought (1) to determine the relationship between each temperament...
variable and the set of learning-style variables, respectively; (2) to determine the relationship between the set of temperament variables and the set of learning variables; (3) to determine the differences that existed, if any, between the sexes (male and female) and islands (Jamaica and Bahamas) on the temperament and learning-style variables; and (4) to describe the implications of any relationship determined with respect to classroom learning and teaching, methodology, program placement and career guidance, and secondary teacher education.

**Research Design**

**Variables**

**Dependent variable**

A set of dependent variables was chosen for this study, namely, learning-style, which is composed of twenty-four component variables as measured by the *Learning Style Inventory (LSI)* (Dunn, Dunn, & Price, 1978). Senior high-school students' learning-styles were determined by the students' responses to 104 items on the *LSI*. On these items students were asked to indicate their preferred style of learning given certain described conditions.

**Independent variable**

The independent variables examined in this study to determine relationships to the dependent variable were temperament modes as measured by the *Temperament Inventory*.
(Cruise & Blitchington, 1977). Senior high-school students indicated their temperament modes in their responses to eighty items on the TI.

**Moderator variables**

Two demographic variables, namely, sex and island, were identified as moderator variables in order to determine if there are any differences between the sexes and between the islands.

A discussion of the instruments is dealt with later in this chapter.

**Selection of Subjects**

**Population**

The population for this study consisted of all grades 11 and 12 Bahamian and Jamaican senior high-school students who had written the General Certificate of Examinations (GCE) and/or the Caribbean Examination Council (CXC) examinations in the year 1984, and who were enrolled in independent and government high-schools which offered three-, four-, five-, or six-year courses of study.

The rationale for selecting senior high-school students was based on the nature of the problem under study (see pp. 1-6).

**Sample**

A stratified random-sampling technique was used with the aid of a random number table (Tuckman, 1978, pp. 441-442) to select senior high-schools in Jamaica from a
list of high-schools published in the 1980-81 school directory by the Ministry of Education in Jamaica. Selections were made proportionally after the high-schools were stratified into urban and rural and independent and government, so as to facilitate representativeness of the sample. Government and independent high-schools included secondary high schools and technical high-schools within the urban and rural areas.

Schools selected were composed of seven secondary high-schools from a total of forty-six and one technical high-school from a total of seven. Of this composition, there were four urban and four rural. A total of eight high-schools was chosen, seven government and one independent, a list of which appears in table 5.

High schools in the Bahamas were selected only from the main island, New Providence. There were several reasons for this decision:

1. New Providence has the largest number of senior high-schools in the Bahamas.

2. Due to the migration of students from the family islands into New Providence to attend high-school, one assumes that within the school system in New Providence there is a reasonable representation of the islands' senior high-schools students.
TABLE 5

LIST OF HIGH SCHOOLS ACCORDING TO LOCATION, OWNERSHIP, AND GEOGRAPHICAL AREA

<table>
<thead>
<tr>
<th>Name</th>
<th>Ownership</th>
<th>Location</th>
<th>Area</th>
<th>No. of Students in Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. P. Adderley High</td>
<td>G</td>
<td>NP</td>
<td>U</td>
<td>23</td>
</tr>
<tr>
<td>Bahamas Academy</td>
<td>I</td>
<td>NP</td>
<td>U</td>
<td>30</td>
</tr>
<tr>
<td>C. C. Sweeting High</td>
<td>G</td>
<td>NP</td>
<td>U</td>
<td>17</td>
</tr>
<tr>
<td>Excelsior</td>
<td>G</td>
<td>J</td>
<td>U</td>
<td>13</td>
</tr>
<tr>
<td>Glenmuir High</td>
<td>G</td>
<td>J</td>
<td>R</td>
<td>30</td>
</tr>
<tr>
<td>Government High</td>
<td>G</td>
<td>NP</td>
<td>U</td>
<td>29</td>
</tr>
<tr>
<td>L. W. Young</td>
<td>G</td>
<td>NP</td>
<td>U</td>
<td>23</td>
</tr>
<tr>
<td>Manchester High</td>
<td>G</td>
<td>J</td>
<td>R</td>
<td>30</td>
</tr>
<tr>
<td>Queens High</td>
<td>G</td>
<td>J</td>
<td>U</td>
<td>10</td>
</tr>
<tr>
<td>R. M. Bailey</td>
<td>G</td>
<td>NP</td>
<td>U</td>
<td>27</td>
</tr>
<tr>
<td>St. Andrews High</td>
<td>G</td>
<td>J</td>
<td>U</td>
<td>28</td>
</tr>
<tr>
<td>Vere Technical High</td>
<td>G</td>
<td>J</td>
<td>U</td>
<td>10</td>
</tr>
<tr>
<td>West Indies College</td>
<td>I</td>
<td>J</td>
<td>R</td>
<td>26</td>
</tr>
<tr>
<td>Wolmers Boys</td>
<td>G</td>
<td>J</td>
<td>U</td>
<td>30</td>
</tr>
</tbody>
</table>


3. The limits of time and cost in undertaking this study limited its scope.

All five of the government senior high schools were selected and one independent school.

The total number of grades 11 and 12 students that were selected from these schools in the Bahamas and Jamaica was 326. This sample size was a sufficient number to guarantee a high level of power for the statistical analysis. Power is the probability of rejecting the null hypothesis at the given criterion level when the null
hypothesis is indeed false (Welkowitz, Ewen, & Cohen 1976, pp. 192-93). Power is calculated based on (1) the significance criterion, and (2) the sample size.

The significance criterion for this study was set at the .05 level, the sample size was 326. Power was calculated based upon the above-mentioned criteria (Cohen 1977, p.216) with regards to zero-order and multiple correlations.

Power for this study, therefore, was .90 which would give a 90 percent probability of finding statistical significance.

Instrumentation

This section focuses upon two parts of instrumentation. The first portion presents the rationale for the choice of instruments. The construction of each instrument is noted, the reliability of each instrument is indicated, and support for the validity of each instrument is also presented.

Rationale for the choice of the Instruments

In order to explore and analyse the relationship between learning-style and temperament, two standardized instruments were used for testing. These instruments were the Learning Style Inventory (Dunn, Dunn & Price, 1978), a measure of one learning-style construct, and the Temperament Inventory (Cruise & Blitchington, 1977), a measure of a temperament construct.
There were basically three reasons why these particular instruments were chosen: (1) their usefulness/realistic orientation was well-suited to the study being conducted; (2) judging from a study of other related instruments, these two were found to be preferable for their comprehensiveness and their respectable construct validation; and (3) the approach to the construction of these tests has received favorable reports in the literature. The instruments are perhaps the best available in the Anglo-American countries.

The first instrument, a measure of one learning-style construct, is the Learning Style Inventory (LSI). The LSI was selected for use in this study because "this instrument has proven operationally successful in screening individual students for learning-style patterns and profiles and in providing the essential ingredients for diagnostic and prescriptive teaching" (Marcus, 1978). The LSI is the first comprehensive approach to the diagnosis of an individual's learning-style for grades 3 through 12. It is important to note that the scale does not measure underlying psychological factors, value systems, or the quality of attitudes. Rather, it yields information concerning the patterns through which learning occurs. It therefore reveals the environmental, emotional, sociological, and physical preferences a student has for learning, not why they exist (Dunn, Dunn, & Price, 1981,
The LSI was chosen specifically for this study because of its reliability and validity data as reported in the LSI Manual (Dunn, Dunn, & Price, 1981).

The second instrument is the Temperament Inventory (TI). There are four reasons which justify the choice of the TI over other instruments designed to measure temperament; these are (with supporting evidence found in the literature):

1. The TI is a scientifically validated test combining the four-temperament theoretical approach with their combinations. This is a contribution of Buss and Plomin (1975). Buss and Plomin (1975) assert that it is more realistic to look at all four categories of temperament than at two dimensions, such as the construction of the Eysenck Personality Inventory (Eysenck & Eysenck, 1963) requires.

2. Normative data for the TI is based on over 3,400 subjects in the United States for the construction of the instrument. This number increased to 4,500 subjects in subsequent data analyses.

3. A test of personality is most useful when it is based upon dimensions or scales which are maximally pure factorially and remain largely consistent from population to population (Adcock, 1972, p. 374). In the construction of the TI, the scales were developed to be factorially pure from tested population to tested population (Cruise, Blitchington, & Futcher, 1980, pp. 946, 947, 954).
4. The TI is a general test of temperament, which is designed for broad application. This renders it more suitable to the application intended in this study than other tests, which have been designed for use in cases where the population is narrowly defined and highly specific.

In addition to the previously described strengths of these two tests, it is useful to note that both instruments incorporate the use of test booklets that are easily read and attractively printed, as well as answer sheets that are easy to use. Furthermore, demographic data that are necessary for the study can be recorded easily on the answer sheets to be used with each of these instruments.

Learning-style inventory

It is important to briefly discuss the construction of the LSI which was designed to measure an individual's preferred style of learning. The test consisting of 104 items representing twenty-four sub-scales (see appendix D).

The LSI was first published in 1975 and was originally developed by identifying from research the variables that seemed to affect the ways individuals prefer to learn. Items were then written to assess individuals' performances in each of the areas.

Later a revised form of the 1978 instrument was administered to a random sample of 1596 individuals from 4669 individuals who had taken the LSI in grades 3 through
from several states and three provinces of Canada. These results were factor analyzed using principal components with unrelated factors as the basis for the analysis. From this analysis 32 factors had eigenvalues greater than 1.00 and explained 62 percent of the cumulative proportion of total variance on the LSI. The eigenvalues by definition are the roots of its characteristic equations of a given sum of squares and cross-product matrix, which result from a variance-maximizing rotation of axis.

The factors and each of the items with its correlation with each factor were submitted to the BMDP4M computer program using varimax, an orthogonal rotation, to maximize the variance of the squared-factor loadings. The factors were rotated to identify which factors were orthogonal (independent) and to minimize cross loading (items loading on more than one scale). No factors were selected with eigenvalues less than 1.00.

Some of the factors were "pure" and were consistent with all of the items relating to each other in an identifiable manner. There was overlap in the area "learning in several ways" with "self-oriented learner", "peer-oriented learner," and "authority-oriented learner." Learning in the morning is on a continuum with learning in the evening (these are combined in the revised instrument). In addition, learning in the evening is related to how much
light one prefers. Self-motivated is on a continuum with unmotivated. Preferring cool is related to preferring to work in the morning.

Reliability and validity

Reliability and validity are the next issues on which to focus.

Based upon data provided in the LSI Manual, 56 percent of the Hoyt's reliability coefficients are equal to or greater than .60. The areas with the highest reliabilities include: sound, light, temperature, responsible, structure, prefer learning alone, peer-oriented learner, prefers learning with adults, tactile preferences, required intake, prefers learning in morning and afternoon, and needs mobility.

The areas with reliabilities less than or equal to .59 include: design, motivated/unmotivated, adult motivated, teacher motivated, persistent, learning in several ways, auditory preferences, visual preferences, kinesthetic preferences, late morning and evening.

A test/retest reliability was calculated on the LSI (1975) for 100 subjects, with the length of time between each administration being one month. All the reliabilities were statistically significant at the .01 level with the exception of adult motivated. On this variable there was no relationship between the students' scores on the first testing and the retesting. No logical explanation was given for this.
Based upon previous research conducted by Dunn, Dunn, and Price, these variables seem to fluctuate at various grade levels, particularly in the middle school years—grades 6, 7, and 8. This might account for the changes in these variables on the test-retest. Table 6 provides a list of the Hoyt's reliability coefficients for the 100 subjects. Those coefficients that are less than .50 can be accepted with less confidence.

**TABLE 6**

**LSI TEST/RETEST RELIABILITIES**
**FOR 100 SUBJECTS**

<table>
<thead>
<tr>
<th>LSI Variables</th>
<th>Reliability Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound</td>
<td>.66</td>
</tr>
<tr>
<td>Light</td>
<td>.43</td>
</tr>
<tr>
<td>Temperature</td>
<td>.53</td>
</tr>
<tr>
<td>Design</td>
<td>.43</td>
</tr>
<tr>
<td>Self-Motivated</td>
<td>.65</td>
</tr>
<tr>
<td>Adult-Motivated</td>
<td>.00</td>
</tr>
<tr>
<td>Teacher-Motivated</td>
<td>.49</td>
</tr>
<tr>
<td>Persistent</td>
<td>.47</td>
</tr>
<tr>
<td>Responsible</td>
<td>.69</td>
</tr>
<tr>
<td>Structure</td>
<td>.58</td>
</tr>
<tr>
<td>Learning Alone</td>
<td>.64</td>
</tr>
<tr>
<td>Peer Oriented</td>
<td>.67</td>
</tr>
<tr>
<td>Learning with Adults</td>
<td>.43</td>
</tr>
<tr>
<td>Learning Several Ways</td>
<td>.74</td>
</tr>
<tr>
<td>Auditory Preference</td>
<td>.47</td>
</tr>
<tr>
<td>Visual Preference</td>
<td>.53</td>
</tr>
<tr>
<td>Tactile Preference</td>
<td>.56</td>
</tr>
<tr>
<td>Kinesthetic Preference</td>
<td>.47</td>
</tr>
<tr>
<td>Food Intake</td>
<td>.61</td>
</tr>
<tr>
<td>Morning</td>
<td>.56</td>
</tr>
<tr>
<td>Late Morning</td>
<td>.31</td>
</tr>
<tr>
<td>Afternoon</td>
<td>.52</td>
</tr>
<tr>
<td>Evening</td>
<td>.58</td>
</tr>
<tr>
<td>Mobility</td>
<td>.65</td>
</tr>
</tbody>
</table>
The Manual provides several pieces of evaluative data regarding the construct and content validities of the LSI. First, the validities of the test rested primarily on the procedures followed in the development and selection of items for each sub-scale. Computed point-biserial correlation provided measures of internal consistency of the test. Subsequent factorial analysis corroborated the grouping of items into twenty-four sub-scales (table 6). Only one study was found which did not support the LSI.

A factor analytic validation of the learning-styles paradigm was the focus of a study conducted by Ferrell (1981) at Southern Illinois University. Ferrell compared four instruments: Grasha-Riechmann Student Learning Style scales, Kolb Learning Styles Inventory, Dunns and Price Learning Style Inventory, and Johnson Decision-Making Inventory, which claimed to measure the construct learning-style. All four instruments were administered to 471 high-school seniors and community college students. The result of the factor analysis were used to provide evidence of construct validity for each instrument. Factor analysis failed to provide evidence of construct validity for all but the Kolb Learning Styles Inventory. All four instruments, however, reflected some aspects of the learning-style paradigm. The Dunns and Price Learning Style Inventory was analysed to have measured affective and physical/physiological behaviors and shares "considerable common variance" (Ferrell, 1981).
Thus far, the LSI has been shown to be a suitable test to use in this effort to establish the relationship of learning-style to temperament.

Stated below is a list of the twenty-four LSI variables with a brief statement as to the interpretations that are given to the high and low scores on the LSI.

The twenty-four sub-scales of the LSI, with corresponding descriptions of high and low scorers, are (LSI Manual, pp. 4-12):

1. **Sound**

   For standard score of 60 or higher, provide soft music, conversation areas, or an open learning environment.

   For standard score of 40 or lower, establish silent areas: provide individual alcoves with soundproofing; provide "earphones" to absorb sound.

2. **Light**

   For standard score of 60 or higher, place student near window, under adequate illumination; add table or desk lamps.

   For standard score of 40 or lower, create learning spaces under indirect or subdued light from windows: use dividers or plants to block or diffuse light.

3. **Warmth**

   For standard score of 60 or higher, provide adequate heating, enclosures, screens, supplemental heaters and placement in warmer areas; allow sweaters.

   For standard score of 40 or lower, provide adequate air-conditioning, ventilation, and placement in cooler areas; permit short sleeved shirts, shorts, etc.
4. **Formal Design**

For standard score of 60 or higher, create "formal" climate—rows of desks, straight chairs, stark walls and lighting.

For standard score of 40 or lower, provide "informal" climate—soft chairs and couches, pillows, some color, lounge furniture, plants, etc.

5. **Motivated/Unmotivated**

For standard score of 60 or higher, encourage use of self-designed objectives, procedures and evaluation before the teacher assesses effort; permit self pacing and rapid achievement.

For standard score of 40 or lower, design short-term, simple, uncomplicated assignments that require frequent discussions with the teacher; provide several easily understood options based on the individual's interests; experiment with short-range motivations and reinforcement; develop peer relationships with able, motivated individuals; solicit self-developed goals and procedures; log results and progress.

6. **Adult-Motivated**

For standard score of 60 or higher, establish den area near teacher (unless student is adult but not teacher-oriented); praise often; send communication to home (notes, commentary, tapes, students's work); praise in front of adults; involve with other adults when working.

For standard score of 40 or lower, allow student to study by him/herself. Do not force student to work with adults. Use intrinsic motivation for outcomes rather than how it will make others feel.

7. **Teacher-Motivated**

For standard score of 60 or higher, establish den area near teacher; praise often; incorporate reporting to teacher into prescriptive; include in small-group instructional techniques when teacher is involved.

For standard score of 40 or lower, allow student to study by him/herself. Do not force student to work with the teacher. Use intrinsic motivation for
outcomes rather than how it will make the teacher feel if one does a good job.

8. **Persistent**

For standard score of 60 or higher, design long-term assignments; provide supervision and assistance only when necessary; suggest when help may be obtained if necessary; praise at completion of assignment.

For standard score of 40 or lower, provide short-term limited assignments; check and log progress frequently; provide options based on individual's interests; experiment with short-range motivators and reinforcement; develop peer relationships with able, persistent individuals; praise during progress of completion of tasks; encourage self-design of short tasks.

9. **Responsible**

For standard score of 60 or higher, begin by designing short-term assignments; as these are successfully completed, gradually increase their length and scope; challenge the individual at the level of his or her functional ability or slightly beyond.

For standard score of 40 or lower, design short-term limited assignments with only single or dual goals; provide few options and frequent checking by the teacher; directions should be simple and responsible peers should be placed in the immediate environment and on the same projects. Base assignments on interests and use interim praise or regards.

10. **Structure**

For standard score of 60 or higher, be precise about every aspect of the assignment; permit no options; use clearly stated objectives in a very simple form; list and itemize as many things as possible, leaving nothing for interpretation; clearly indicate time requirements and the resources that may be used; required tasks should be indicated; as successful completion is evidenced, gradually lengthen the assignment and provide some choices from among approved alternative procedures; gradually increase the number of options; establish specific learning and reporting patterns and criteria as each task is completed.
For standard score of 40 or lower, establish clearly stated objectives but permit choices of resources, procedures, time lines, reporting, checking, etc.: permit choices of environmental, sociological, and physical elements; provide creative options and opportunities to grow and to stretch talents and abilities; review work at regular intervals but permit latitude for completion if progress is evident.

11. **Prefers Learning Alone**

For standard score of 60 or higher, encourage use of self-designed objectives, procedures and evaluations before the teacher assesses effort; permit self pacing and achievement beyond department goals; encourage creativity if it exists.

For standard score of 40 or lower, pair or team this person with peer-oriented or authority-oriented individuals that complement his/her sociological characteristics, e.g., prefers to work with peers, is team-oriented with a small group, and so on.

12. **Peer Oriented Learner**

For standard score of 60 or higher, encourage peer meetings and planning; permit these students to evaluate each other individually and in groups; seek group suggestions and recommendations.

For standard score of 40 or lower, identify this person's sociological characteristics and permit isolated achievement if self-oriented, working with teacher if authority-oriented, or multiple options if learning in several ways is indicated.

13. **Learning with Adults**

For standard score of 60 or higher, place these students near appropriate teachers and schedule numerous meetings among them; plan to visit and check assignments often.

For standard score of 40 or lower, identify the student's sociological characteristics, and permit isolated achievement if self-oriented, peer groupings if peer-oriented, or multiple options if learning in several ways is indicated.
14. **Prefers Learning Through Several Ways**

For standard score of 60 or higher, provide opportunities for a variety of learning patterns for the same student, i.e., alone, with peers, with teachers or adults.

For standard score of 40 or lower, permit the person to learn in the sociological patterns indicated. If none are strong, permit options. Recheck self-orientation and motivation, responsibility and persistence.

15. **Auditory Preferences**

For standard score of 60 or higher, use tapes, videotapes, records, radio, television, and precise oral directions when giving assignments, setting tasks, reviewing progress using resources or for any aspect of the task requiring understanding, performance, progress, and/or evaluation.

For standard score of 40 or lower, use resources prescribed under the perceptual preferences that are strong. If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television, and tactual/kinesthetic materials.

16. **Visual Preferences**

For standard score of 60 or higher, pictures, filmstrips, films, graphs, single concept loops, transparencies, diagrams, drawings, books, and magazines; provide resources that require reading and seeing; use programmed learning (if in need of structure) and written assignments and evaluations.

For standard score of 40 or lower, use resources prescribed under the perceptual preferences that are strong. If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television, and tactual/kinesthetic materials.

17. **Tactile Preferences**

For standard score of 60 or higher, use manipulative and three dimensional materials; resources should be touchable and moveable as well as readable; allow these individuals to plan, demonstrate, report, and
evaluate with models and other real objects; encourage them to keep written records.

For standard score of 40 or lower, use resources prescribed under the perceptual preferences that are strong. If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television and real-life experiences such as visits, interviewing, building, designing, and so on.

18. Kinesthetic Preferences

For standard score of 60 or higher, provide opportunities for real and active experiences for planning and carrying out objectives; site visits, seeing projects in action and becoming physically involved are appropriate activities for these individuals.

For standard score of 40 or lower, use resources prescribed under the preferences that are strong. If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television, and tactual/manipulative materials.

19. Requires Intake

For standard score of 60 or higher, provide frequent opportunities for nutritious food breaks, food at learning station, beverage at desk, and so on.

For standard score of 40 or lower, no special arrangements are needed.

20. Functions Best in Morning

For standard score of 60 or higher, permit scheduling of difficult assignments in morning. Take advantage of the strongest segment of the energy curve for morning. If possible self-scheduling of learning activities if desired by student.

For standard score of 40 or lower, permit scheduling of difficult assignments in evening. Take advantage of the strongest segment of the time energy curve for evening. If possible, allow self-scheduling later in the day if desired by student.
21. **Functions Best in Late Morning**

For standard score of 60 or higher, permit scheduling of difficult assignments in late morning. Take advantage of the strongest segment of the energy curve for late morning.

For standard score of 40 or lower, permit scheduling of difficult assignments in the strongest segment of the energy curve.

22. **Functions Best in Afternoon**

For standard score of 60 or higher, permit scheduling of difficult assignments in afternoon. Take advantage of the strongest segment of the energy curve for afternoon.

For standard score of 40 or lower, permit scheduling of difficult assignments in the strongest segment of the energy curve.

23. **Functions Best in Evening**

For best score of 60 or higher, permit self-scheduling of tasks in the evening. Take advantage of the strongest segment of the energy curve for evening.

For standard score of 40 or lower, allow student to schedule task in the morning. Schedule learning activities early in the day rather than in the evening. Utilize the strongest segment of the energy curve.

24. **Needs Mobility**

For standard score of 60 or higher, provide frequent breaks, assignments that require movement to different locations, and schedules that build mobility into the work/learning pattern; require results, not immobility.

For standard score of 40 or lower, provide stationary desk or learning station where most of the student's responsibilities can be completed without requiring excessive movement.

A similar discussion of the TI constitutes the next section.
The Temperament Inventory (TI) was first published in 1977 and was designed to measure the four types of temperament: Melancholy, Choleric, Phlegmatic, and Sanguine. Through a combination of the two-dimensional four-category approach of Eysenck (1967) and the individual factor scoring of Buss and Plomin (1975), those who developed the TI have produced an instrument which allows for a comparison of each subject's score on all four temperament scales (see appendix D). The test is an 80-item scale and can be self-administered within ten to twenty minutes. The four scales of the TI, with corresponding descriptions of high scorers, are:

**Choleric.** People who score high on the choleric scale are aggressive, energetic, and bold. Their initiative and drive usually make them decisive and, therefore, productive. They are persistent and tireless in the pursuit of their goals, sometimes to the point of riding roughshod over others to accomplish their purposes. Thus they are often described by their friends as somewhat insensitive and callous. They possess self-discipline and are practically oriented.

**Melancholic.** People who score high on the melancholy scale are sensitive, perfectionistic, and idealistic. They experience strong emotions, although they may not show them outwardly. They have high standards and they tend to punish themselves when they fall short of those standards. They prefer solitary activities and only a few friends, and they tend to be loyal to those few. Because of their strong consciences, they often feel guilty and worthless. Melancholic persons are usually creative and gifted in the arts.

**Phlegmatic.** People who score high on the phlegmatic scale are calm, easy-going, and stable. They are usually dependable and responsible at work although they usually need another person to motivate them or else they appear as procrastinating and indecisive. People with phlegmatic temperaments are peace-loving and make
good diplomats because they hate disagreements and arguments. They usually do well in jobs that require steadiness and cautiousness.

Sanguine. People who score high on the sanguine scale are gregarious, sociable, and fun-loving. They mix easily and get along well with other people. They enjoy going to parties and making new friends. Their warmth and cheerful nature make them "the life of the party," though more structured people find them quite trying at times. They are sometimes undependable and often jump from one interest to another. They like excitement and active life. They become easily bored when tied down to routine work. (Cruise & Blitchington, 1978)

The construction of the TI employed the strategies of personality theory, scale homogeneity, content validation, and factor analysis. The specific processes used in the construction of the TI are presented in the article published by Cruise, Blitchington, and Futcher (1980, pp. 946, 947, 954).

The internal reliability of the TI was determined independently for each scale through the use of Cronbach's coefficient alpha (1951). Reliability coefficients for the four scales were found to be:

- Phlegmatic = .88
- Sanguine = .90
- Choleric = .84
- Melancholic = .88

(Cruise et al., 1980, p. 950)

Content validity of the test items was established through rigorous evaluation by a six-judge panel. Construct validity of the four-category approach to temperament was established through factor analysis of the final 80-item scale.
The validation procedure for concurrent validity was established through comparison of TI with the Eysenck Personality Inventory (EPI). In only 5 percent of the cases of this comparison was there a lack of agreement between the EPI and at least one of the two highest factors on the TI (Cruise et al., 1980, p. 952).

In summary, this section has shown that the TI is a valid and useful instrument to employ in the process of establishing the relationship of learning-style and temperament.

Field Procedures for Collecting Data

Field procedures involved (1) obtaining permission and co-operation from the Ministries of Education in Jamaica and the Bahamas in order to conduct the study; (2) obtaining permission from the principals of the high-schools sampled for the administration of the LSI and TI to a sample of their grades 11 and 12 students who wrote the GCE and/or CXC in the year the study as conducted; and (3) the administration of the two instruments.

Obtaining permission and cooperation from the Ministries of Education in Jamaica and the Bahamas

A letter was written to the Chief Education Evaluation Officers of the Jamaican and Bahamian Ministries of Education on November 23, 1983, informing them of the proposed study and requesting cooperation and permission for conducting it. A copy of the research proposal was
also sent under separate cover at the same time. Six weeks following the first letter, another was sent to the permanent secretaries of the Ministries of Education, citing requests made in the letter to the Chief Education Evaluation Officers.

Having received no reply, a number of telephone calls were made to ascertain the reason for the delay in reply. As a result, permission was finally granted and cooperation assured on January 24, 1984, from the Bahamian Ministry. Another letter was written to the Jamaican Permanent Secretary of the Ministry of Education, after which permission was granted with the assurance of their cooperation, on February 21, 1984 (see appendix E).

Obtaining permission and cooperation of principals of the government high schools sampled

Upon receipt of the subsequent letter from the Acting Chief Education Officer of the Ministry of Education, Jamaica, letters seeking cooperation were sent to the high-schools sampled (see appendix E).

Favorable responses were immediately received from some high-schools. Others were slow to respond. However, as a result of personal visits and telephone calls to those slow-responding institutions, permission and cooperation were received.

The Ministry of Education in the Bahamas took the responsibility to solicit the principals' support and
cooperation of the selected high-schools in the administration of the instruments.

**Obtaining special permission and cooperation from the independent schools sampled**

Special permission and cooperation were sought from two independent high schools by way of written communication. A prompt and favorable reply was given.

**Collection of Data**

Due to the constraints of time and finance, the researcher sought the assistance of a colleague and school administrator who resided in New Providence, with respect to the administration of the instruments in the sampled high-schools in the Bahamas. Written instructions and procedures in administering each instrument were sent to him. All the high-schools sampled were visited or telephoned in order to arrange dates and times for the collection of the data. From the selected schools 149 subjects responded to both instruments. The Bahamas administrator was asked to report any difficulty or unusual circumstances surrounding the collection of the data. No difficulty or such circumstances were reported which would jeopardize external validity and reliability of the study.

The instruments were personally administered by the researcher in Jamaica after dates and times for the collection of the data were arranged. The same
instructions and procedure were used in Jamaica as in the Bahamas.

Grades 11 and 12 students who were preparing to write the GCE and/or CXC examination in June 1984 were randomly sampled in each school (representation was restricted to classes that were available at the time arranged, or willingness of teachers to give up a class period, or the number of students present in school on the day of the collection of the data). The number of students selected in each school varied between ten and thirty. The number of schools selected were thirteen, each with an average of 130 students in the senior levels (grades 11 and 12). The number of Jamaican students who responded to both instruments was 177. In each school the sampled students were allowed to sit at random in a classroom and special care was taken to minimize distraction on a school day.

A total of 326 grade 11 and 12 senior high-school students in the Bahamas and Jamaica were tested within the time limits specified to the principals, that is, within fifteen to thirty minutes for each instrument.

Generally the subjects characterized the LSI and TI as interesting, clear, relevant, and easy to understand.

Model-Building Statements

Four model-building statements were advanced in order to determine if there were any linear combinations of learning-style variables which "best" describe each temperament variable.
1. There is a significant linear combination of learning-style variables which best describes melancholics.

2. There is a significant linear combination of learning-style variables which best describes choleric.

3. There is a significant linear combination of learning-style variables which best describes phlegmatics.

4. There is a significant linear combination of learning-style variables which best describes sanguines.

**Hypotheses**

In order to determine significant differences among the variables investigated, hypotheses were formulated into null statements of hypotheses to facilitate statistical testing.

1. There is no linear combination of the learning-style variables which significantly discriminates between males and females in grades 11 and 12.

2. There is no linear combination of the temperament variables which significantly discriminates between males and females in grades 11 and 12.

3. There is no linear combination of the learning-style variables which significantly discriminates between Bahamian and Jamaican students in grades 11 and 12.

4. There is no linear combination of the temperament variables which significantly discriminates between Bahamian and Jamaican students in grades 11 and 12.
5. There is no significant relationship between temperament and learning-style of Bahamian and Jamaican senior high-school students in grades 11 and 12.

Data Analysis

The statistical analysis includes two components. These are the statistical treatment of data and the testing of the null hypothesis.

All statistical treatment of data was carried out on the Xerox Sigma 6 computer at Andrews University Computer Center. Statistical programs from the computer library and statistical library that were employed in the analysis were:

1. **BMDP2D and BMDP9R** -- used for data screening purposes to ensure that the data satisfied certain basic statistical assumptions before any of the analyses mentioned below were performed.

2. **BMDP9R** -- to estimate regression equations for "best" subsets of predictor variables or "best" linear combination of learning-style variables which "best" described each temperament variable. This analysis was used in the building of the four models.

3. **BMDP7M and Discrmnt** -- used to perform a discriminant analysis between the sexes and islands so as to ascertain if there were any significant differences in each of the demographic variables on the temperament and learning-style variables. This analysis performed the tests of significance on hypotheses 1, 2, 3, and 4.
4. **BMDP6M** -- performed a canonical correlation analysis between the set of temperament variables and that of the learning-style variables. This analysis performed the test of significance on hypothesis 5.

**Summary**

This chapter has presented the methodology for the study. The research approach and design introduced the chapter. The procedure used in the selection of the sample from the defined population was presented along with the justification of the power of the study. In addition, the following components of the methodology have been outlined in detailed: instrumentation, procedure used in data collection, and the statistical analysis of the data.
CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

This chapter reports the results of the analysis of data concerning the relationship between the expressed temperament and learning-style of senior high-school students in Jamaica and the Bahamas. The LSI and TI were administered to 326 senior high-school students who were selected by a stratified random procedure (see chapter 3).

The data were analyzed by utilizing (1) Pearson's product-moment correlation to examine the inter-correlations between the LSI and TI variables; (2) all Possible Subsets Regression (Pedhazur, 1982) for model building statements; (3) discriminant analysis (Tatsuoka, 1970) for hypotheses 1, 2, 3, and 4; and (4) canonical correlation analysis (Hotelling, 1936; Tatsuoka, 1971) for hypothesis 5. It should be noted that because of the exploratory nature of the study, all tests of the null hypotheses were two-tailed. This allowed for an examination of the possible existence of a relationship in either direction.

The .05 level of significance was used as the level of confidence for all correlations except the "best" subset variables. The "best" subset variables were selected based
upon their stability and consistency, with close consideration given to the R-squared and Cp criteria.

The first section is presented in triad, giving the data results of the statistical methodology (described in chapter 3) with respect to each tested null hypothesis. Each triad presents (1) the statistical method applied to the data; (2) accompanying summary tables of statistics from the applied tests; and (3) a brief discussion and summary of the findings. The second section is a general summary, integrating the data findings from the three statistical methods.

**Analysis of Data and Testing of the Hypothesis**

**Zero-order Correlation**

As described in chapter 3, the TI yields four scores and the LSI twenty-two scores for each respondent. The correlation matrix yielded a number of significant zero-order correlation coefficients among the temperament and learning style variables (see appendix F). The more meaningful intercorrelation coefficients were examined, that is, those which were greater than .50 and which were significant at the .05 level of significance (i.e., the probability for the correlation to be the result of chance is less than 1%). Table 7 indicates these correlation coefficients for the related variables.

Teacher-motivated is related to self-motivated \((r = .741)\), adult-motivated \((r = .578)\), kinesthetic preference \((r = .571)\), and persistent \((r = .515)\). This means
that students who score high on teacher-motivated tend to be self-motivated, adult-motivated, prefer to learn with bodily involvement, and are likely to concentrate on a given task until it is completed.

TABLE 7

ZERO-ORDER CORRELATION COEFFICIENTS
OF SELECTED TI AND LSI VARIABLES

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher-Motivated</td>
<td>.741</td>
<td>Self-motivated</td>
</tr>
<tr>
<td>Learn in Several Ways</td>
<td>.732</td>
<td>Peer-Oriented</td>
</tr>
<tr>
<td>Adult-Motivated</td>
<td>.616</td>
<td>Self-motivated</td>
</tr>
<tr>
<td>Kinesthetic Preference</td>
<td>.608</td>
<td>Tactile Preference</td>
</tr>
<tr>
<td>Melancholic</td>
<td>-.602</td>
<td>Phlegmatic</td>
</tr>
<tr>
<td>Teacher-Motivated</td>
<td>.578</td>
<td>Adult-Motivated</td>
</tr>
<tr>
<td>Teacher-Motivated</td>
<td>.571</td>
<td>Kinesthetic Preference</td>
</tr>
<tr>
<td>Persistent</td>
<td>.553</td>
<td>Self-motivated</td>
</tr>
<tr>
<td>Teacher-Motivated</td>
<td>.551</td>
<td>Persistent</td>
</tr>
<tr>
<td>Responsible</td>
<td>.515</td>
<td>Self-motivated</td>
</tr>
<tr>
<td>Kinesthetic Preference</td>
<td>.500</td>
<td>Self-motivated</td>
</tr>
</tbody>
</table>

A person who scores high on self-motivated tends to be teacher-motivated, adult-motivated, persistent, responsible, and kinesthetic. The peer-oriented learner is related to learning through several ways ($r = .732$). This means that students who prefer to learn with peers tend to prefer learning through a variety of ways. Tactual
preference is related to kinesthetic preference \((r = .608)\), which means that an individual who scores high on tactual preference tends to prefer being bodily involved while learning and vice-versa. Finally, melancholic is related to phlegmatic \((r = -.602)\), which means that an individual who scores high on melancholic tends to be less phlegmatic.

Between the scales of the LSI and those of the TI there were a number of statistically significant correlations \((p < .05)\), ranging from .30 upwards. The variables are listed in figure 3.

<table>
<thead>
<tr>
<th>TI Scales</th>
<th>LSI Scales</th>
<th>Correlation Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phlegmatic</td>
<td>Learn in Several Ways</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Phlegmatic</td>
<td>Teacher Motivated</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Auditory Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Tactile Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Kinesthetic Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Require Intake</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Morning</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Mobility</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Adult Motivated</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Sanguine</td>
<td>Teacher Motivated</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Choleric</td>
<td>Visual Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Choleric</td>
<td>Tactile Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Choleric</td>
<td>Kinesthetic Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Choleric</td>
<td>Mobility</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Choleric</td>
<td>Adult Motivated</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Choleric</td>
<td>Teacher Motivated</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Melancholic</td>
<td>Tactile Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Melancholic</td>
<td>Kinesthetic Preference</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Melancholic</td>
<td>Morning</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Melancholic</td>
<td>Mobility</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Melancholic</td>
<td>Adult Motivated</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Melancholic</td>
<td>Teacher Motivated</td>
<td>Positive (+)</td>
</tr>
</tbody>
</table>

Fig. 3. TI and LSI correlations which are significant.
These correlations presented the first statistical relationship between learning-style and temperament. The significant findings of the subsequent "best" subset, discriminant analysis, and canonical correlation analysis supported these correlations.

"Best" Subset Algorithm

This statistical procedure was used to analyze the data in building models 1 to 4. The BMDPR9R "All Possible Subsets Regression" computer program (Dixon & Brown, 1979) produced four computer printouts.

Description of "All Possible Subsets Regression": "Best" subset computer printout

The unique components of the best subset computer printout are listed. Each contained:

1. the listing of the best subsets using one to four predictors for the LSI and one to twenty-four predictors for the TI
2. the "best" five subsets, mathematically selected on the basic of lowest Cp value
3. statistics for the chosen "best" subset having the lowest Cp value.

Data Analysis

Specific criteria used for selecting the "best" subset of predictor variables were:

1. All variables which were significant (t-statistic, 1.96 or greater) were first selected from the
"best" five mathematically selected subsets. If they were not statistically significant, but were meaningful based upon the writer's judgment, they were included in the model.

2. All variables which made some meaningful contribution to the R-squared were considered.

3. The variables were then examined for stability (in sign and magnitude) and consistency in various linear combinations of different subsets and were ranked from the most stable and consistent to the least stable and consistent.

A combination of the selected variables from the most stable list were used to form a model.

Presentation of "Best" subset models

Four models are presented in relationship to the four corresponding model-building statements. It is significant to note that those models are not predictive nor causal, but descriptive. That is, the linear combination of the selected variables in each model is not intended to predict nor to explain a causal relationship with the criterion variables. Instead the researcher intends to utilize the models to describe each temperament variable.

Table 3 presents the statistics for the four variables which were found to be significant descriptors of melancholics.
Melancholic individuals are therefore described as being low on sound and responsible and high on visual and kinesthetic preferences.

**TABLE 8**

"BEST" SIGNIFICANT LSI DESCRIPTORS OF MELANCHOLICS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Regression Coefficient</th>
<th>T-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound</td>
<td>-.157</td>
<td>-2.87</td>
</tr>
<tr>
<td>Responsible</td>
<td>-.193</td>
<td>-3.30</td>
</tr>
<tr>
<td>Visual Preference</td>
<td>.119</td>
<td>1.97</td>
</tr>
<tr>
<td>Kinesthetic Preference</td>
<td>.174</td>
<td>2.70</td>
</tr>
</tbody>
</table>

Table 9 presents the statistics for six variables related to cholerics, five of which were found to be statistically significant at the .05 level.

**TABLE 9**

"BEST" SIGNIFICANT LSI DESCRIPTORS OF CHOLERICS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Regression Coefficient</th>
<th>T-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-motivated</td>
<td>.142</td>
<td>2.01</td>
</tr>
<tr>
<td>Responsible</td>
<td>.316</td>
<td>5.33</td>
</tr>
<tr>
<td>Visual Preference</td>
<td>-.171</td>
<td>-2.95</td>
</tr>
<tr>
<td>Afternoon</td>
<td>.122</td>
<td>2.26</td>
</tr>
<tr>
<td>Mobility</td>
<td>-.175</td>
<td>-1.15</td>
</tr>
<tr>
<td>Adult-Motivated</td>
<td>-.191</td>
<td>-2.93</td>
</tr>
</tbody>
</table>
The other one was selected because it was considered to be a meaningful descriptor of choleric, and makes a meaningful contribution to $R$-square. This model satisfied the $C_p$ criterion with the lowest $C_p$ value.

Choleric are therefore described as being high on motivated, responsible, and learning in the afternoon, and low on visual preference, mobility, and adult-motivated.

Table 10 presents the statistics for four variables related to phlegmatics, which, while not statistically significant at the .05 level, were selected because they were considered to be meaningful descriptors of phlegmatics, and make a meaningful contribution to $R$-square. This model satisfied the $C_p$ criterion with the lowest $C_p$ value.

### Table 10

**"BEST" SIGNIFICANT LSI DESCRIPTORS OF PHLEGMATICS**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Regression Coefficient</th>
<th>T-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound</td>
<td>.079</td>
<td>1.76</td>
</tr>
<tr>
<td>Light</td>
<td>-.978</td>
<td>-1.34</td>
</tr>
<tr>
<td>Temperature</td>
<td>.084</td>
<td>1.60</td>
</tr>
<tr>
<td>Afternoon</td>
<td>-.115</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Phlegmatics are therefore described as being high on sound and temperature and low on light and afternoon.
Table 11 presents the statistics for three variables, one of which was found to be statistically significant at the .05 level; the other two were selected because they were considered to be meaningful descriptors of sanguines and make a meaningful contribution to $R^2$. This model satisfied the $C_p$ criterion with the lowest $C_p$ value.

**TABLE 11**

"BEST" SIGNIFICANT LSI DESCRIPTORS OF SANGUINES

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Regression Coefficient</th>
<th>T-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>.134</td>
<td>2.11</td>
</tr>
<tr>
<td>Several Ways</td>
<td>-.080</td>
<td>-1.34</td>
</tr>
<tr>
<td>Auditory Preference</td>
<td>.134</td>
<td>1.65</td>
</tr>
</tbody>
</table>

Sanguines are therefore described as being high on light and auditory preference and low on learning in several ways.

**Discussion and Summary**

Based upon the series of computer runs of the All Possible Subset Regression program the four final description models were built. Table 12 is an illustrative comparison of the four models.
Model 1

A linear combination of four learning-style descriptors which meaningfully characterized melancholics was selected as the "best" model.

TABLE 12
SUMMARY TABLE COMPARISON OF LSI DESCRIPTORS WITH EACH TI VARIABLE

<table>
<thead>
<tr>
<th>Learning Style Inventory</th>
<th>Temperament Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Melan</td>
</tr>
<tr>
<td>Sound</td>
<td>-</td>
</tr>
<tr>
<td>Light</td>
<td>-</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td></td>
</tr>
<tr>
<td>Self-motivated</td>
<td>+</td>
</tr>
<tr>
<td>Persistent</td>
<td>-</td>
</tr>
<tr>
<td>Responsible</td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td></td>
</tr>
<tr>
<td>Learn alone</td>
<td></td>
</tr>
<tr>
<td>Peer-oriented</td>
<td></td>
</tr>
<tr>
<td>Learn with adults</td>
<td></td>
</tr>
<tr>
<td>Learn in several ways</td>
<td></td>
</tr>
<tr>
<td>Auditory preference</td>
<td></td>
</tr>
<tr>
<td>Visual preference</td>
<td>+</td>
</tr>
<tr>
<td>Tactile preference</td>
<td></td>
</tr>
<tr>
<td>Kinesthetic preference</td>
<td></td>
</tr>
<tr>
<td>Requires intake</td>
<td></td>
</tr>
<tr>
<td>Morning/evening</td>
<td></td>
</tr>
<tr>
<td>Late morning</td>
<td></td>
</tr>
<tr>
<td>Afternoon</td>
<td></td>
</tr>
<tr>
<td>Needs mobility</td>
<td></td>
</tr>
<tr>
<td>Adult-motivated</td>
<td></td>
</tr>
<tr>
<td>Teacher-motivated</td>
<td></td>
</tr>
</tbody>
</table>

Key: (+) = tendency to be high, i.e. movement towards the positive pole.
(-) = tendency to be low, i.e. movement towards the negative pole.
This model describes senior high-school students who have the melancholic temperament type. They have the need for low sound or silence; the use of visual aids (pictures, filmstrips, graphs, role-play, etc.); opportunities for real and active experiences which involve bodily activities such as site visits, seeing projects in action, and becoming physically engaged. They tend to be less responsible and therefore need short-term goals, limited assignments, frequent checking by teachers, clear, simple instructions, and frequent-interval positive reinforcement.

Model 2

A linear combination of six learning-style descriptors which meaningfully characterized cholerics was selected as the "best" model. This model describes senior high-school students who have the choleric temperament type. They are self-motivated (i.e., tend to prefer self-directed learning activities and programs); responsible (i.e., tend to initiate and complete learning task with minimum teacher involvement); and prefer to handle difficult learning tasks in the afternoon (i.e., energy peak is reached in the afternoon). On the other hand, they have less visual preference (i.e., need multisensory resources); less need for mobility (i.e., prefer to be stationary); and tend not to be adult-motivated (i.e., prefer to be intrinsically motivated than to use an adult as criterion for motivation).
Model 3

A linear combination of four learning-style variables was selected as the "best" model which meaningfully describes the phlegmatic temperament type of senior high-school student. They have need for soft music, conversational areas, or an open learning environment. Warmth tends to be an essential environmental factor which is necessary for the phlegmatic's physical comfort. They also have the need for low light intensity and prefer not to be engaged in difficult learning tasks in the afternoon.

Model 4

Three learning-style variables were found to be linearly combined to build a model that was the "best" descriptor of the sanguine temperament type. This type has a need for high light intensity (i.e., prefer to be near windows or highly lit areas) and prefer to use their auditory sense when engaged in learning. They are also specific with regards to the sociological group they prefer to study with (i.e., either peer, pair, small group, or large group).

All four models provide distinguishable characteristics which discriminate among the temperament types. These models can be used as guides for teachers and school counselors in diagnosing and prescribing specific learning experiences compatible with students' needs.
Discriminant Analysis

Discriminant analysis was used to analyze the data in testing hypotheses 1 through 4. The discriminant analysis is a procedure for finding a linear combination of the original predictor variables that shows large differences in group means. The discriminant computer program in the statistical library (Andrews University Statistical Computing Services) was used to ascertain if any significant discrimination existed between the established groups stated in hypotheses 1 through 4.

The discriminant analysis computer printout yielded the following relevant components:

1. The group means for each discriminant function.
2. An approximate Chi Square for the test of significance of the discriminant function.
3. A list of the standardized discriminant function weights for each variable.

The standardized discriminant function weights that were interpreted initially were those that are at least half of the largest standardized discriminant function weight, and then others that are close to a half which make practical sense. These standardized discriminant function weights are interpreted in order of importance (i.e., from the most important to the least important).
Hypothesis 1

There is no linear combination of the learning-style variables which significantly discriminate between males and females in grades 11 and 12.

Table 13 is a list of the standardized discriminant function weights for the 26 variables examined in the test of hypothesis 1.

**TABLE 13**

**STANDARDIZED DISCRIMINANT FUNCTION OF LSI VARIABLES IN DISCRIMINATING BETWEEN MALES & FEMALES**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Discriminant Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sound</td>
<td>.6173</td>
</tr>
<tr>
<td>2. Light</td>
<td>13.8194</td>
</tr>
<tr>
<td>3. Temperature</td>
<td>-4.7884</td>
</tr>
<tr>
<td>4. Design</td>
<td>-19.8678*</td>
</tr>
<tr>
<td>5. Self-motivated</td>
<td>6.6388</td>
</tr>
<tr>
<td>6. Persistent</td>
<td>19.7041*</td>
</tr>
<tr>
<td>7. Responsible</td>
<td>-13.0795*</td>
</tr>
<tr>
<td>9. Peer-oriented</td>
<td>-22.6561*</td>
</tr>
<tr>
<td>10. Learn with adult</td>
<td>-1.9079</td>
</tr>
<tr>
<td>11. Learn in several ways</td>
<td>5.9151</td>
</tr>
<tr>
<td>12. Auditory preference</td>
<td>4.0913</td>
</tr>
<tr>
<td>13. Visual preference</td>
<td>-7.5525</td>
</tr>
<tr>
<td>14. Tactile preference</td>
<td>-28.5352*</td>
</tr>
<tr>
<td>15. Kinesthetic preference</td>
<td>41.4198*</td>
</tr>
<tr>
<td>16. Requires intake</td>
<td>34.6423*</td>
</tr>
<tr>
<td>17. Morning</td>
<td>19.7249*</td>
</tr>
<tr>
<td>18. Late morning</td>
<td>11.0261</td>
</tr>
<tr>
<td>19. Afternoon</td>
<td>-11.2429</td>
</tr>
<tr>
<td>20. Needs mobility</td>
<td>-14.5138</td>
</tr>
<tr>
<td>21. Adult-motivated</td>
<td>-20.9719*</td>
</tr>
<tr>
<td>22. Teacher-motivated</td>
<td>-4.2990</td>
</tr>
</tbody>
</table>

Asterisk (*) indicate variables that were interpreted.
The test of significance of the discriminant function provided in table 13 yielded a Chi Square of 64.1287 with 22 degrees of freedom. This Chi Square value is significant with $p < .00005$. Hence null hypothesis 1 was rejected, i.e., there is a linear combination of the learning-style variables which significantly discriminates between males and females. The standardized discriminant function along with the group means indicates that females as compared to males tend to be more kinesthetic, require more intake, are less tactile, prefer to learn alone (less peer-oriented), are less adult-motivated, prefer informal design, function best in the morning, and are more persistent.

Hypothesis 2

There is no linear combination of the temperament variables which significantly discriminates between males and females in grades 11 and 12.

The test of significance of the standardized discriminant function yielded a Chi Square of 4.5415 with 4 degrees of freedom. This Chi Square value is not significant with $p > .05$. Therefore the null hypothesis was retained. No interpretation is given for the standardized discriminant function weights.
Hypothesis 3

There is no linear combination of the learning-style variables which significantly discriminates between Bahamian and Jamaican students in grades 11 and 12.

The test of significance of the discriminant functions provided in table 14 yielded a Chi Square of 125.4081 with 22 degrees of freedom. This Chi Square value is significant with \( p < .00005 \).

**TABLE 14**

STANDARDIZED DISCRIMINANT FUNCTION
OF LSI VARIABLES IN DISCRIMINATING
BETWEEN JAMAICAN & BAHAMIAN STUDENTS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Discriminant Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sound</td>
<td>5.8070</td>
</tr>
<tr>
<td>2. Light</td>
<td>6.8936</td>
</tr>
<tr>
<td>3. Temperature</td>
<td>3.4312</td>
</tr>
<tr>
<td>4. Design</td>
<td>-22.2835*</td>
</tr>
<tr>
<td>5. Self-motivated</td>
<td>-16.1764*</td>
</tr>
<tr>
<td>6. Persistent</td>
<td>16.5345*</td>
</tr>
<tr>
<td>7. Responsible</td>
<td>.4985</td>
</tr>
<tr>
<td>8. Structure</td>
<td>2.7019</td>
</tr>
<tr>
<td>9. Peer-oriented</td>
<td>-1.7916</td>
</tr>
<tr>
<td>10. Learn with adult</td>
<td>-11.3593</td>
</tr>
<tr>
<td>11. Learn in several ways</td>
<td>-18.4820*</td>
</tr>
<tr>
<td>12. Auditory preference</td>
<td>15.8377*</td>
</tr>
<tr>
<td>13. Visual preference</td>
<td>-16.5248*</td>
</tr>
<tr>
<td>14. Tactile preference</td>
<td>-8.9958</td>
</tr>
<tr>
<td>15. Kinesthetic preference</td>
<td>-5.7469</td>
</tr>
<tr>
<td>16. Requires intake</td>
<td>-8.6257</td>
</tr>
<tr>
<td>17. Morning</td>
<td>-33.6695*</td>
</tr>
<tr>
<td>18. Late morning</td>
<td>22.1925*</td>
</tr>
<tr>
<td>19. Afternoon</td>
<td>-2.2687</td>
</tr>
<tr>
<td>20. Needs mobility</td>
<td>-4.4043</td>
</tr>
<tr>
<td>21. Adult-motivated</td>
<td>-20.6128*</td>
</tr>
<tr>
<td>22. Teacher-motivated</td>
<td>2.7295</td>
</tr>
</tbody>
</table>

Asterisk (*) indicate variables that were interpreted.
Therefore, the null hypothesis is rejected, i.e., there is a significant linear combination of the learning-style variables which significantly discriminates between Jamaican and Bahamian students.

The interpretation of the standardized discriminant function with respect to the group means indicates that Bahamian students as compared with Jamaican students do not prefer learning in the evening, prefer informal design, function best in the late morning, are less adultmotivated, do not prefer to learn in several ways, tend to be persistent learners, have less visual preference, more self-motivated, and prefer to use the auditory sense when engaged in a learning experience.

Hypothesis 4

There is no linear combination of the temperament variables which significantly discriminates between Bahamian and Jamaican students in grades 11 and 12. The test of significance of the discriminant function weights provided in table 15 yielded a Chi Square of 19.9769 with 4 degrees of freedom. This Chi Square value is significant with \( p < .005 \). Therefore the null hypothesis is rejected, i.e., there is a significant linear combination of the temperament variables which significantly discriminates between Bahamian and Jamaican students.
TABLE 15
STANDARDIZED DISCRIMINANT FUNCTION
OF TI VARIABLES IN DISCRIMINATING
BETWEEN BAHAMIAN AND JAMAICAN STUDENTS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Discriminant Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Phlegmatic</td>
<td>20.6272*</td>
</tr>
<tr>
<td>2. Sanguine</td>
<td>-20.8035*</td>
</tr>
<tr>
<td>3. Choleric</td>
<td>58.8665*</td>
</tr>
<tr>
<td>4. Melancholic</td>
<td>- .8024</td>
</tr>
</tbody>
</table>

Asterisk (*) indicate variables that were interpreted.

The interpretation of the standardized discriminant function with respect to the group means indicate that Bahamian students as compared to Jamaican students tend to be more choleric and, to some extent, more phlegmatic and less sanguine.

Discussion and Summary

The test of the four null hypotheses by discriminant analysis yielded hypotheses 1, 3, 4, and 5 to be rejected and hypothesis 2 to be retained. Table 16 presents a summary of the LSI and TI variables which significantly discriminate between males and females, and between Jamaican students and Bahamian students. Females as compared to males seems to have a greater tendency for physical satisfaction (i.e., food intake, bodily involvement, and time of day) when engaged in a learning
exercise: while males seem to have a greater sociological need (i.e., working with peers, or in groups).

**TABLE 16**

**SUMMARY TABLE COMPARISON OF LSI & TI VARIABLES AS THEY DISCRIMINATE BETWEEN SEXES & ISLANDS**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sex</th>
<th>Island</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Phlegmatic</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Sanguine</td>
<td>++</td>
<td>--</td>
</tr>
<tr>
<td>Choleric</td>
<td>--</td>
<td>++</td>
</tr>
<tr>
<td>Melancholic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Motivated/unmotivated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Responsible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn alone</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Peer-oriented</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Learn with adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn in several ways</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Auditory preference</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Visual preference</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Tactile Preference</td>
<td>++</td>
<td>--</td>
</tr>
<tr>
<td>Kinesthetic preference</td>
<td>--</td>
<td>++</td>
</tr>
<tr>
<td>Requires intake</td>
<td>--</td>
<td>++</td>
</tr>
<tr>
<td>Morning</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Evening</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Late morning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Needs mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult-motivated</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Teacher-motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key:** (+++) means high on  
(++) means moderately high on  
(+) means moderately low on  
(-) means low on  
(-) means low on
Canonical Correlation

Hypothesis 5

There is no significant relationship between temperament and learning-style of Jamaican and Bahamian senior high school students in grades 11 and 12.

The statistical procedure used in testing hypothesis 5 was canonical correlation, which analyzes the data for correlation which existed between the set of four temperament variables and the set of twenty-four learning-style variables. Based upon the above-mentioned test of significance the null hypothesis 5 was rejected (i.e., there is a significant correlation between temperament and learning-style of Bahamian and Jamaican senior high school students).

Presentation of results of Canonical correlation analysis and hypothesis

The canonical correlation computer printout yielded the following relevant components that are indicated in tables 17 and 18.

1. A list of eigenvalues, canonical correlations, and Bartlett's test of significance for remaining eigenvalues.

2. Standardized coefficients for canonical variables for the first and second sets of variables.

The first canonical function had a significant correlation .52086, with Chi Square of 162.62 and p < .00005.
TABLE 17
CANONICAL CORRELATION AND BARTLETT’S TEST OF SIGNIFICANCE

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Canonical Correlation</th>
<th>Chi-Square</th>
<th>Degree of Freedom</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>.27130</td>
<td>.52086*</td>
<td>162.64</td>
<td>88</td>
<td>.000005*</td>
</tr>
<tr>
<td>.09991</td>
<td>.31608</td>
<td>64.06</td>
<td>63</td>
<td>.43916</td>
</tr>
<tr>
<td>.05353</td>
<td>.23137</td>
<td>31.27</td>
<td>40</td>
<td>.83687</td>
</tr>
<tr>
<td>.04435</td>
<td>.21060</td>
<td>14.13</td>
<td>19</td>
<td>.77593</td>
</tr>
</tbody>
</table>

Asterisk (*) indicate significant canonical correlation.

Table 18 presents a list of the canonical variables in the first canonical function (i.e., the canonical function which has significant correlation). The interpretation given is that students who are high on choleric and low on melancholy tend to be more responsible and self-motivated, while they are less inclined towards visual preference, formal design, mobility, adult-motivation, and kinesthetic preference.

Discussion and Summary

The significant canonical correlation of the LSI and TI variables indicates that a significant relationship existed between the two sets of variables. Therefore an understanding of students' temperament along with their characteristic learning-style should be an essential guide.
for teachers and school counselors in improving students' learning experience.

**TABLE 18**

**CANONICAL CORRELATION OF LSI AND TI VARIABLES**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set I</strong></td>
<td></td>
</tr>
<tr>
<td>Phlegmatic</td>
<td>-.168</td>
</tr>
<tr>
<td>Sanguine</td>
<td>-.205</td>
</tr>
<tr>
<td>Choleric</td>
<td>.895*</td>
</tr>
<tr>
<td>Melancholic</td>
<td>-.482*</td>
</tr>
<tr>
<td><strong>Set II</strong></td>
<td></td>
</tr>
<tr>
<td>Sound</td>
<td>-.061</td>
</tr>
<tr>
<td>Light</td>
<td>.183</td>
</tr>
<tr>
<td>Temperature</td>
<td>-.100</td>
</tr>
<tr>
<td>Design</td>
<td>-.266*</td>
</tr>
<tr>
<td>Unmotivated</td>
<td>-.317*</td>
</tr>
<tr>
<td>Persistent</td>
<td>.159</td>
</tr>
<tr>
<td>Responsible</td>
<td>.649*</td>
</tr>
<tr>
<td>Structure</td>
<td>-.178</td>
</tr>
<tr>
<td>Peer-oriented</td>
<td>.052</td>
</tr>
<tr>
<td>Learn with adults</td>
<td>.199</td>
</tr>
<tr>
<td>Learn in several ways</td>
<td>-.107</td>
</tr>
<tr>
<td>Auditory preference</td>
<td>-.066</td>
</tr>
<tr>
<td>Visual preference</td>
<td>-.413*</td>
</tr>
<tr>
<td>Tactile preference</td>
<td>.102</td>
</tr>
<tr>
<td>Kinesthetic preference</td>
<td>-.239*</td>
</tr>
<tr>
<td>Requires intake</td>
<td>-.098</td>
</tr>
<tr>
<td>Evening</td>
<td>-.015</td>
</tr>
<tr>
<td>Late morning</td>
<td>.009</td>
</tr>
<tr>
<td>Afternoon</td>
<td>.133</td>
</tr>
<tr>
<td>Needs mobility</td>
<td>-.259*</td>
</tr>
<tr>
<td>Adult-motivated</td>
<td>-.240*</td>
</tr>
<tr>
<td>Teacher-motivated</td>
<td>.068</td>
</tr>
</tbody>
</table>

Asterisk (*) indicate variables that were interpreted.
General Summary

Chapter 5 presents the results of the analysis of data concerning the building of descriptive models, the discrimination between sexes, and islands, and the correlation of the expressed temperament and learning-style of Jamaican and Bahamian student.

The basic data are presented with the statistical analysis and some brief interpretation. The analysis of the data is presented with respect to each null hypothesis tested.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a summary of the study with conclusions, implications, and recommendations drawn from the findings. The study was concerned with the relationship between the learning-style and temperament of grades 11 and 12 senior high-school students in the Bahamas and Jamaica.

Summary

The summary is presented in four sections covering (1) the purpose of the study, (2) a review of related literature and research, (3) a brief description of the research design including the target population and instrumentation, and (4) findings and discussion.

Purpose of the Study

Students' temperaments are considered a significant factor affecting their learning-style, and hence academic achievement. After a careful review of relevant literature and some eight years of observation as a teacher it became apparent to the writer that this subject needed empirical study.
The purpose of this research was to ascertain if a significant relationship existed between the learning-styles and temperament types of a selected group of grades 11 and 12 senior high-school students in the Bahamas and Jamaica. Further purposes were to determine if (1) there were any significant combinations of learning-style variables which meaningfully characterized each temperament type, and (2) whether learning-style and temperament differed significantly between the sexes and between Bahamian and Jamaican students.

Four model-building statements and five hypotheses were formulated and projected for this study. The four model-building statements were concerned with four descriptive models relating significant linear combinations of learning-style variables to each temperament variable. The first four hypotheses were concerned with the discrimination between males and females, and between Bahamian and Jamaican students in the learning-style and temperament variables, respectively. The fifth hypothesis dealt with the relationship between the set of learning-style variables and the set of temperament variables.

The Review of Related Literature and Research

The review of the relevant literature and research was divided into four sections. The first presented a review of literature dealing with theories and theorists of temperament. This included discussions about the view on the two-dimensional/four-part typology approach of
temperament. The contributions of many researchers, and most recently Cruise and Blitchington (1980), has given broader application and meaning to the two-dimensional/four-part typology approach. There seemed to be an agreement that the major dimensions of temperament as defined by Allport (1937) are introversion/extroversion and emotionality.

The second section dealt with the related research on temperament that has relevance for learning. Research has demonstrated that extroversion/introversion and emotionality are significant dimensions of personality which have a significant effect on learning and learning components (such as motivation, attention span, learning-style, reinforcement etc.). If there was one aspect of this part of the review which might be considered to be most significant for educators, it would be the effect of extroversion/introversion on academic performance.

The third section was concerned with the theories and theorists of learning style constructs. The review reflected learning-style paradigms as outgrowths of "individualized learning".

The fourth section was concerned with related research on learning-style with special focus on the works of Rita and Kenneth Dunn and Gary Price (1974, 1977, 1981). Throughout the review, however, it was clearly demonstrated that each person has an identifiable personalized way of learning, called learning-style. The learning-styles of
students therefore has specific educational implications for the teaching-learning process, and hence its understanding is vital to students' academic progress and success.

Research Design, Population, and Instrumentation

An ex-post facto research design was used in order to determine the relationship existing between learning style and temperament variables, and the discrimination of sex and island in these two sets of variables. The statistical tools used, from the more simple to the more complex were:

1. The Pearson product-moment correlation coefficient, also referred to as zero-order correlation coefficient.

2. "Best" subset algorithm, a variation of multiple regression.

3. Discriminant analysis, a multivariate procedure.

4. Canonical correlation, an extension of multiple regression.

Subjects used in this study consisted of 326, grades 11 and 12 senior high school students in the Bahamas and Jamaica during the 1983-1984 school year. Students were selected by a stratified random sampling procedure to represent both sexes and the urban and rural areas of the islands.
Two standardized instruments were used for testing. These were the Learning Style Inventory (Dunn, Dunn, & Price, 1978), a measure of four learning-style dimensions (environmental, emotional, sociological, and physical) with twenty-two subscales, and the Temperament Inventory (Cruise & Blitchington, 1977), a measure of four temperament types (Phlegmatic, Choleric, Sanguine, and Melancholy). A rationale for the choice of instruments, and a description, the construction, and the reliability and validity of each instrument were also presented. Four model-building statements and five null hypotheses were advanced as a component of the methodology.

Findings of the Study

This section presents a summary of the findings of the study with regards to the four model-building statements and five null hypotheses.

Zero-order correlation

A number of significant correlations were found from the intercorrelation matrix of the Learning Style scales, the intercorrelation matrix of the Temperament Inventory scales, and the matrix giving the correlations between each LSI scale and each TI scale (see appendix E). The decision was made to delimit this part of the discussion to correlation coefficients of .50 or greater, followed by those ranging from .30 to .49. Ten correlation coefficients, .50 or greater, were found among...
all LSI scales tested. These correlations, with a plus (+) or a minus (-) to indicate a positive or negative relationship are listed. They are ranked from the highest to the lowest:

+ Teacher-motivated and Self-motivated
+ Learn in several ways and Peer-oriented learning
+ Adult-motivated and Self-motivated
+ Kinesthetic preference and Tactile preference
+ Teacher-motivated and Adult motivated
+ Teacher-motivated and Kinesthetic preference
+ Persistent and Self-motivated
+ Teacher-motivated and Persistent
+ Responsible and Self-motivated
+ Kinesthetic preference and Self-motivated

Only one significant correlation (with high effect of .50 or greater) was found among all TI scales. This correlation was:

- Melancholy and Phlegmatic

Furthermore, twenty-two statistically significant and meaningful zero-order correlations existed between the four temperament types and the learning-style variables (see figure 3). These correlations were all positive. Most of these relationships were also supported by the findings from the "best" subset algorithm regression and the canonical-correlation analyses. The phlegmatic temperament is correlated with students' preference to learn in several ways and teacher motivation. Sanguine
temperament is related to auditory, tactile, and kinesthetic preferences, require intake, preference to learn in the morning, mobility, adult-motivation, and teacher-motivation. Choleric temperament is correlated to visual, tactile, and kinesthetic preferences, mobility, adult-motivation, and teacher-motivation. Melancholic temperament is related to tactile and kinesthetic preferences, students' preference to learn in the morning, mobility, adult-motivation, and teacher-motivation.

"Best" subset algorithm

"Best" subset algorithm analysis was used as a model-building procedure to select LSI variables which best describe each TI scale. Four model-building statements were formulated. These were:

1. There is a significant linear combination of LSI variables which meaningfully characterizes melancholies.

2. There is a significant linear combination of LSI variables which meaningfully characterizes choleric s.

3. There is a significant linear combination of LSI variables which meaningfully characterizes phlegmatics.

4. There is a significant linear combination of LSI variables which meaningfully characterizes sanguines.

The models that were developed were all descriptive models. Each TI variable is therefore characterized by a linear combination of LSI variables, as shown in figure 4. The variables are rank-ordered from the highest to lowest,
based upon their obtained standardized coefficient values. A plus (+) or minus (-) indicates a positive or negative weight for the variable.

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<thead>
<tr>
<th>MELANCHOLY</th>
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<tr>
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<tr>
<td>- Sound</td>
<td>+ Self-motivated</td>
</tr>
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<td>+ Visual Preference</td>
<td>+ Afternoon</td>
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<td>- Afternoon</td>
<td>+ Light</td>
</tr>
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<td>+ Temperature</td>
<td>+ Auditory Preference</td>
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<tr>
<td>+ Sound</td>
<td>- Learn in Several Ways</td>
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<tr>
<td>- Light</td>
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</table>

**Fig. 4.** "Best" subset model selection: Temperament Inventory dependent variable for the total group of respondents.

**Discriminant analysis**

Discriminant analysis presented significant results for three of the four hypotheses tested by this procedure.

**Hypothesis 1**

There is a linear combination of the learning style variables which significantly discriminates between male and females.
A comparison of both groups indicated that females are more kinesthetic, require more intake, function best in the morning, and are less tactile, prefer to learn alone, and are less adult-motivated.
Hypothesis 2

There is no linear combination of the temperament variables which significantly discriminates between males and females.

This hypothesis was retained. Therefore, the discriminant functions were not interpreted.

Hypothesis 3

There is a linear combination of the learning style variables which significantly discriminates between Bahamian and Jamaican students.

A comparison of both groups indicated that Bahamian students as compared to Jamaican students function better in late morning, and prefer to use auditory sense when engaged in learning. They are also persistent, do not function best in the early morning and evening, need low sound or silence, low light intensity, and a cool physical environment.

Hypothesis 4

There is a linear combination of the temperament variables which significantly discriminates between Bahamian and Jamaican students. A comparison of the groups indicated that Bahamian students tend to be more choleric, less phlegmatic and sanguine.
Canonical Correlation

Canonical correlation analysis was used to test hypothesis 5 and was found to be statistically significant.

Hypothesis 5
There is a significant relationship between the temperament and learning-style of senior high-school students in the Bahamas and Jamaica.
The analysis revealed that a significant canonical correlation function exists between the four Temperament Inventory scales and the twenty-four Learning Style Inventory scales. The significant canonical function indicated that students who are high on choleric and low on melancholy tend to be more responsible and self-motivated, while they are less inclined toward visual preference, formal design, mobility, adult-motivation, and kinesthetic preference.

Discussion of the Findings
The statistical tests used in this study produced a number of significant findings for improving students' learning experiences. Table 7 and figure 3 (see chapter 4) present two listings of LSI and TI variables which have significantly meaningful intercorrelations.
Both male and female students that are teacher-motivated tend to be self-motivated, adult-motivated, persistent, and show kinesthetic preference when they are engaged in learning. It is also indicated that self-
motivated students tend to be teacher-motivated, adult-motivated, persistent, responsible and show kinesthetic preference. Furthermore students that show tactual preference tend to show kinesthetic preference. These findings are consistent with Dunns' (1981, pp. 19-24) findings. In addition to the findings stated above, learning in several ways is positively related to peer-oriented learning in males alone. This seems to suggest that males prefer to learn with their peers and when they do so the methods of instruction should be multi-sensory and varied. One pair of TI variables has a significantly high relationship. Melancholy is negative correlated to phlegmatic, which seems to suggest that students who are melancholic are less phlegmatic and vice-versa. This finding is consistent with Jordan's (1983) findings.

A key element to the purpose of the study is the relationships which exist between the LSI and the TI variables. Figure 3 indicates these relationships. It has been indicated that senior high-school students with phlegmatic temperament type prefer a multi-sensory approach to learning. They should be provided with opportunities for a variety of learning patterns, (i.e., alone, with peers, with adults, tactual, visual, and auditory experiences, etc.). They also respond well to teacher-motivation. This may have significant implications for the use of positive reinforcement, such as praise, rewards and incentives, and other complimentary motivational
mechanisms. This is also true for the sanguine, choleric, and melancholic temperament-type students. In addition, the sanguines, cholerics, and melancholies indicated their preference for tactual, kinesthetic, and mobility experiences when engaged in a learning exercise. This suggests that they should be provided with opportunities for real and active experiences in which they become physically involved, such as experimentation, site visits, designing and building projects, role-playing, demonstrations, composing (i.e., drawing or mapping, and written forms), etc.

It is also essential to note that these three temperament-type students expressed the desire for adult-motivation. This may have significant implications for more parent and the adult community involvement in the learning process of students. That is, more interest in and attention to the child's learning activities (e.g., homework assignments) on the part of the parents, and a more direct involvement of the professional and non-professional adult community in schooling. Sanguines also indicate the need for food intake while engaging in a learning activity, as well as their preference to learn in the morning, and with more emphasis on auditory activities. Specific to choleric is their desire for visual activities, such as pictures, films, graphs, diagrams, dramatizations, etc.
The above discussion indicates one main fact. The child (student) must no longer be viewed as a passive learner; rather he/she is an active participating, interacting, and reacting agent in the learning process. Hence the teacher's role in the process ought to be defined as a diagnostian, prescriber, facilitator, and evaluator of the student's learning experiences.

A second finding is that for the four temperament types there are four characteristic linear combinations of LSI variables which significantly describe each expressed temperament. "Best" subset model building with each TI as the dependent variable yielded variable selections consistent with theory. Students who are identified as melancholies indicated preferences for low sound (i.e., soft music) or silence; visual aids (i.e., teaching methodologies which utilize more visual perception); kinesthetic learning experiences (i.e., learning experiences in which they are physically involved); and are less responsible (i.e., not irresponsible, but prefer more attention and guidance in performing a given learning task). Choleric's on the other hand indicated high self-motivation (i.e., they prefer less teacher direction and supervision—note that this does not mean no supervision); they tend to be more responsible and feel themselves accountable for their own learning outcomes. According to Loeb (1975) and Bradley and Teeter (1977) this type of disposition is referred to as an "internal locus of
They prefer learning in the afternoon; less visual (i.e., need multisensory resources); have less need for mobility and tend to be motivated by adults.

Students who are identified as being phlegmatic indicated preferences for an open learning environment, conversational areas, warmth, low light intensity, and learning in the afternoon. These characteristics appear to be consistent with a description of phlegmatics by Cruise and Blitchington (1979). Sanguines, unlike phlegmatics, indicated preferences for bright light and peer and/or group activities. They are more auditory, that is, they like to hear things or express things orally.

The third finding indicates how males and females and Bahamian and Jamaican students are differentiated on the significant TI and LSI variables. Females when compared to males show no significant difference on the TI variables. However, on the LSI variables females indicate more kinesthetic preference, require intake (i.e., need food, e.g., chewing gum, a drink, etc.). This could be due to higher metabolic rates in females during their middle-adolescence years or as a measure to deal with stress and tension. They indicated that they do not function best in the early morning, are less tactile, prefer to learn alone, and are not so greatly motivated by adults. The findings suggest that learning experiences for males and females should be geared toward catering for these sexual
differences in order to make learning more pleasurable and productive.

The fourth finding indicates that students with high choleric scores and low melancholic scores tend to be more responsible and self-motivated, and are less inclined towards visual preference, formal design, mobility, adult-motivation, and kinesthetic preference. This means that students that have a choleric temperament tend to display more responsibility and are self-motivated when engaged in a given learning task. Such students should be given self-directed tasks (e.g., contract program) which require that the student aid in the design of the objectives and evaluative procedure for the task, and permit self-pacing and rapid achievement.

Conclusions

From the foregoing findings the following conclusions are drawn:

1. The findings of this study confirm the fact that students can identify their preferred style of learning (Dunn & Dunn, 1978).

2. It is clearly apparent that students' learning-style is a function of their characteristic temperament type. This temperament influences their dispositions toward immediate environmental factors (sound, light, temperature, and design); emotional factors (motivation, persistence, responsibility and structure); sociological
factors (self, peers, pair, team, adult, and varied); and physical factors (perceptual, food intake, time, and mobility).

3. Sex differentiation seems to be a vital variable to be considered when applying learning-styles to individualized and group instructions.

4. It can be concluded that the demographic differences between the Bahamas and Jamaica has contributed to the differences in learning-styles and temperaments of students in these two West Indian islands.

Implications

Certain implications have emerged from the findings of this study. The first implication is that, because the study of learning-style and temperament is so complex and because temperaments operate in combination (Cruise & Blitchington, 1980), one learning-style variable should not be singled out as the chief descriptor of a particular temperament type.

The second implication is that, because learning style and temperament are so related, more attention should be given to program placement and career guidance based upon students' temperament and learning-style. It seems evident that students who are placed in an academic program compatible with their learning-style and temperament should perform better than if they were randomly placed.

The third implication is that, since males and females are differentiated on learning-style variables,
learning-style and teaching style should be matched—based upon sex differences.

**Recommendations**

As the research for this study progressed, other questions were raised which were not part of the present study. Therefore the following recommendations are made:

1. As a result of the findings of this study, it is recommended that more attention be given to the use of guidance counselors in schools to foster and provide an educated diagnosis of students' learning-style and temperament for the purpose of matching learning-style with (a) teaching methodologies; (b) program placements; and (c) career guidance.

2. It would be beneficial, if in the preparation of secondary teachers, they were trained to identify learning style elements in students and how to gear teaching instructions to match such style.

3. It would be well to conduct a similar study with other instruments which would measure the learning-style and temperament of high-school students. A similar group of students could be used in order to determine if the same type of results would be obtained. A valuable contribution could be made by extending the study to include a larger population of West Indian students (i.e., including other islands).
4. It would be enlightening to extend the study to relate students' learning-style, temperament, and academic performance on the General Certificate of Education (GCE) examination and/or Caribbean Examination Council (CXC).

5. It is recommended that the study be replicated using GCE and/or CXC and non-GCE/CXC students, including the variables learning-style, temperament, academic achievement, socio-economic status, sex, age, and demographics, over a larger West Indian population.
APPENDIX A

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SOURCE: Calculated from Ministry of Education's documents.
### CXC Examination: Percentage of Candidates Obtaining Grades I and II, 1979-1981

(Number of candidates writing examination in parentheses)

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Source: Calculated from Ministry of Education's documents.
STRUCTURE OF THE EDUCATION SYSTEM 1982

Primary School

Grade 1-6

Secondary School

Grade 7-11

Tertiary School

Grade 12-13

Primary School Leavers

High Schools

Common Entrance Exam.

Comprehensive

Technical

ALL AGE

NEW SECONDARY

Industrial Training Centres

Labour Market

GCE O'Level

CXC

Labour Market

GCE O'Level

AEB, CGLI, RSA, UCL

GCE A'Level

CAST, CTC

TTC, JCA

Community Colleges

Private Institutions

University

CAST : College of Science and Technology

CTC : Cultural Training Centre

TTC : Teacher Training Colleges

JCA : Jamaica College of Agriculture

UWI : University of the West Indies

Explanations:

At the school's initiative; not planned by MOE

Admission at the discretion of Principal

GNAT : Grade-Nine Achievement Test

CXC : Caribbean Examination Council Examination

SSC : Secondary School Certificate

AEB : Associated Examination Board

GGLI : City & Guilds of London Instil.

RSA : Royal Society of Arts

UCL : Union of Lancashire & Cheshire Institutes

Notes:

- Age 6-11
- 12 13 14 15 16
- 17 18
STRUCTURE OF THE EDUCATION SYSTEM 1983
BAHAMAS

Primary
Grade 1-6

Secondary
7 8 9 10 11 12

Tertiary
13 14

High School

Junior High School

Primary School Leavers

BJC

GCE O'LEVEL

CDB or UWI
or other Universities

Age 6-11 12 13 14 15 16 17 18

Explanations:
BJC : Bahamas Junior Certificate
GCE : General Certificate of Education
CDB : College of the Bahamas
UWI : University of the West Indies
APPENDIX C

COMPARATIVE ILLUSTRATION OF LEARNING-STYLE PARADIGMS
## APPENDIX C

### COMPARISON OF LEARNING STYLE INSTRUMENTS

<table>
<thead>
<tr>
<th>Researchers and Their Definitions of Learning Style</th>
<th>Instruments</th>
<th>Applications/Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranfield and Lafferty</td>
<td>Learning Style Inventory: a self-report instrument based on a rank ordering of choices for each of 30 questions. For use with junior high through adult levels. Approximate administration time: 15 minutes.</td>
<td>Major use to develop instructional materials for whole class or individual students. LSI is viewed as a tool to aid in understanding students' difficulties in completing academic units and for counseling. Emphasis on attitudinal and affective dimensions in the Inventory strengthens such application.</td>
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<tr>
<td>Dunn, Dunn, and Price</td>
<td>Learning Style Inventory (LSI): a self-report instrument based on a rank ordering of choices for each of 104 items. For use with grades 3-12. Approximate administration time: 15 minutes.</td>
<td>The LSI and the PEPS are designed to diagnose individual learning characteristics. Accompanying manuals suggest prescriptions to complement selected styles to facilitate academic achievement.</td>
</tr>
</tbody>
</table>

**Individual learning style is derived from:**
- (a) academic conditions (relations with instructor and peers);
- (b) structural conditions (organization and detail);
- (c) achievement conditions (goal setting, competition);
- (d) content (numbers, words, etc.);
- (e) mode of preferred learning (listening, reading, iconic and direct experience); and
- (f) expectation of performance level (superior through satisfactory).

**Learners are affected by their:**
- (a) environmental (sound, light, temperature, and the need for either a formal or informal design);
- (b) emotional (motivation, persistence, responsibility, and the need for either a structured or unstructured);
- (c) sociocultural (self, peer, teacher, etc. varied); and
- (d) physical (precepted strengths).
### Researchers and Their Definitions of Learning Style

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Applications/Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Assessment of Student Learning Styles: Observations based on student reactions to systematic teacher-introduced changes in structure.</td>
<td>Matching educational approaches to student learning style facilitates academic achievement. Conceptual level, in terms of learning style, is a developmental phenomenon which ranges from the &quot;unsocialized&quot; to the &quot;independent.&quot; Knowledge of learning style can influence and enhance the development of conceptual level.</td>
</tr>
<tr>
<td>Paragraph Completion Method (PCM): a semi-projective method which assesses conceptual level. Students write responses to a posed topic. For use with grade 6-adult levels. Approximate administration time: 20 minutes.</td>
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</tr>
<tr>
<td>Learning Style Inventory: a self-report instrument based on a rank ordering of 4 possible words in each of 9 different sets. Each word represents 1 of the 4 learning modes: feeling (CE); watching (KO); thinking (AC); doing (AE). For use with young adults. Approximate administration time: 5-10 minutes.</td>
<td>Emphasis is placed on individual awareness of personal learning style and available alternative modes. Knowledge of learning style differences should encourage the design of instructional experiences to enhance individual strengths and develop non-dominant orientation.</td>
</tr>
</tbody>
</table>

---

**David E. Hunt**

Learning Style describes students in terms of those educational conditions under which they are most likely to learn and essentially describes the amount of structure individuals require.

---

**David Kolb**

Learning style is a result of hereditary equipment, past experience, and the demands of the present environment combining to produce individual orientations that give differential emphasis to the four basic learning modes postulated in experiential learning theory: Concrete Experience (CE); Reflective Observation (RO); Abstract Conceptualization (AC); and Active Experimentation (AE).
Researchers and Their Definitions of Learning Style

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<th>Instruments</th>
<th>Applications/Implications</th>
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<td>Transaction Ability Inventory: a self-report instrument based on rank ordering of four words to each of 10 sets. Observation and interviews suggested to aid in categorizing learning preference patterns or modes. For use with upper junior high-adult levels. Approximate administration time: 5 minutes.</td>
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<td>Strong emphasis is placed on the matching of instructional materials and methods to meet the range of individual preferences. Gregorc also recommends that selected nonpreferences be utilized at times to encourage students to strengthen those areas.</td>
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### Cognitive Style

Cognitive style is the unique way in which an individual searches for meaning. It is reflected in the way; (a) qualitative and theoretical symbols are handled; (b) cultural influence affects the learning process; (c) meaning is derived from symbols that are perceived.

### Cognitive Style Interest Inventory:
A self-report instrument based on a rank ordering which measures abstractions, visual, tactile, and auditory perceptions, rate coordination, and social interaction. For use with elementary, junior high, and high school levels. Approximate administration time: 30 minutes.

### Cognitive Style Mapping
Identifies student strengths and weaknesses through major, minor, and negligible categories. It serves as a basis for developing a personalized educational program (PEP) which utilizes varied instructional aids to match students and the educational task.
Researchers and Their Definitions of Learning Style

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<th>Researchers and Instrument</th>
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<td>Ramirez and Castaneda</td>
<td>Identification of cognitive style is used both to match and mismatch learning and teaching styles. The goal is to encourage personal &quot;bicognitive ability&quot; that reduces favoring one style over another continually.</td>
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<td>Cognitive Style Differences (field independent/field sensitive) and cultural differences create individual learning styles. Because learning style is not permanently fixed, it is possible to intervene and affect it.</td>
<td>Students should be encouraged to develop a learning style which is thoughtful, deep, and elaborative. Through the use of specific instructional strategies, teachers should discourage shallow repetitive information processing.</td>
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Ronald R. Schimeck

Learning style is the product of the organization of a group of information processing activities that individuals prefer to engage in when confronted with a learning task. These activities range from (a) deep and elaborate to (b) shallow, repetitive and reiterative.

**Inventory of Learning Processes:** A 62-item, true-false, self-report inventory grouped via factor analysis into synthesis-analysis, study methods, fact retention, and elaborative processing. Approximate administration time: 20 minutes.

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PLEASE NOTE:

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

These consist of pages:

Appendix D, (Learning Style Inventory)
(Temperament Inventory)
Dear Sir/Madam:

This letter is to inform you of a study that I am presently undertaking which will be investigating the relationship between Temperaments and Learning styles of West Indian Senior High School students. The study will also focus on the implications that these two variables have for learning, instructional strategies, scholastic performance and career guidance. I will also be considering the effect of sex difference and the demographic effect of other variables. My experimental hypothesis is that there is a significant relationship between the dependent variable, learning styles and the independent variable, temperament.

It is significant to note that in my review of the literature on the West Indies, I have not found any listing of work done with respect to Learning style and/or Temperament within the West Indies. This study therefore will not only add to the literature of West Indian Education but will serve the following essential purposes:

1. Provide insights for teachers and educators at all levels in educational planning (i.e. curriculum, physical, facility, etc).

2. Provide a guide for teachers in planning and implementing individualized and group instructional strategies so as to maximize desired learning outcomes.

3. Provide an understanding of some of the significant personal factors influencing learning disabilities and disciplinary problems that teachers encounter, especially at the elementary and secondary levels and how these may be detected early and corrected.

4. Provide more practical evidence for the need and role of school counselors. Also to provide a guide whereby counselors and teachers are able to apply a diagnostic and prescriptive approach to learning through the understanding of individual temperaments and learning styles.
The Permanent Secretary  

5. Provide essential information in guiding the preparation of secondary teachers.

I am therefore requesting your support by granting me permission to use one of your secondary schools (specifically Grades 11 and 12 students who will be writing the GCE this year) as samples in accomplishing the objectives of this study. I will only need an hour in each school to administer the instruments. A list of the schools selected is provided and a tentative date for administering the instruments.

It is my intention to make available to the Ministry of Education for each participating Island an abstract of this study. I am therefore planning to make a further investigation, with your permission, by way of a follow-up study at the doctoral level, as to the significance of the findings from this study with respect to the subjects performances on the GCE. With respect to this, however, I will keep you informed as to the specifics of that follow-up study.

It is worthy of note for me to mention that the Learning Styles Unit of St. John's University, New York, has expressed their interest in publishing this study. I am also in communication with other Professional and Scholarly Associations which may have interest in such a study. Any suggestions or comments from you that would enhance this study would be welcomed and greatly appreciated.

Finally, I am presently completing graduate studies at Andrews University, Michigan, in Educational and Psychological Research and Statistics, Methodology, and have been a science teacher for nine years, having taught in Nassau and Jamaica. I am excited about this study and hope that you will have much interest in its findings.

Please reply as early as possible to inform me of your decision.

Yours respectfully,

Owen A. Roberts

Enclosures: 1. Copy of proposal
            2. Copy of instruments to be administered
            3. List of selected schools
Attentio of Mrs. Phyllis Cargil, Testing and Evaluation Officer

Mr. Cecil Turner
Permanent Secretary
Ministry of Education
2 National Heroes Circle
Kingston 1

Dear Mr. Turner:

Compliments of the season and a prosperous 1982. This letter is to inform you of a study that I am presently undertaking which will be investigating the relationship between temperaments and learning styles of West Indian Senior High School students. The study will also focus on the investigation that these two variables have for learning, instructional strategies, scholastic performance and career guidance. I will also be considering the effect of sex difference and the demographical effect on both variables. A tentative experimental hypothesis is that there is a significant relationship between the dependent variable, learning styles and the independent variable temperament.

It is significant to note that in my review of the literature on West Indians of study, I have not found any listing of work done with respect to learning style and/or temperament within the West Indies. This study therefore will not only add to the literature on West Indian Education but will serve the following essential purposes:

1. Provide insights for teachers and educators at all levels of educational planning (i.e. curriculum, physical, facility, career etc.)

2. Provide a guide for teachers in planning and implementing individualized and group instructional strategies so as to maximize desired learning outcomes.

3. Provide an understanding of some of the significant personal factors influencing learning disabilities and discipline problems that teachers encounter, especially at the elementary and secondary levels and how these may be detected early and corrected.

4. Provide more practical evidence for the need and role of school counselors. Also to provide a guide whereby counselors ...
 Teachers are able to apply a diagnostic and prescriptive approach to learning through the understanding of individual temperaments and learning styles.

5. Provide essential information in guiding the preparation of secondary teachers.

I am therefore requesting your support by granting me permission to use a select number of your secondary schools (specifically Grades 11 and 12 students who will be writing the GCE this year) as samples in accomplishing the objectives of this study. I will only need an hour in each school to administer the instruments. A list of the schools selected is provided and a tentative date for administering the instruments.

It is my intention to make available to the Ministry of Education for each participating Island an abstract of this study. I am therefore planning to make a further investigation, with your permission, by way of a doctoral study at the doctoral level, as to the significance of the findings from this study with respect to the subject’s performances on the GCE. In addition to this, however, I will keep you informed as to the specifics of the follow-up study.

It is worthy of note for me to mention that the learning styles researcher at St. John’s University, New York, has expressed their interest in following this study. I am also in communication with other Professional and Scholarly Associations which may have interest in such a study. Any suggestions or comments from you that would enhance this study would be welcomed and greatly appreciated.

Finally, I am presently completing graduate studies at Michigan State University, Michigan, in Educational and Psychological Research and Statistics. Furthermore, and has been a science teacher for nine years, having taught in Kingston and Jamaica. I am excited about this study and hope that you will have keen interest in its findings.

Please reply as early as possible to inform me of your decision.

Yours respectfully,

Owen A. Roberts

Enclosures: 1. Copy of proposal
2. List of selected schools

PS. It is in my interest to note that I am indeed sorry that you have not received my correspondence dated October 14, 1983 and January 13, 1984. However, I would greatly appreciate any courtesy that can be granted to me with regards to a prompt attention to my requests.
Dear

Compliments for the season and a prosperous 1984. I am a Jamaican student presently completing a Master of Arts Degree in Educational and Psychological Research and Statistics at Andrews University.

My thesis study is focused on the relationship between the temperament and learning style of high school students with implications for academic performance, instructional methodology and career guidance.

The Ministry of Education of Jamaica is co-operating with me in the conduct of this study. Your school has been chosen by a stratified random sampling procedure as one of the high schools from which I need to collect data for the study.

I respectfully request that you allow me the privilege of visiting your school during the period March 12-22, 1984 in order to administer the thirty-minute research instruments to approximately 20 of your seniors who will be sitting the GCE or CXC Examination.

If this meets with your approval, could you kindly reply to me immediately your response to this request.

Thank you in advance.

Yours respectfully,

Owen A. Roberts

PS. This letter had been delayed due to my awaiting permission from the Ministry of Education. I am therefore apologising for any inconvenience this may cause. However, I would greatly appreciate any courtesy that can be extended to me in accomplishing my studies.
Mr. Owen A. Roberts
Andrews University
Garland Apts. D-6
Berrien Springs MI 49103
U.S.A.

Dear Mr. Roberts,

This acknowledges receipt of your letter dated January 6, 1983 in which you sought the Ministry's permission to use nine (9) Secondary Schools in Jamaica as samples for a study you are presently undertaking to investigate the relationship between Temperaments and Learning Styles of West Indian Senior High School students.

Your request was discussed with Mr. C. R. Smith, the Assistant Chief Education Officer with responsibility for Secondary Education, and there is no objection to your using the schools identified in your correspondence. However, a copy of the instruments to be used should be submitted to this Ministry before they are administered in the schools.

As requested, the schools will be advised of your visit during the period March 8-19 but it is assumed that when you are in the island you will advise each school of the specific date and time.

I share your view that the findings of your study should be of interest to educators and wish you every success in your work.

Yours truly,

Phyllis Cargill (Mrs.)
A.C.E.O. Evaluation & Counselling Unit
(for Permanent Secretary)

cc: Mr. C. R. Smith
A.C.E.O. Secondary Unit
The Principal,  
Government High School,  
NASSAU, Bahamas.

Dear Sir/Madam,

ADMINISTRATION OF QUESTIONNAIRES

Dr. John Carey of The Bahamas Conference of Seventh Day Adventists has approached this Ministry concerning the participation of students who are writing the G.C.E. in June 1984 in the above captioned.

This project is being carried out on behalf of Mr. Owen Roberts, a student of Andrews University for his Master's Thesis on the topic, An Investigation of the Relationship between Learning Styles and Temperament of Senior High School Students within the West Indies.

It is being requested that fifteen (15) students from your school respond to the Questionnaires which will take no more than one hour.

This Ministry has no objections to the proposal. Grateful if you would accommodate Dr. Carey in this matter.

By copy of this letter he is being asked to contact you further for dates and time.

Yours sincerely,

for/Permanent Secretary.

MWTD/mrs

copied to: Principals -  
R. M. Bailey  
C. C. Sweeting  
A. F. Adderley  
L. W. Young  
Dr. John Carey
March 5, 1964

Mr. Owen Roberts,
Andrews University,
Garland Apts. D-6,
Berrien Springs,
Michigan, 49103,
U.S.A.

Dear Mr. Roberts,

Although the Ministry of Education has not informed us about whether it is "co-operating" with you on the matter of your M.A. research, we should be glad to help you as far as possible.

Please be good enough, however, to send me advanced copies of your research instruments for our records.

Furthermore, it would be of interest to know the structure of your research including a statement of your hypothesis.

On arrival please get in touch with our Mr. Hector Stone (Guidance Office) and/or Mr. Sidney Fenton and Miss Smart Grade 11 Supervisors.

Best wishes.

Yours faithfully,

L. A. Wong
Principal
Mr. Gwen Roberts,
Andrews University
Garland Apts. D-6
Berrin Springs
Michigan, 49103
U.S.A.

Dear Mr. Roberts,

Further to your letter of request to conduct a research at the above mentioned school, I wish to inform you that you are granted permission to conduct same.

Best wishes.

Yours sincerely,

B. St. C. Burton
Principal.
Mr Owen A. Roberts,
Andrews University,
Garland Apts. D-6,
Berrien Springs,
Michigan, 49103,
U.S.A.

Dear Sir,

I have received your letter of February 20, 1984, today and have no objections to your questionnaire (if that is what you mean by research instruments) being answered by our students, provided I have seen such instruments before and approved of them.

We would also have to decide on a time most convenient for the School.

I await your reply to this letter,

Yours truly,

(Mrs Dassie R. Bond)
Acting Principal.
March 2, 1984

Mr. Owen Roberts
Andrews University
Garland Apts. D-6
Berrien Springs
Michigan

Dear Mr. Roberts

We received your letter today concerning visit to West Indies College High School campus.

We are happy to accommodate you for this venture and wish you success in this endeavour.

Sincerely yours

Linnie Barnes
PRINCIPAL
APPENDIX F

INTERCORRELATION MATRIX
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Pizzo, Jeanne. "An Investigation of the Relationship between Selected Acoustic Environments and Sound, and Element of Learning Style as They Affect Sixth Grade Students' Reading Achievement and Attitudes." Ed.D. dissertation, St. John's University, 1981.


