University of the Virgin Islands

Graduate Program

A Comparison of the Learning Styles of Freshmen Who are Required to Remain in the Developmental Courses at the University of the Virgin Islands versus Those Who Passed to Pursue Regular Academic Courses

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Abstract

When students recognize their learning style strengths then their opportunity to advance academically increases. The purpose of this study was to ascertain the learning styles of freshmen on the St. Thomas campus at UVI during the 2004-2005 academic year, and compare the learning styles of those who remain in the developmental courses (repeaters) with those who passed to pursue regular academic courses (passers). A Learning Style Inventory (LSI) was the primary data collection instrument. Additionally, professors of the developmental classes were interviewed. The LSI questionnaire was administered to students in both developmental and regular courses. When ranked by "importance," the area of Structure in the domain of Emotionality was favored most, followed by Afternoon as the preferred time of day; and Auditory as the dominant perceptual strength. The repeater's and passer's groups were compared and their learning style profiles tested by the Mann-Whitney U procedure. No significant difference existed between the two groups. Because students are more likely to succeed when taught in an instructional style compatible with their learning style strengths, teaching styles should be matched to learning styles. It was found that students do best when studying at their individual preferred time of day and auditory learners like to listen to lectures and discuss lesson topics. It is suggested that students should be encouraged to structure their own learning. It is recommended that instructors become familiar with learning style options and the methodology that they imply, and that each student discovers his or her own preferences so that he or she can apply appropriate strategies. Freshmen entering developmental courses should complete a learning style inventory so that profiles can be developed and students with compatible learning styles allocated to the same classes.

Acknowledgements

I am thankful to God for providing the necessary strength and support during the course of this study. Gratitude is extended to my beloved parents who demonstrated enormous interest, concern, and assistance in times of disillusionment and despair. There are a number of outstanding individuals who have contributed greatly to the cumbersome task of conducting this research. Dr. Linda Thomas, former chairperson of the Division of Education gave guidance in selecting a topic. Dr. Suzy Green, my advisor, steered me in the right direction when it appeared that the research was becoming overwhelming. Special thanks is also extended to Dr. Edward Lind, my second reader, who provided encouragement to ensure that the topic was adequately covered. Dr. Sandra Harrigan encouraged the completion of this study and during times of abandonment Dr. Doris Batiste provided help in reviewing my manuscript. Professor Wymer played a major role in building my confidence and empowering me to reach my goal, especially when it felt as though the task of completing this study was insurmountable. Dr. Robert Nicholls ensured that an initial focus was maintained throughout the course of this research; for this, I am grateful. Finally, there are a numerous other remarkable individuals that deserve recognition for their dedicated and tireless work, these include Eloise Benjamin, Professor Pinkett, UVI Library staff, and the faculty and staff at the Day Adult Program.

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Chapter 1

Introduction

The subject of learning styles is a prevalent issue among educators. Once students recognize their learning style, their opportunity to advance academically can increase greatly. Many scholars have placed emphasis on learning styles with an effort to make a difference in the lives of students whether they are at a high or low level of academic achievement. With such a thought in mind, this study will attempt to compare the learning styles of university freshmen who are required to remain in developmental courses versus those who passed to pursue regular academic courses in the second semester.

According to Griggs (1991) a definition of learning styles was adopted by a national task force that consisted of influential theorists in the field. The National Association of Secondary School Principals eventually sponsored and defined learning styles as "the composite of characteristic, cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with and responds to the learning environment" (1979, p. 2).

A study by Vincent and Ross (2001), further defines learning styles as a transformation in learners' behavior as a result of experiences amassed in the past. Mental ideologies, therefore, are then formed that direct the manner in which individuals learn. In concurring with this statement, a study by Campeau (1997) showed the importance of the adaptability of one's style of learning in order to deal with circumstantial encounters in life. Even though this is the case, a single style is often preferred by many learners.

Campeau also indicated that students have various learning styles which encompass their abilities and interests when processing information. For instance, some students' preferences involve focusing on facts, data, and algorithms. Others may delight in working with hypotheses and mathematical models. Another set of students are more responsive to

visual information such as pictures and diagrams. Students who are interested in verbal information often engage in written and spoken expressions. Some students may prefer to learn "actively, interactively, introspectively and individually" (Felder, 1996, p. 1).

Felder indicated that students have a tendency to concentrate on information which can be perceived in different ways. If students therefore, are not accommodated according to their preferred style of learning, their learning abilities may be impeded. Felder claimed that when students' learning styles are in accordance with the teaching styles of the instructor, the students can retain information for an extensive period of time. Felder maintained that when there is a match between learning and teaching style, students maintain a more positive attitude regarding a subject after the completion of a course than their counterparts who encounter learning style mismatches.

According to Lemire and Gray (2003), there has been recent progress in both personality traits and instructional learning styles. Such findings demonstrate the importance of interactions that may occur between learning styles and instructional methods. Based on this premise, it is therefore imperative for instructional methods to correspond with students' styles of learning. An approach of this nature is appropriate in assisting students to perform on a more progressive academic level.

If students learn according to their own individual learning styles, their ability to perform may improve. Students who often experience difficulties in learning may resort to thinking that they lack intelligence, whereas this may not be the case. "Students' lack of academic success might be a direct result of having a learning style of which they are unaware." If, therefore students are able to identify their individual styles of learning, they would to able to adapt to instructions similar to their own. This, as a result might become a contributing factor that improves students academic performance instead of hindering them (Conner, 2004).

A study conducted by Kang (1999) demonstrated that he concedes with Connor. Kang mentioned that instructors should assist students in recognizing their individual learning styles. Once students are aware of their learning styles, they should be able to demonstrate a degree of acceptance toward their preferences in learning. This would then enable them to become more confident in constructing their own styles of learning.

From a national perspective, Amrein and Berliner (2002) indicated that a report was released by the National Commission on Education in 1983 entitled *A Nation at Risk.* It showed that the American educational standards of achievement was lowered and thereby was in critical condition and needed immediate repair. This issue, however, surrounding education did not stop after attention was drawn to this documentation. Nineteen years later, President George W. Bush signed into effect a legislative policy. No Child Left Behind advocated that all children, regardless of their race, creed or status are required to obtain quality education and should not be neglected (Marshak, 2003).

In addressing the report of *A Nation at Risk* and how our nations' leaders are responding to this situation, Griggs (1991) seems to believe that they are handling the matter rather well. She claims that they are beginning to acknowledge and comprehend that the manner in which individuals learn is the key to educational progress. Griggs further elaborated on the main point that "educational establishment in the United States is comparatively behind that of selected Western European and Asian nations in teaching youth the knowledge base and skills necessary to compete in a highly technical era. The challenge, therefore for our schools today is to assess the learning style characteristics of each individual student and to provide teaching interventions that are compatible with those characteristics" (p. 1).

On a local level, the Caribbean also plays an important role in concentrating on information based on learning styles of students. For instance, a study done by Milburn

(2000) focused on the cultural learning styles of Puerto Ricans in the U.S. This study showed that the structure of some classrooms, consisting of rigid time rules for subjects, may not be the most favorable learning atmosphere for Puerto Ricans.

Another study which was conducted by Skelton (2004) in St. Thomas, Virgin Islands, showed the results of high and low achievers at a local high school. Skelton's findings showed differences in the learning styles of high and low achievers in regards to self motivation, persistence, and responsibility. These studies are among the few that exist in the Caribbean on the subject of learning styles.

Statement of the Problem

As many as half the students taking the math developmental courses fail these courses. This leaves them the option of either repeating the courses until they pass or drop out. Given the enrollment situation at UVI, this is not good news. It is generally true that Freshmen instructors at UVI do not place enough emphasis on students' learning styles, and neither identify their students' learning styles nor factor them into the teaching methodology. There is a need for this situation to be addressed. In particular, the learning styles used by successful students need to be identified and contrasted to the styles of the learning styles of their less successful peers.

The Director of Admissions and New Student Services at UVI indicated that there are several classes that are offered in the curriculum guide, that is referred to as Overview of the Freshman Year at the University of the Virgin Islands. Some of these classes encompass studies in the science area which are designed to assist students in making links to other courses of study (C. Cook, personal interview, May 14, 2004). Even though students are not administered a learning style inventory, a specialist at the Freshman Developmental Seminar (FDS) mentioned that different learning styles are being integrated into the tutorials that assist students in studying (V. Bailey, personal interview, December 15, 2005).

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A considerable number of students who enter UVI at the freshmen level have to take developmental courses. A UVI Math coordinator maintains, these courses are designed to help students strengthen their preparation for learning at the college level. She estimated that approximately 25% of entering freshmen go into regular academic courses, whereas, 75% of entering freshmen have to take developmental courses (R. Dance, personal interview, April 18, 2005). UVI professor Rosalie Dance worked with Georgetown professor James Sandefur to develop materials to form the core of a mathematics course for adult learners at the level of elementary algebra. In their paper titled , "Mathematics Investigation for Improving Mathematical Skill and Attitudes of Under-prepared College Freshmen" (2004), they note that many freshmen lack prerequisite number sense and conceptual understanding of arithmetic operations. This is exemplified by the apparent high failure rate of students in the math developmental courses.

Pass and fail rate percentages of students in the math developmental courses during Fall 2004 and Spring 2005, was obtained from UVI's Office of Institutional Research and Planning. In analyzing the results of the data, it was found that a relatively high proportion of students failed these courses. The trend for Fall 2004, demonstrated that 54.3% of students in math passed. The percentage of students who were non-passers (failed) was 45.3 percent. The percentage of students who withdrew was 0.4% and there were no incompletes. In Spring 2005, the percentage of passers in math was of 37.1 %, while 58.6 % of students were non-passers. Other results show that during the Spring Semester 2.7% students withdrew, while 0.5% received an incomplete. Combining these semesters' scores reveals that for the two semesters under consideration by this study, there was an average of 45.7% passers and 51.95% non passers. The fact that the proportion of non-passers exceeds that of passers by over 5%, does not reflect positively on the effectiveness of the courses, and

underlines the need to incorporate a consideration of learning styles into the teaching methodology.

Although recognizing that this is an unavoidable situation, it is important that students successfully complete the developmental courses so that they can progress into their academic program. From an economic perspective there is a cost to teach every student. Therefore, both students and the university can lose financially if students fail in developmental courses or remain in them for repeated semesters (R. Hall, personal interview, February 8, 2005). It is therefore imperative to use effective means of assisting students to advance academically, which may mean recognizing their learning skills and accommodating them from that perspective.

Purpose of the Study

The purpose of this study is to assess and compare the learning styles of freshmen who were required to remain in the developmental courses at the University of the Virgin Islands for two semesters versus those who passed to pursue regular academic courses in their second semester.

Research Questions

1. What are the learning styles of freshmen at the University of the Virgin Islands?
2. Is there a difference between the learning styles of freshmen students who remained in developmental courses and those who passed to pursue regular academic classes?

Null Hypothesis

In regard to Research Question #2, there is no difference between the learning styles of freshmen who did not remain in developmental courses and those who remained.

Definition of Terms

Learning Styles -The different way, time, place or condition or environment that is conducive to enable individual learners to absorb, process, retain, and recall information for personal use. This definition embraces the Dunn, Dunn & Price (1998) learning style model which consists of five major categories and 21 different factors which affect learning styles. The following are included in the five categories: environmental - the characteristics of this element include light, sound, temperature, and seating arrangement; emotionality - the element of this nature involves organized planning, persistence, motivation, and responsibility; sociological - from a social perspective, this element involves: pairs, adults, self, group, and varied; physical - this element focuses on practical activities which involve perceptual strengths, mobility, intake, and time of day; psychological - the characteristics of this element includes global/analytic, impulsive/reflective, and right - or left-brain dominance (1998).

Developmental skill classes - these are remedial courses that are designed to assist students in developing their respective writing, reading and math abilities. These classes are English –WAC- 011 (Writing Across the Curriculum) and English - RCA-021 (Reading in the Content Area). The Math classes include MAT- 023 and MAT- 024, which are referred to as Introduction to Algebra Concept Skills (University of the Virgin Islands 2004-2005 Catalog, p. 66). The developmental Math courses cannot be used for degree requirements while the English courses allow one credit as stated in the University of the Virgin Islands 2004-2005 Catalog (Appendix A).

Delimitations/Limitations

There were several delimitations to this research study. Only the freshmen at the University of the Virgin Islands in St. Thomas were included in this study. The developmental courses included in this study were Introduction to Algebra Concepts and

Skills, Parts 1 and Part 2. The period of time this research was conducted was during the Fall semester of 2004 and the Spring semester of 2005.

There were several limitations in the findings of this study: first, students who have passed skills since the year of 2004 might not have had the opportunity to take the learning style survey because they may be scattered throughout other classes, thereby making it difficult to track them; second, students might not have completed all the items on the questionnaire because they might not have been interested in the subject of learning styles; third, instructors might not have given permission to use their classes in order to administer the Learning Style Inventory because they might not have had sufficient class time; fourth, students might have had difficulties understanding the instructions on the administrative inventory form and left an answer blank.

Significance of the Study

Hopefully, in the future, students will read this study and become cognizant of the importance of knowing their own learning styles and encourage instructors, parents and counselors to assist in accommodating individual styles of learning. Once students are aware of their styles of learning, they can motivate themselves to learn in a manner that is conducive to processing information effectively. This, as a result can generate opportunities for students to achieve academic success. Perhaps instructors, moreover will learn to identify the various learning styles that students possess. Once this knowledge is acquired, instead of depending upon their preferred teaching styles to instruct students, they will implement other styles. This can make a difference in assisting students to learn more efficiently. This is especially relevant to the Caribbean, therefore more research on learning styles needs to be conducted in this area. The theoretical view in Chapter Two will further indicate the importance of learning styles and how they are developed from an early stage to adulthood.

Chapter 2

Review of Literature

The purpose of this study was to assess and compare the learning styles of freshman who are required to remain in the Developmental Courses at the University of the Virgin Islands, (UVI) during Fall 2004 to Spring 2005 versus those who passed to pursue regular academic courses. The areas covered in this section include theoretical views of psychologists, learning styles, and empirical studies.

Theoretical Views of Psychologists

One area of educational psychology focuses on the enhancement of effective instructional techniques. The assessment of learners' capability to perform in whatever style or strategy they may utilize is important. A look at freshman in college, therefore would be incomplete without mentioning theorists who express how theories affect learning styles (Peter, 1994). The educational philosophies that are included are from Piaget; Dewey; Bruner; Montessori; Gardner and Dunn, Dunn and Price.

To address learning styles that are visual, auditory and kinesthetic/tactile, Piaget, in his stages of intellectual development, showed that students from kindergarten to third grade learn best presented with information in a kinesthetic manner. Visual information, on the other hand, is presented to children when they attend 4th to 8th grade. By the time children reach the ninth grade level to college and finally enter into the business world, information is being presented in an auditory manner through lectures (Atkinson, et. al, 1983). Piaget's research showed that all children move through stages, which involves different ways of learning, kinesthetic, visual, tactile and auditory, but these relate to all children and do not imply individual learning styles.

Atkinson went on to state that in the concrete stage (4th to 8th), children can visualize objects that possess various features such as size, weight and mass, and classify those objects

based on those features. The formal operational stage is parallel to the level of ninth grade to college and on into the business world of work. This stage is consistent with auditory learning, for during this stage lectures tend to be more prevalent in terms of teaching. Since the previous information incorporates the three basic learning styles from birth to old age, it is imperative that teachers give presentations that include all three main basic styles of learning. This permits learners to become cognizant of their learning styles which can contribute extensively to students becoming more involved in class activities.

To elaborate further on the theory of learning style, Dewey strongly emphasized the importance of students working in labs (Flanagan, 1994). The reason is simply because Dewey wanted them to provide their own individual experiences. Activities of this nature would allow students to be creative, explorative and engage in experimental activities that would enhance their learning abilities. Students, therefore, should be permitted to work in groups to enhance social interaction by planning and implementing their own activities while becoming mobile. In order to acquire knowledge, it is imperative to start by actually engaging in an activity which allows one to employ concepts to examine the experience.

Flanagan also expressed the thought that Dewey believed in granting students opportunities to develop learning abilities by engaging in assignments such as projects and problem solving activities. These are essential in developing individual thinking. During these class activities, teachers would pursue the role of a facilitator in which they would guide and direct students in their assigned activities. Dewey was advocating learning that involved bodily movements and hands-on or practical class assignments, which is parallel to kinesthetic learning.

In expanding on the concept of hands-on activities, Hendrickson (2000) also mentioned that it is important that students learn by actually doing something. This trend of thought has been greatly emphasized by many in the field of education since Dewey's time.

Dewey had become influential in convincing others that learning is more effective when one engages in practical activities. This type of learning associated with him is referred to as active learning, in which both application and creativity of activities become the responsibility of the learner. It is also instrumental in the incorporation of activities, such as games, problem solving issues, projects involving the achievement of group or cooperative goals (Hendrickson 2000).

Clark (2000) also concurs with Dewey on the concept of movements through body movements. Clark cited Kolb (1984) experiment for a learning style model, which states that "a high score in active experimentation indicates an active doing orientation to learning that relies heavily on experimentation." Students learn better when they interact with assignments including projects and homework that suggest action. These learners do not appreciate learning in an inactive atmosphere. Because of their outgoing personality, they prefer to solve problems through touching, playing and games. They also delight in engaging in assignments that are independently oriented where the opportunity is offered to choose from a selection of materials that interest them the most.

Bruner, an influential psychologist, has made a tremendous impact in education. Among some of his popular writings is *The Process of Education* which has greatly influenced many educators of today. Bruner believes that young learners are to construct their own learning through discovery. He claimed that engaging in mental activities allows learners to become equipped to use trial and error to resolve problems for themselves. Thereby, mistakes are essential in the learning process. It enables individuals to unlock their potential to interact with their environment and solve situations that they may encounter (Flores, 2001).

Bruner believes that if children are permitted to play with objects such as blocks, wood and scraps in their environment, it can improve their level of understanding. Once this

process is established, children can develop their skills in becoming active in solving problems effectively. Subsequently, those previous activities will become fundamental in the comprehension of subjects such as math and science. These subjects are important for they require a substantial amount of operational thinking (Matherne, 1999).

Montessori, a well renowned theorist, closely observed the learning styles of children. She discovered that as they interact with their surroundings, the construction of their own individualities become evident (Lewis, 2005). During her observation, she also began to realize even more that sensory learning styles plays a significant role in the daily activities of children. Montessori showed that children following their own curiosity, will automatically adopt a "learning style" that are most rewarding, i.e. provide feedback in terms of learning. By this method he or she is utilizing the learning style which suits them best (one assumes that this is true of any self-directed learning). To the extent that Dewey also encouraged self-directed learning/learning by discovery this is true of his theories also.

Montessori was of the opinion that the incorporation of sensory learning materials assists children in the construction of cognitive skills. This allows them to enhance their capabilities to categorize and organize their environment by employing their sensory abilities, such as smelling, tasting, touching, hearing and seeing. These senses are essential in the development of math, reading and language skills. Such fundamental skills can be applied through the means of practical activities that would allow children to engage in problem solving, manipulation of materials, and social interaction. All these activities surround the Montessori educational theory of learning styles that is extended to all ages in a natural community (Bough, 2003).

Gardner, similar to the educational theorists who were previously mentioned, has created a great impact on education and the manner in which we think. Gardner's books include *Frames of Mind* and *the Theory of Multiple Intelligences*. Gardner believes that his

theory of seven intelligences (linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal and intrapersonal) is essential in living a good life. He advised that educators should attend to all of the seven intelligences (Smith 2002). In essence, Gardner's seven multiple intelligences represent different ways of learning that are favored by certain individuals, and thus in fact, correspond to different learning styles. With his line of thinking, Gardner connected himself with other great thinkers such as Bruner whom Gardner worked with on the *Process of Education* and also *Man: A Course of Study*. Gardner also was intrigued by the works of Piaget and Levi-Strauss Smith (Smith 2002). Students' learning styles have been the focus of various educational psychologists. In addition to Gardner and Kolb, there are studies by Wyman, Felder-Silverman, Gregor, Honey and Mumford (Appendix B).

Learning Styles: Empirical Studies

Individuals learn in various ways. A learning style is an individual's characteristic method of responding to and processing learning events. How individuals learn best and process information is known as their learning style preference. Three decades ago, learning styles experimentation influenced numerous professionals, such as instructors and administrators. Today more of these individuals are engaging in activities that concentrate on learning styles. This is occurring because of the efficiency of teaching by identifying how individuals process, internalize and retain new data and skills (Dunn and Griggs, 2001).

Kolb (1981) developed an experiential learning model and explained that individuals emphasize some learning abilities over others. Kolb proposed four categories of learners: accommodators, divergers, convergers, and assimilators. Accomodators approach problems in a trial-and-error manner and will discard a theory if the facts do not fit; Divergers utilize imaginative abilities and acquire knowledge through intuition; Convergers acquire

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knowledge by thinking/analyzing and then applying the new ideas; Assimilators create theoretical models and reason inductively.

Kolb's Learning Style Inventory (LSI) was used in a study of learning styles of freshmen as a predictor of college academic adjustment. Results indicated a great diversity in learning styles. It was found that divergers and assimilators had more difficulty academically than the accommodators and convergers. However, a trend was revealed whereby more accommodators and divergers were on academic probation (Cook, 1997).

Using Kolb's LSI, Biberman and Buchanan (1986) examined learning style differences across business and other academic majors. They surveyed accounting, economic/finance, management, and marketing majors. The results revealed that the economic/finance majors scored differently from accounting students who scored similarly to science majors. It was also found that management and marketing majors scored in the same range as the humanities majors.

Other learning style inventories have been developed and are explored within empirical research. Farrell-Moskwa (1992) used a Learning Style Inventory developed by Brown and Cooper to examine the relationship between learning style and academic achievement among fifth grade students in a suburban middle school. The students learning styles were compared to their academic scores and it was found that there was a negligible relationship between learning styles and academic achievement. Schmeck, Ribich, and Ramanaiah (1977) developed an Inventory of Learning Processes (ILP) which is a self-report inventory for assessing individual differences in learning styles as they relate to academic achievement. Subscales in the ILP consist of Deep Processing which utilizes hierarchical and logical assessment of categories; Methodical Study which utilizes methods believed to lead to higher grades; Elaborative Processing which utilizes self involvement and personal experiences to decipher information; and Fact Retention which utilizes memorization.

Using Schmeck et al's., ILP, Clump (2003) examined differences in learning styles of college students attending similar universities in geographically distinct locations. It was found that students at a mid-western university (Southern Illinois University) scored higher statistically than the students at a western university (Boise State University) on both Deep Processing and Methodical Study, and that male students at both institutions scored higher statistically on the Deep Processing subscale and lower on the Methodical Study, subscale than female students. Clump concludes that the students at the mid-western university are more likely to succeed academically. but queries whether these differences might also be an "artifact of previous education or the result of their current education" beyond that of simply geography. Clump also considers whether the political environment and type of community may influence the students' learning styles.

While Kolb's and Schmeck's inventories primarily concentrate on cognitive processing, other models depict learning styles as multidimensional and encompassing non-cognitive factors. The National Association of Secondary School Principals (NASSP) encouraged research in this area and was instrumental in promoting the Dunn, Dunn and Price Learning Styles Model through publications and workshop activities (Dunn, Dunn and Price, 1979). Although modified over time, Dunn, Dunn and Price's model initially classified learning styles into five types of stimuli or domains which contain 21 elements. The original categories were: Environmental, Emotional, Sociological, Physical, and Psychological. The Learning Style Inventory (LSI) consists of 100 statements that elicit self-diagnostic responses. The data collected yield a profile of each individual's preferred learning style. Because Dunn, Dunn and Price's instrument's measuring capability to determine the learning styles of individuals was analyzed and declared reliable and valid, it became widely used by many researchers and institutions (Curry, 1987).

The Learning Style Inventory (LSI) developed by Dunn, Dunn and Price (1998), is a comprehensive approach to diagnosing the learning styles of individuals. It is also a device employed in analyzing the various conditions under which students prefer to learn. It is used to evaluate individual preferences in four domains: immediate environment (noise level, temperature, light and design); emotionality (motivation, persistence, responsibility and structure); sociological needs (learning alone/peer oriented, authority figures present, learn in several ways, parent figure motivation and teacher motivated); and physical needs (auditory, visual, tactile, kinesthetic, need mobility, requires intake, evening-morning, late morning and afternoon) (Appendix C).

Some studies have focused on achievement gains through learning styles matching. Spires (1983) conducted doctoral research on reading and mathematic scores using the Dunn, Dunn and Price LSI. The LSI was administered to students in grades three through six. The results indicated that instructing students through their individual learning styles resulted in significantly higher reading and mathematic scores on standardized achievement tests particularly in areas requiring higher cognitive abilities, such as reading concepts.

Other studies have involved cultural comparisons and minority studies. Using the Dunn, Dunn and Price LSI, a study by Jackson-Allen (1994) identified and compared the learning style preferences of low-achieving and high-achieving young African-American males. The perceptual preferences for the 22 learning modalities were obtained from a sample of 50 ninth- and tenth-grade students. Half were identified as low-achievers, and the other half as high-achievers. Comparisons of scores on each of the learning modalities yielded only three significant differences between low and high achievers. High-achievers had stronger preferences for motivation and were more parent motivated than low-achievers. Low-achievers, however, had stronger preferences for opportunities for mobility.

The purpose of a study by Jacobs (1987) was to determine whether a difference existed in the learning style of Afro-American high, average, and low achievers and to compare the learning styles of African-American and Euro-American high, average, and low achievers. The sample included 300 students from three middle schools in the south. The Dunn, Dunn and Price LSI, was administered to determine individual learning style characteristics. Analysis of the data revealed that there are differences in learning styles according to achievement level, sex, and race:

(1) African -American high achievers had strong preferences for teacher motivation; African-American average achievers had strong preferences for auditory learning; African-American low achievers had a strong preference for persistence.

(2) More European-American high achievers preferred auditory learning, while European-American average achievers were teacher motivated and European-American low achievers were less persistent.

(3) More European-Americans displayed a strong preference for bright lights while learning compared to African-Americans. African-Americans were more teacher motivated and European-Americans were less teacher motivated.

(4) More European-American high achievers had a strong preference for auditory learning, while African-American high achievers expressed a strong preference for teacher motivation.

(5) African-American average achievers exhibited a strong preference for structure, while European-American average achievers expressed less preference for structure.

(6) African-American low achievers were more persistent than European-American low achievers.

Dunn et al. (1993) examined the learning style characteristics of Mexican-American students (n=687) in grades four through six and compared results to those from 70,000 Anglo-American children. Mexican-American students preferred formal seating designs and were significantly more peer oriented than the Anglo Americans. Sex differences also were found. Ewing et al. (1992) examined whether significant group, gender, and grade differences existed in the preferred learning styles of gifted minority 6th-8th graders. Fifty four African-American, 61 Mexican-American, and 40 Chinese-American students completed Dunn, Dunn and Price's Learning Style Inventory. Significant gender differences were found in preferences for tactile and intake modality. All three ethnic groups were responsible and motivated. African-American subjects preferred a visual modality and studying in the afternoon. Mexican-Americans preferred a kinesthetic modality. Chinese-Americans reported the strongest preference for the visual modality of the three groups.

Apart from the study by Milburn (2000) in Puerto Rico and Skelton (2004) in St. Thomas, little research has been conducted on student learning styles in the Caribbean. Milburn's study addresses the impact of cultural factors on learning styles in the Eastern Caribbean. Milburn's study explored cultural variations of learning in Puerto Rico and proposed that one model for instruction does not suit all participants well, especially when those participants are from different cultural backgrounds. She focused on a sense of time labeled "Puerto Rican time" which is fluid and flexible. From this a cultural base for a group learning style is inferred. She argues that as a result the structure of some classroom situations, with strict time rules for particular subjects, may not be the most optimal learning environment for Puerto Ricans (Milburn 2000).

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Style Inventory. The results of the study indicated there were differences in the learning styles between the groups in self motivation, persistence, and responsibility whereby high achievers had a stronger preference in these areas. Clearly there is a need for more of these kinds of studies in the Caribbean.

Any study of student learning styles implies an ultimate goal of accommodating individual learning styles within instruction or matching teaching styles to learning styles. Other researchers who credit the Dunn, Dunn & Price Learning Style are Ellsworth and Ellsworth (1999). They cited Dunn, et al. (1993) by postulating that it is critical for counselors and educators to identify the various learning styles of students. These researchers also indicated that it is essential to experiment with learning style techniques that will strengthen the learning styles of individual students.

A study by Wallace (1995) assessed how closely students' learning style preferences matched those of their teachers. A total of 450 sixth- and seventh-graders completed the Learning Style Inventory, and 128 teachers completed a specific version of the Learning Style Inventory known as the Productivity Environmental Preference Survey. While the visual modality was the students' most preferred learning style, teachers' preferred the auditory modality. This may reflect traditional chalk-and-talk techniques.

The Renulli/Smith Learning Style Inventory (RSLSI) focuses on methodology rather than processing in terms of nine teaching methods: projects, simulations, drill and recitation, peer teaching, discussion, teaching games, independent study programmed instruction, and lecture. Ristow and Edeburn (1983) used the RSLSI, to assess the learning styles of sophomore and junior college students. The majority of students in the study showed a high preference for peer teaching, discussion, teaching games, programmed instruction, and lecture. Females tended to prefer teaching games and programmed instruction more than males. More average students preferred discussion than high-achieving students.

Theorists throughout the years have emphasized the impact learning styles have on students. They appeared to have captured a glimpse of what would positively or negatively affect students' learning styles. Because of their dedication in experimenting and researching pertinent information in learning, many have benefited. They have made a tremendous contribution that will continue to transform and impact the learning styles of students. Studies that were conducted by them have assisted others, especially teachers, to become knowledgeable of how to match the teaching styles of teachers to the learning styles of students.

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Chapter 3

Methodology

The purpose of this study was to assess and compare the learning styles of freshman students who are required to remain in the basic developmental skills classes at the University of the Virgin Islands, to those who passed the skills classes to pursue regular academic courses. The design of this causal-comparative study encompasses the following information: setting, population, participants, selection of participants, research plan, instrumentation, procedure, and data analysis.

Setting

The Virgin Islands are an American territory in the Caribbean consisting of three main islands: St. Thomas, St. John and St. Croix. The University of the Virgin Islands has campuses on both St. Thomas and St. Croix. Various ethnicities attend the University. The majority are of African-Caribbean descent. While some are from the Virgin Islands, others are from neighboring Eastern Caribbean islands, the mainland U. S. A., and elsewhere. Caucasians are the second group, but are far less numerically. The Hispanics are next but with only half the number of Caucasians. Finally, there are a handful of Asian/Pacific Islanders.

Population

The population of freshmen during the 2004-2005 academic year, was 360 on St. Thomas Campus and 377 on St. Croix Campus, making a total of 737.

Student Participants

The primary participants in this study were freshmen on the St. Thomas campus. For reasons of expediency and lack of time, the freshmen on St. Croix were not included. However, there were no reasons to suspect notably different outcomes as the admittance and

placement policies and procedures were the same for both campuses. All the participants were enrolled in freshmen courses during Fall 2004 and Spring 2005 Semesters.

Professor Participants

Seven professors of the developmental classes were secondary participants and were identified in order that they could be interviewed about learning styles of students. Two other UVI personnel, who are knowledgeable about students in the developmental courses were also identified and interviewed. These were a professor in Math and Science, and the Director of Enrollment Management.

Selection of Participants

During the course of this study, several actions were taken in order to obtain the most appropriate information. A clustered random sample of several classes was conducted to locate the bulk of students who remained in the developmental courses and those who passed in Fall 2004 to Spring of 2005. This sample was also chosen to categorize students into the groups as specified in Research Question One, i.e., those who remained in developmental courses and those who did not.

LSI Instrumentation

Learning Style Inventory: The primary instrument that was chosen to be employed for this study is referred to as The Learning Style Inventory (LSI) Appendix D). It was constructed by Dunn, Dunn and Price, (1998) and is designed to diagnose the learning styles of individuals. The Learning Style Inventory is a comprehensive approach to the diagnosis of an individual's learning style. The Learning Style Inventory was created to accomplish the following tasks: Permit students to identify how they prefer to learn and will also indicate the degree to which their responses are consistent; provide a computerized summary of each student's preferred learning style; provide a basis for teacher/student interaction in the way(s) that each student learns best; provide suggested strategies for instructional and

environmental alternatives to complement students' revealed learning styles; provide for appropriate student involvement in their unique learning prescriptions; and provide a computerized class summary so that teachers can group students with similar learning style elements.

The LSI survey consists of 100 questions and takes at least 20 minutes to complete. It assesses individual preferences in twenty-two areas under four domains: (a) immediate environment (sound, heat, light and design); (b) emotionality (motivation, responsibility, persistence and structure); (c) sociological needs (self oriented, peer oriented, adult oriented or combined ways); and (d) physical needs (perceptual preference(s), time of day, food intake and mobility). The following are sample items from the LSI instrument that appear in each domain. For example, in (a) immediate environment (sound, heat, light and design), two items are, "I study best when it is quiet," and "I concentrate best when I feel cool." In (b) emotionality (motivation, responsibility, persistence and structure), two items are, "I have to be reminded often to do something" and "I do better if I know my work is going to be checked." In (c) sociological needs (self oriented, peer oriented, adult oriented or combined ways), two items are, "I like to study by myself," and "The things I remember best are the things I read." In (d) physical needs (perceptual preference(s), time of day, food intake and mobility), two items are, "It's hard for me to sit in one place for a long time," and "I really like to mold things with my hands" (Appendix C). The computerized results of the LSI include individual's identification, group identification, and standard scores for each of the 22 areas. Standard scores of 60 or higher are considered as "important" area for the individual.

Interview Instrumentation

Another instrument used in the study was an interview guide which was created by this author to obtain structured responses to specific questions about learning styles of

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students. The aim was to collect information about learning styles and determine whether or not instructors take them into consideration within their methodology. Accordingly, six questions were prepared that asked of the seven professors during each interview: (1) What is the "traditional" method of teaching and testing? (2) To what degree (if any) are different learning styles taken into consideration for teaching and testing? (3) What are the instructors' typical teaching methods on a typical day? (4) What are the instructors testing methods? (5) Do the instructors try to assess learning style distinctions? (6) Do the instructors try to accommodate different learning styles in their teaching or testing? Within the interview process, opportunities were also provided for open-ended discussion. It was anticipated that the responses of the instructors would provide comprehensive information of how students learn. During the interviews hand-written notes were taken. When the interviews were completed, the notes of each interview were transcribed into an electronic format. The typed interviews were then sent to each individual instructor to verify the accuracy of the responses, and were modified accordingly.

Procedure

Price Systems Incorporated was contacted for permission to employ the Learning Style Inventory instrument (LSI) (Appendix E). A LSI pilot survey was administered to five individuals in the UVI campus library. This took approximately twenty minutes. Developmental courses and an academic course that follows the developmental courses (English 120) were identified. Before any questionnaire was distributed, rosters of students in developmental courses during the Fall 2004 and Spring 2005, and rosters of students enrolled in ENG 120 during Spring 2005 were accessed from the UVI website. This strategy was utilized to identify potential participants. The professors in the developmental classes were contacted for permission to allow the LSI survey to be conducted in their various classes. In some cases, the professors distributed the questionnaires, in other cases; this

researcher conducted the LSI survey. Instructions were read to the students before distribution (Appendix F).

The LSI questionnaire was administered to students in twelve classes, both developmental courses and regular courses. The developmental courses comprised of MAT 023, "Introduction to Algebra Concepts and Skills, Part I" and MAT 024, "Introduction to Algebra Concepts and Skills, Part II." The classes consisted of MAT 023, section A and section B; MAT 024 section A, section 1, section 2, section 3 and section 5. The LSI questionnaire was also administered to students in English 120 "English Composition," namely ENG120 section 2, section 3, section A section B and section C. Some students completed the questionnaire in class, while others went away with them. Informational flyers about questionnaire drop-off sites were posted in appropriate locations.

In order to obtain data to answer Research Question II, "Is there a difference between the learning styles of freshmen who remained in developmental courses and those passed to pursue regular academic classes," it was necessary to divide the participants who completed the LSI questionnaire into two groups; those that might be termed "repeaters" because they failed developmental courses and had to repeat them, and those that can be described as "passers" because they passed developmental courses and moved on to regular classes. Freshman who "did not remain in developmental courses" were termed "Passers" while "those who remained" were referred to as "Repeaters."

Grade records were obtained from the Office of Enrollment Management, but without names. However, it was possible to identify individuals by their majors and their position on the roster. This process was done anonymously. Additionally, a majority of students entered their names on the questionnaire, but in some cases individual students entered their major but not their names. As a result it was possible to identify them and determine their status as "Passers" or Repeaters." Students who did not enter their names or their majors created an

additional difficulty and their questionnaires could not be utilized. The names of questionnaire respondents were entered on a list and assigned ID numbers which were entered in the "special code" section on the questionnaire in order to ensure anonymity.

Data Analysis

Relative to Research Question One which undertakes to determine the learning styles of freshmen at the University of the Virgin Islands, an assessment of the learning styles of all the questionnaire respondents was processed as a single batch. For this the frequency, median, minimum and maximum standard scores were determined. In order to test the Hypothesis to answer Research Question Two, an assessment of participants by separate groups was made. The difference in learning style profile between the "Passers" and "Repeaters" was tested by the Mann-Whitney U procedure. The Mann-Whitney U test is a nonparametric statistical method used to test differences between the mean ranks of two sub populations. The Statistical Package for the Social Sciences (SPSS) was used to analyze the data.

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Chapter 4

Results

This study set out to assess compare the predominant learning styles of freshmen at the University of the Virgin Islands. It also compared the learning styles of those freshmen who had to repeat the developmental courses with those who successfully passed these courses to pursue regular academic courses. Data was gathered from both professors and students during Fall 2004 and Spring 2005. Seven professors were interviewed, while a total of 103 Learning Style Inventory surveys were completed by students for use within this research. Out of the 103 questionnaires that were collected, ten were discarded because they were incomplete. As a result, there were 93 usable questionnaires. The surveys were scored by Price Systems Incorporated. In order to examine the research questions, a diagnosis of participants by separate groups and also as a total group was made.

Research Question One

Research Question One asks, What are the learning styles of freshmen at the University of the Virgin Islands? An assessment of the learning styles of all of the 93 questionnaires reveals the following individual preferences among freshmen respondents. When ranked by "importance" (standard score ≥ 60), the area of Structure in the domain of Emotionality is favored most. This shows that more than half (53.72%) of freshmen favored more structure rather than less structure in terms of learning in a conventional ordered manner. Afternoon which is in the domain of Physical Needs, at 45.22%, placed second, which shows that a sizable minority of freshmen preferred the afternoon, so it is better for them to take classes at this time. Third, at 38.7% is Auditory in the domain of physical needs which showed that freshmen preferred to listen.

Research Question Two

Research Question Two asked whether there are differences between the learning styles of freshmen who did not remain in developmental courses (passers) and those who remained (repeaters). This requires an analysis of data regarding learning preferences between groups of "Passers" and "Repeaters." After collecting the questionnaires for the LSI survey individual learning style preferences were revealed and a nonparametric statistical method, the Mann-Whitney U test was used to test differences between the mean ranks of two sub populations. To test the null hypothesis, there is no difference in the learning styles of repeaters and passers, the original survey scores were rank ordered and the Mann-Whitney U test was used to compare the ranks of passers and repeaters within each of the twenty learning styles and whether there were significant differences in the learning style scores of the two groups (Appendix G).

The results yielded no significant difference between the two groups. The data has shown insufficient evidence to conclude that there is a significant difference in learning styles between passers and repeaters. This may be due in part because of the small number of repeaters.

Interviews with Instructors

Interviews were held with seven instructors who teach the developmental courses on the St. Thomas campus. The information was compiled as a collective set of interviews and each instructor's responses were grouped against each of the six questions (Appendix H). In response to question one, "What is the "traditional method" of teaching and testing?" some professors related the traditional methods they use. For example, as an instructor of reading, Professor A uses the chalkboard for teaching and uses test papers for quizzes and exams. Professor B, a math instructor, gives traditional lectures and administers written tests. Professor C uses traditional methods by allowing students to read.

In response to question two, "To what degree, if any, are different learning styles taken into consideration for teaching or testing?", Professor A says she does not take different learning styles into consideration in her reading classes, but suggests this occurs within the Freshman Development Seminar. Professor D takes different learning styles into consideration, for example, students are encouraged to use their imagination and visualize something before they write a descriptive report about it. This process corresponds to structure. Professor C, a reading instructor, also takes learning styles into consideration. A combination of visual, kinesthetic and tactile learning is used to increase retention and enhance student ability through association. Professor E emphasizes learning styles. For instance, students are guided to become more creative and this in turn encourages them to experience the styles of learning that they are most comfortable with. In this case, the professor structures the activity to elicit this result. For instance, students work on projects such as "The Life Expectancy of Male and Female" and "Sea Life: Conchs" in which mathematical concepts are utilized. These projects provide them with the opportunity to use graphing calculators. This hands-on experience utilizes a tactile learning style. Professor B takes different learning styles into consideration. She observes distinct learning styles through students' use of writing, reading and computer use, and concludes that some students are more auditory than visual. Professor F applies the learning styles suggested by Howard Gardner. For example, students enjoy the opportunity of creating Power Point presentations and applying what they have been taught by using the computer lab to research topics of interest on the Internet and use media to enhance their auditory skills.

In response to question three, "What are the instructors' typical teaching methods on a typical day?", the majority of the professors felt there were no typical teaching methods on a typical day. However, for Professor B, on a typical day student learning would be of an interactive nature. For example, students might assemble in groups and engage in hands on

activities while she serves as a facilitator. Students in Professor F's writing classes use the Internet for research and she suggests that such learning is visual in nature. The same is true of creating slide shows in Power Point. Professor F's students assist each other in groups as a means of developing social skills. The students find these activities fun and such activities motivate them to write.

In response to question four, "What are the instructors' typical testing methods?" the majority of the professors felt there were no typical testing methods. However, Professor G says that her students are motivated by the administration of the Nelson Denny Test which measures progress of a student's performance. Professor D places students in groups to analyze each others' writing assignments. Professor E's students are given a chance to develop their visual and auditory skills by using the Gateway Computer Lab software to complete quizzes and tests.

In response to question five, "Do the instructors try to assess learning style distinctions?," the majority of professors interviewed agree that there is no indication that the instructor try to assess learning style distinctions. Professor B says that the computer assignments that she uses, assists her in assessing students learning styles. Professor G says that it is impossible to assess the learning styles of every student. However, her students are encouraged to demonstrate responsibility by keeping a journal and feedback is given for the purpose of correction.

In response to question six, "Do the instructors try to accommodate different learning styles in their teaching or testing?", Professor C and Professor D said that instructor do try to accommodate different learning styles in their teaching. Professor F utilizes the learning styles suggested by Howard Gardner and allows students to apply these styles. Professor A sometimes accommodates students' learning styles by putting them into groups to complete assignments on various subjects and independently use the learning style of their choice.

Professor E students are allowed to search the Internet to find subjects that they find interesting and can be used from a mathematical perspective. These kinds of interactive approaches provide students with hands-on activities, and experience the styles of learning that they are most comfortable with.

Chapter 5

Conclusion, Discussion, and Recommendations

Conclusion

In this assessment of the learning styles of freshmen at the University of the Virgin Islands some useful information was uncovered. Although the data did not find that there was a significant difference in the learning styles of freshmen, students who remained in developmental courses and those who passed to pursue regular academic classes, the study did reveal that freshmen prefer their learning experiences to have a high degree of structure, that afternoon is the time of day when they learn best, and that freshmen value auditory stimuli in their learning experiences that capitalizes on their verbal perceptual strengths.

Moreover, it has been noted that many freshmen lack prerequisite number sense and conceptual understanding of arithmetic operations. This is exemplified by the apparent high failure rate of students in the math developmental courses. Information obtained from UVI's Office of Institutional Research and Planning revealed that as many as half the students taking the math developmental courses fail these courses. This leaves them the option of either repeating the courses until they pass and move onto regular academic studies, or of dropping out. Given the enrollment situation at UVI this is not good news. This emphasizes that there is a need to recognize different learning style preferences and incorporate this into the teaching methodology.

Discussion

This research is atypical as it includes a follow-up research section. It was decided that because structure, afternoon, and auditory learning styles were found to be important, a more detailed exploration was needed in each these areas. This constituted a mini-research study which includes a further review of the literature and a series of four interviews with instructors of developmental courses and the completion of six questionnaires of students in

developmental courses. The instructors and students were selected for convenience and represent a modest form of feedback on the research findings in the expectation that their input would be somewhat representative. The instructors reported that most of the freshmen were young adults between 17 and 19 years of ages although the upper age range might extend to 25 years old.

Structure

The learning styles that dominated in early studies consisted of the three basic sensory learning styles: visual, auditory, and kinesthetic/tactile. More recently studies have also focused on other learning style preferences such as the twenty-two outlined by Dunn, Dunn and Price (1996). These include Structure in the Domain of Emotionality which describes a preference for structured planning. Activities address how teachers structure learning activities. This calls upon tightness as opposed to loose management of instruction such as providing assignments and other instructional activities in an organized in manner. Dunn (1996) maintains that while the majority of learning styles are biologically imposed, the need for less or more structure is a developmental learning style which develops as an outgrowth of students' experience. The ways in which learning style characteristics appeared to change as students advanced from grade to grade was examined by Price (1980). A total of 3,972 subjects in grades 3 through 12 completed the LSI during the 1979-1980 school year. It was found that an overall decrease in the need for Structure was evidenced the higher the grade. However, the study of learning style preference of adult career and technical education teachers in West Virginia by Gordon and Yocke (2005) recognized that adults learn differently. Overall findings of Gordon and Yocke's research suggest that career and technical education teachers had a strong preference for structure (as well as mobility, tactile, and authority figures present).

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A study by Grigg, Price, Kopal, and Swaine (1984) examined learning styles of sixth grade students. The study matched motivation and structure. Students were classified as possessing a high or low degree of motivation and a high or low need for structure. The study evaluated levels of Career Motivation Awareness in the student participants. It was found that student whose learning style preferences for Motivation and Structure were accommodated in the counseling groups achieved higher career awareness scores than those whose styles were not matched.

Some studies have compared learning style characteristics and hemisphericity. The two hemispheres of the brain that process information differently is referred to as hemisphericity. This supposition shows that the left hemisphere has the verbal, sequential, and analytical abilities; while the right, has visual-spatial, global and holistic, and functions (Levy 1983). Cody (1983) compared the learning style characteristics and hemisphericity of 240 students in Grades 5 through 12. Based on their I.Q., he divided the students into three ability groups: average, gifted, and highly gifted. With regards to Structure the study showed that average students had a strong need for Structure and preferred to know exactly what was required. They were less motivated than the other groups and evidenced more integrated and left hemisphere processing. Gifted students were more integrated and demonstrated a right hemisphere processing style. They studied better than average students and required less Structure. The highly gifted students were the most motivated and the strongest Right hemisphere processors. It was concluded that students with dominant left hemisphere processing styles preferred more Structure, while students with dominant right hemisphere disliked structure.

Other studies have examined multiple intelligences and learning styles, including a study by Giles, Pitre, and Womack (2003). They suggest that students who need more structure fare better in teacher-centered lessons in which teachers introduce material and

establish prior knowledge and student conceptions. Teachers may lecture students, show informational videos and posters, perform drills, pose problem-solving exercise, arrange museum visits and other outings, and most importantly specify a time-frame for the lesson or unit.

The instructors were asked about forms of assistance that help provide structure to the freshmen's experience. Upon entry to UVI, Freshmen receive an orientation regarding the location of the library and other facilities. Students are guided through the class syllabus and course expectations. Students who require individual attention are assisted as much as possible. Special attention is given to students who are failing. Some students are directed to the Freshman Counselor or receive tutoring in the Freshman Center. In cases where students are absent on a regular basis, points may be deducted from the "class participation" category. Some instructors deduct penalty points from score on the final exam if students are repeatedly absent. Methods of instruction include: mini-lectures; scaffolding and bridging techniques in which students move from what they know to new unfamiliar material; discovery learning by means of a self-directed approach in which the lesson is organized to lead students to solve problems on their own; individual and team assignments; and collaborative group work in which students engage in peer-learning and work cooperatively.

Regarding the six students, the majority of students found that the university provides more structure than the high school. The majority of the six lived off campus. Those who live at home said that living with parents provides them with structure, but two students disagreed on this point. Those who live at home said they feel dependent on their parents because they provide tuition fees. The one student who lives on campus said that this provides more structure because it is easier to get around and get things done.

Time of Day

It is of interest that "afternoon" is a time of day option in the stimuli domain of Physical Needs emerges as a time when freshmen at UVI learn best. Murray's 1980 study was one of the first to reveal a relationship between time preference and academic achievement. Other studies have shown that time-of-day energy levels change with age. Reports that match teaching to student learning preferences exist within major databases such as ERIC and MEDLINE. A number of studies suggest that matching time of day to student preferences can raise grades, improve test scores, improve behavior and reduce truancy and tardiness. The implication is that schools might consider scheduling more demanding courses during the students' preferred time of day. It is of interest that afternoon has emerged as a preferred time of day in some studies. For example, studies show that elementary students do better on reading tasks in the afternoon (Barron Henderson, and Spurgeon 1994; Davis 1987). Gardiner (1986) experimented with Multisensory Instructional Packages MIP with fourth-grade underachievers at specific times of day. Significantly higher social studies test scores resulted with MIP versus traditional instruction during afternoon, rather than morning teaching. Another study found that 33% of fifth-grade students in a particular school preferred studying science in the afternoon and when tested their scores were significantly higher when tested at their preferred time of day. A study of learning style preference of adult career and technical education teachers by Gordon and Yocke (2005) indicated that beginning teachers with a standard score of 60 or more preferred learning in the afternoon.

Within the instructors' interviews regarding the time of day that classes take place and whether afternoon classes are applicable, three UVI instructors teach in the morning (one also teaches in the evening), and only one instructor teaches in the afternoon. When asked to respond to the question, "Do students absorb instruction well in the afternoon," three

Time of Day

It is of interest that "afternoon" is a time of day option in the stimuli domain of Physical Needs emerges as a time when freshmen at UVI learn best. Murray's 1980 study was one of the first to reveal a relationship between time preference and academic achievement. Other studies have shown that time-of-day energy levels change with age. Reports that match teaching to student learning preferences exist within major databases such as ERIC and MEDLINE. A number of studies suggest that matching time of day to student preferences can raise grades, improve test scores, improve behavior and reduce truancy and tardiness. The implication is that schools might consider scheduling more demanding courses during the students' preferred time of day. It is of interest that afternoon has emerged as a preferred time of day in some studies. For example, studies show that elementary students do better on reading tasks in the afternoon (Barron Henderson, and Spurgeon 1994; Davis 1987). Gardiner (1986) experimented with Multisensory Instructional Packages MIP with fourth-grade underachievers at specific times of day. Significantly higher social studies test scores resulted with MIP versus traditional instruction during afternoon, rather than morning teaching. Another study found that 33% of fifth-grade students in a particular school preferred studying science in the afternoon and when tested their scores were significantly higher when tested at their preferred time of day. A study of learning style preference of adult career and technical education teachers by Gordon and Yocke (2005) indicated that beginning teachers with a standard score of 60 or more preferred learning in the afternoon.

Within the instructors' interviews regarding the time of day that classes take place and whether afternoon classes are applicable, three UVI instructors teach in the morning (one also teaches in the evening), and only one instructor teaches in the afternoon. When asked to respond to the question, "Do students absorb instruction well in the afternoon," three

instructors disagreed. One instructor stated, "Students tend to absorb instruction better in the morning," while another said students focus better in the morning, but in the afternoon, "students tend to arrive late because of traffic and other situations. They are also unable to do homework because they are too tired." A third instructor said students tend to take too many credits and that as a result "most students in the afternoon and early evening tend to fail because they often are full-time working people." Why is there a discrepancy between the students' preference for afternoon as reported in LSI survey and the instructors' perceptions? The one instructor who teaches in the afternoon agrees that students absorb instruction well in the afternoon, and states, "Based on students' volition, those who come to class and learn are those who absorb the information the most."

The responses of the six students show they are more amenable to afternoon learning and there are a variety of answers to the question, "What time of day would you feel alert taking classes and studying?" Two students prefer the afternoon, saying they feel more alert at this time day. Two students they prefer taking classes in the day, without specifying the time of day, and they also say they prefer studying at night. Two students say they prefer the morning, because they feel more alert, but one specifies a preference for morning classes coupled with studying in the afternoon, when the information obtained in the classes can be reviewed. This student's response suggests that classes are viewed more as a time for obtaining information, but the real studying and consequent learning is better accomplished in the afternoon.

Auditory

Although the expressed preference for Auditory may simply reflect the predominance of traditional chalk-and-talk techniques, the fact that it ranks high among the preferred learning style of freshmen at UVI has several implications. Auditory indicates a verbal perceptual strength, and is one of the three basic sensory-based learning styles, the others

being are visual and kinesthetic/tactile. Price's (1980) examination of the ways in which learning style characteristics changed as students advanced through grade levels revealed that the younger the student, the more tactual and kinesthetic he/she was. Those modalities were followed by the development of visual strengths and, beginning with grades 5 and 6, the development of auditory strengths. It is of interest that Dunn (1996) maintains that low achievers tend to have poor auditory memory.

As a Caribbean community with strong oral traditions derived from its African heritage, it is not surprising that auditory should be a dominant perceptual strength. Auditory learners need to hear to understand and grasp ideas more quickly when they are verbalized. Written information may have little meaning until it is verbalized or read aloud. The auditory learner solves problems by talking about them and is often talkative with an outgoing personality. Auditory learners like class discussions but can become easily distracted. They may have difficulty with written instructions. Their strengths include an interest in lectures whereby they would rather listen to a lecture than read the material in a text book (Peng, 2002). Auditory learners are usually good at making speeches and presentations and are skilled at verbal interaction and possess ability in debates. As Mead and Rubin (1985) point out, students who are adept at effective oral communication can be persuasive orators and experience success in school and in other areas of their lives.

Within the UVI instructors' interviews regarding sensory-based learning styles, two instructors emphasize that the three styles, auditory, visual and tactile/kinesthetic, should all be incorporated. One confirmed that auditory is the primary method of instruction but should be supplemented with visual aids to reinforce the ideas. One instructor favors hands-on activities but if the group seems visual then appropriate activities will be incorporated. Another instructor stated that, "The weakest link for instruction is auditory. Students often forget once instructions are given, so reinforcement is important through kinesthetic, tactile

and visual means." From these responses it would seem that appropriate methodologies that capitalize on the students' preferences for auditory learning and their verbal strengths are not being fully utilized.

Of the six students, half favor auditory. One student is in complete concurrence with this study's findings and frankly states "I understand information a lot more by listening... It registers in my mind more clearly." Another student couples the value of listening with the use of visual aids, while another favors listening and then applying what is learned. Two students favor visual aids, one of these reports having a photographic memory. Despite this claim the student is nevertheless in a developmental course. The remaining student grasps information best by hands-on-learning (tactile/kinesthetic).

Recommendations

The studies of the Dunns and their colleagues suggest that students can learn almost any subject matter when they are taught with methods and approaches responsive to their learning style. It follows that the same students may be more likely to fail when they are taught in an instructional style dissonant with their strengths. Practitioners throughout the United States have reported statistically higher test scores for students who changed from traditional teaching to learning-style teaching at all levels- elementary, secondary, and college. It is therefore recommended that instructors implement learning style-based instruction.

Any study of student learning styles implies an ultimate goal of accommodating individual learning styles within instruction or matching teaching styles to learning styles. It might be asked, how closely do students' learning style preferences match those of their teachers? As Giles et.al. (2003) state:

> The first step in implementing learning style-based instruction is diagnosing the individual learning styles of each student.... The second step is profiling group preferences and weaknesses. Are most of the students visual learners? Does your

class have very few kinesthetic/tactile learners? The third step is assessing current instructional methods to determine whether they are adequate or require more flexibility. If modifications need to be made, various activities can be developed and/or adapted to conform with learning styles.

It is apparent from the review of literature that there is often no consensus in learning style preferences among students in a class. As with other students, it has been found that adult learners vary tremendously in how they acquire knowledge and no one theory of adult leaning styles can adequately address the diversity of each learner. Classes usually display a great variety of student learning styles, and in most teaching situations, it is impossible for the instructor to accommodate all of the learning styles represented by the class. This is especially true when one considers that many of the learning styles contrast sharply with each other, examples include: prefer warm, prefer cool; prefer light, prefer dim; prefer sound, prefer quiet; prefer morning, prefer evening; prefer authority figure present, does not want authority figure present. In this situation, it is recommended that teachers at UVI cast a wide net and utilize a variety of instructional techniques in order to accommodate the students.

Some recommendations can be made regarding the learning styles that emerged as preferences by the freshmen involved in this study, namely, structure, afternoon, and auditory. With regards to structure, Strool et al. (1998) provide a synopsis of adult learning preferences. Under the title "Structure of Learning Experiences" they list the following preferences: (1) Adults prefer flexible schedules that respond to their own time constraints; (2) Adults learn better when learning is individualized; (3) Adults prefer face to face learning rather than through the use of video or audio communications; (4) Adults derive benefits from interactional activities with others who differ in age, level of experience, and professional preparation.

Helping students to structure their own learning can be encouraged within such student-centered activities as project-based learning which allows them to plan, create, and

process information independently. This idea is reflected in longitudinal study of the learning styles of entering freshmen in a College of Agriculture (Garton and Thompson (1999). Freshmen with a field-dependent learning style were contrasted with those who prefer a field-independent learning style. The field-dependent freshmen tend to be extrinsically motivated social learners and achieve better when organization and structure is provided by a teacher. Field-independent learners on the other hand prefer to provide their own structure and organization for learning, are intrinsically motivated, and are more likely to favor learning activities that require individual effort.

Regarding afternoon as the preferred time of day of freshmen participants, research studies suggest that students do best with any academic subject at their individual preferred time of day. However finding a best time of day to teach is difficult because research shows considerable variation in preference, no matter what the age group. There appears to be no one time of day that that is good for everyone in any particular age group. However, Dunn (1996) discovered that both gifted adolescents and low achievers learn best during late morning, afternoon, or evening hours. If this kind of scheduling is not possible for all students, some kind of class rotation might be attempted so that all students could have a chance to learn at their preferred times. The idea of grouping like students in a particular class on the basis of their dominant learning style is a novel one that deserves further exploration.

With regards to auditory, specific instructional strategies can be applied. In learning and studying, auditory learners like to discuss lecture topics and explain new concepts to others. They work well within student study groups. They use mnemonic devices and work well with tape recorders. Auditory students achieve significantly higher scores with cassette tapes rather than visual or tactile materials. Auditory learners can be considered in two categories. The most prevalent are "Listeners," who can succeed when they apply this ability

productively in learning. A smaller subgroup need to hear their own voice in order to process the information. Some have a tendency to think out loud and carry on mental dialogues. Auditory learners benefit from methods that require student participation. The relevance to evaluation is that they favor talks with instructor, and fare best with oral exams. Auditory learners should practice writing answers and read practice answers out loud.

Although the learning styles that were prevalent among the research participants were structure, afternoon and auditory, other styles cannot be ignored when recommending teaching and learning strategies. It is recommended that educators at UVI should become familiar with learning style options and the methodology that they imply. Instructors benefit by developing lesson plans and materials that disseminate identical information across the spectrum of learning styles (Vincent and Ross, 2001). Within learning style-based instruction, teachers can vary teaching strategies, learning activities, and the type of assignments given. For example, both oral and written assignments can be given as well as both individual tasks and small group tasks. Material can be presented in a variety of ways including lectures, discussions, experiential, videos, and reading. Exams or assignments can include questions or tasks that encourage students to think in different ways. While some questions will require specific information, open-ended essays can be included that require students to solve problems. Comparison and contrast questions can be incorporated as well as practical application of theoretical principles. By utilizing an assortment of methods that accommodates different learning styles, a more stimulating environment for students is provided. Vincent and Ross (1998) provide a list of twenty general guidelines which make for good teaching of all styles of learning. These include: Determine the learning styles of students before teaching; Educate students on their own learning styles and how to cope; Match teaching style to the learning style of a majority of the students giving attention to students with other learning styles; Provide an outline or a concept map to organize learning;

Use audiovisual aids and activities that allow student participation wherever possible (make the instruction vivid); Incorporate hands-on activities into the lesson wherever possible; Assign tasks that allow for self-learning, for example, library readings, case problems, group projects. Therefore it is recommended that professional development training is provided to freshman faculty at UVI in order that instructors can learn how to incorporate learning styles into the classroom. It is especially important that instructors learn how to assist students so that they know their own individual learning styles.

Finally, it is recommended that each student knows his or her own individual learning style preferences. This will empower them as self-directed learners. Theorists such as Montessori, Dewey, Gardner, and today's Constructivists emphasize the importance of students taking responsibility for their own learning. Montessori promoted the child's own curiosity and learning by discovery, while Dewey believed in engaging students in individual or group projects and problem solving activities. Gardner's theory of multiple intelligences shows that different ways of learning are favored by certain individuals and these correspond to their learning styles. The Constructivists, emphasize that learners construct their own meaning from the experiences they are exposed to. This implies that although an instructor can teach he or she cannot make the students learn, they have to learn for themselves. Within Progressivist and Constructivist methodologies teachers adopt roles of facilitators and managers of instruction rather than mere transmitters of knowledge. When engaged in self-directed learning, students are encouraged to utilize the learning style which suits them best.

When each student knows his or her own individual learning style preferences he or she can apply appropriate strategies. For example, if a student favors the auditory mode, a tape recorder can be taken to class to provide an audio documentation of instructional activities. Students benefit by using knowledge about their particular learning style to better manage their learning. When students understand how they learn, they are more in control of

their environment and ask for what they need. This awareness improves students' self-esteem, and research shows that even at–risk students will accept responsibility for their own learning and exhibit confidence. It is asserted that for school-aged children parents need to understand the distinctiveness of their children's individual styles to help them become better students. It is argued that principals and teachers have a responsibility to make parents aware of their children's need for a study environment that reflects their learning styles strengths (In Time 2001). As Kang (1999) states, "A knowledge of one's own learning style is essential in 'learning to learn.' Teachers should help students discover their own learning preferences and provide constructive feedback about the advantages and disadvantages of various styles."

Becoming aware of their personal learning styles is not something that can be accomplished without guidance; it is therefore recommended that freshmen complete a learning style inventory early in their academic career at UVI. The idea of grouping like students in a particular class on the basis of their dominant learning style is a novel one that deserves further exploration. The developmental classes at UVI are large and are divided into different sections. For example, in the Spring Semester 2005 there were five section of MAT 024. It is recommended that freshmen entering developmental courses complete a learning style inventory as a form of pretest so that profiles can be developed and students with compatible learning styles are allocated to the same classes. As an initial pilot perhaps it would be best to limit this to the primary perceptual strengths of Auditory, Visual, and Kinesthetic/Tactile and instructors utilize methodologies that appeal to these learners.

Perhaps a simpler recommendation to implement would also involve UVI students completing a LSI assessment following admission into UVI. This could be repeated at intervals as they progress through Freshman, Sophomore, Junior, and Senior years. At the very least this would enable them to examine their learning experiences and study habits

which would lead to more informed and better decision making. Furthermore, it could provide their instructors with a valuable record of each student's learning style profile which could help inform the instructional methodologies they utilize.

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Appendix A

Freshman Year Curriculum Guide, 2002-2003

UVI-Freshmen Year
Curriculum Guide -2002-2003

This paradigm is a generic guide designed to assist you in planning the freshman curriculum. Schedules may vary slightly for some majors. This guide is applicable to all new students, full and part-time, who matriculate Fall/Spring 2002 - 2003. Note to co-requisites to SCI 100 and SSC 100 must be taken as *linked* courses.
*These are required freshman year courses; mandatory for transfer students(with less than 24 credits)and freshman.

Guide for students who take basic skills classes

FIRST SEMESTER		SECOND SEMESTER	
General Education Courses	*Credits*	*General Education Courses*	*Credits*
SCI 100* or SSC 100* *Caribbean :The Natural World/ Intro to the Social Sciences*	3	SCI 100* or SSC 100* *Caribbean :The Natural World/Intro to the Social Sciences*	3
MAT 023 *Introductory Algebra Concepts and Skills*	4 *Non-degree*	MAT 024 *Introductory Algebra Concepts and Skills*	4 *Non-degree*
WAC 011/ENG100 *Writing Across the Curriculum*	1/3nd	SPE 119 *Public Speaking*	3
RCA 021 *Reading in the Content Area*	1/3nd	ENG 120 *English Composition*	3
FDS 100* *Freshman Development Seminar*	1	Other (recommended by Division Advisor)	3
PED 111 *Physical Education*	.5	PED 111 *Physical Education*	.5
Total Credits	16.5	Total Credits	16.5

***Required Freshman Year Courses** (For student who matriculate at UVI with less than 24 degree credits)
SCI 100 - The Caribbean: The Natural World - 3 credits
SSC 100- An Introduction to the Social Sciences: A Caribbean Focus - 3 credits
FDS 100- Freshman Development Seminar- 1credit

Basic Skills Courses (as needed)
RCA 021- Reading in the Content Area -4 credits (1 degree credit/ 3 non-degree credits)
WAC 011- Writing Across the Curriculum - 4 credits (1degree credit/3 non-degree credits)
MAT 023- Math Skills I : Introductory Algebra Concepts and Skills- 4(non-degree) credits
MAT 024- Math Skills II: Introductory Algebra Concepts and Skills- 4(non-degree) credits

Appendix B

Chart of Student Learning Styles Models

Chart of Student Learning Styles Models

Name of Model	Learning Styles	Characteristics
Primary or Sensory Learning Styles (Pat Wyman)	Visual Learners	Learn through seeing.
	Auditory Learners	Learn through listening.
		Learn through hearing.
	Kinesthetic/Tactile	Learn through moving, doing and touching.
Multiple Intelligence (Howard Gardner)	Visual/Spatial Intelligence	Rely on visuals to retain information.
	Verbal Linguistic Intelligence	Use words & language skills fully.
	Logical/Mathematical Intelligence	Think & reason logically & numerically.
	Bodily/Kinesthetic Intelligence	Move the body & handle objects skillfully.
	Musical/Rhythm Intelligence	Generate music.
	Interpersonal Intelligence	Relate to the perspective of others.
	Intrapersonal Intelligence	Understand ones feelings, dreams & relationships with others.
Myers-Briggs Type Indicator MBTI	Introvert/Extrovert	Introvert - focus on inner world of ideas. Extrovert - focus on the outer world and people.
	Sensors/Intuitors	Sensors - focus on information in detail. Intuitors - focus on meanings and possibilities.
	Thinkers/Feelers	Thinkers – focus decisions on logic and rules. Feelers - focus on consideration and appreciation.
	Judgers/Perceivers	Judgers - thorough in activities; like being planned and structured Perceivers – open, flexible and unstructured.
Kolb's Learning Style Model	Type 1 (concrete, reflective)	Divergers are innovative learners.
	Type 2 (abstract, reflective)	Assimilators are analytic learners.
	Type 3 (abstract, active)	Convergers are common sense learners.
	Type 4 (concrete, active)	Accommodators apply course material in order to solve problems.

Marcia L. Connor (2004, p.3.)

Chart of Student Learning Styles Models

Felder-Silverman Learning Styles	Active	Need stimulation in exercises that allow them to interact with the information.
	Reflective	Favors solitary working and finds it necessary to think about what they are learning at their own pace.
	Sequential	Goes from beginning to end over a laid out route.
	Global	Interested in topics, summaries and broad overviews.
	The Rational Self	Knows how things work; knows about numbers and money. Tends to be realistic, critical and logical and analytical.
The Brain/Dominance Thinking Learning Styles	Upper or Cerebral Left Brain	Tend to plan ahead and are time conscious, neat, well organized and reliable. Get things done, establish procedures and take preventative action.
	The Safekeeping Self (Lower or Limbic Left Brain)	Focus on his/her feelings. Talk extensively and are emotional, expressive and supportive.
	The Feeling Self (Lower or Limbic Right Brain) Experimental Self	Touches a lot, likes teaching and tends to be sensitive towards others. Imaginative, curious and engage in plays and like surprises. Engage in rule-breaking. Speculate and tend to be impulsive.

Felder-Silverman (2003 pp. 1, 2)
Ned Herman (2003 pp. 1, 2)

Chart of Student Learning Styles Models

Gregor Mind Style	Concrete Sequential (CS)	Hard working, conventional, accurate, stable, dependable, consistent, factual and organized.
	Abstract Sequential (AS)	Analytic, objective, knowledgeable, thorough, structured, logical, deliberate, and systematic.
	Abstract Random (AR)	Sensitive, compassionate, perceptive, imaginative, idealistic, spontaneous and flexible.
	Concrete Random (CR)	Quick, intuitive, curious, realistic, creative, innovative, instinctive and adventurous.

Marcia Connor (2004, p.2)

Chart of Student Learning Styles Models

Honey & Mumford's Learning Model	Activists	No bias to new experiences. Open-minded, enthusiastic, constantly thriving for new challenges, but are bored with implementation and long-term consolidation. Enjoy learning through games, other competitions and role-plays.
	Reflectors	Thoughtful and observant before taking action and are cautious. Perceptive, indecisive; and keep a low profile. Prefer learning activities that are observable.
	Theorists	Adapt and integrate information, sequentially and logically. Maximize certainty and feel uncomfortable with subjective judgments, lateral thinking and anything flippant; prefers exploratory activities.
	Pragmatists	Keen to try out ideas, theories and techniques, to see if they work in practice. Down-to-earth, like making practical decisions. Act quickly on attractive ideas; tend to be impatient with open-ended discussions. Prefer learning activities which are as close as possible to direct work experience.

Lim Lum Peng (2002, p.2)

Chart of Student Learning Styles Models

Dunn & Dunn Learning Style Model	Environmental	Elements such as lighting, sound, temperature and seating arrangement
	Emotionality.	Elements related to the following types of psychological processing.
	Sociological	Elements related to the following types of psychological processing.
	Physiological	The elements in this strand are: perceptual (auditory, visual, tactual & kinesthetic), time-of-day energy levels, intake (eating or not while studying) and mobility (sitting still or moving around).
	Psychological	Corresponds to the following types of psychological processing: hemispheric, impulsive or reflective and global versus analytic. The hemispheric elements refers to left and right brain processing modes; the impulsive versus reflective style describes how some people leap before thinking and other scrutinize the situation before moving an inch. Global and analytic elements are unique in comparison to other elements.

Sarah Church (2000, p.1)

Appendix C

Learning Style Inventory
Domain Ranges and Definitions
of Individual Preferences

Domain Ranges of Individual Preferences

Immediate environment

1. Noise Level
2. Light
3. Temperature
4. Design

Emotionality

5. Motivation
6. Persistence
7. Responsibility (conforming)
8. Structure

Sociological needs

9. Learning alone/peer oriented
10. Authority Figures Present
11. Learn in Several Ways
12. Parent Figure Motivated (Adult oriented)
13. Teacher Motivated (Adult oriented)

Physical needs

14. Auditory (Perceptual preferences)
15. Visual (Perceptual preferences)
16. Tactile (Perceptual preferences)
17. Kinesthetic (Perceptual preferences)
18. Need Mobility
19. Requires Intake
20. Evening-Morning
21. Late Morning
22. Afternoon

Learning Style Inventory:
Individual Preferences and Definitions

Immediate environment	**Quality or arrangement of the study area**
Noise Level	Prefers sound/ prefers quiet Some people study better with noise, others with quietness.
Temperature	Prefers cool/ prefers warm Some people study better in a cool environment, others prefer warmth.
Light	Prefers light/ prefers light dim Studies better in bright light like sunshine, others prefer dimmer lighting.
Design	Prefers informal/ prefers formal Some people study better sitting on the floor, laying on the bed and outside the class, whereas others prefer regular seating.
Emotionality	**Feelings, approach to tasks**
Motivation	High/ low Some student push him/herself to study or initiate study activities and are self directed versus requiring encouragement from others in order to learn.
Persistence	High/ low Like to stay with a task until its completed, and then move to the next task; others are distracted easily.
Responsibility (conforming)	High/ low Ready to do what they are asked to do in a docile manner, i.e. willing to conform; others are not willing to comply; prefer to initiate things by themselves in an autonomous manner.
Structure	Does not like structure/ wants structure Thinks in a spontaneous and impromptu manner. Others prefer to think in a conventional ordered manner.

Sociological needs	**Attitudes towards and/or need for others in the learning situation**
Learning alone/peer oriented	Prefer learning alone, maybe in private area / prefer learning with others, maybe one-to-one or in a group.
Authority figures present	Wants present/ Does not want present Student feels comfortable studying/learning with an adult such as a teacher present. Does not feel comfortable with authority figure; may feel intimidated.
Learn in Several Ways	Prefer variety/ Does not learn in several ways Learn better by self, with authority figure or with one or two other people. Prefer a single way to learn.
Parent figure motivated (adult oriented)	High/ low Want to please parent/ or don't care to please parent.
Teacher motivated (adult oriented)	High/ low Want to please teacher/ or don't care to please teacher.
Physical needs	**Perceptual preferences and other environmental stimulation**
Auditory (perceptual preference)	Prefer/ Does not prefer Learn better by listening e.g. to lectures; others prefer different perceptual stimuli.
Visual (perceptual preference)	Prefer/ Does not prefer Likes reading and learns better from illustrations such as graphs, videos; others prefer different perceptual stimuli.
Tactile (perceptual preference)	Prefer/ Does not prefer Like writing and learn by touching or feeling things; others learn little by touching or feeling things.
Kinesthetic (perceptual preference)	Prefer/ Does not prefer A total body learning, move around, going on field trips, performing drama, dance, etc; others learn better when they are still.
Need Mobility	Prefer/ Does not prefer Benefit from moving around after studying in order to take a break; others prefer to work right through until task is completed.
Requires Intake	Prefer intake/ Does not prefers intake Important to chew or drink something to help concentrate while learning; other prefer not to eat or drink while learning.

Evening-Morning	Prefer evening-morning/ doesn't prefer Wide awake and ready to learn during the evening and morning; if they study at other times, it will take longer for them to learn
Late Morning	Prefer/ Does not prefer Accomplish their best work 10am to noon. This is common among Elementary children, whereas if they study very early in the morning, it is difficult for them to concentrate. If they study at other times, it takes longer for them to learn.
Afternoon	Prefer/ Does not prefer Learn best in the afternoon, therefore, it is better for them to take classes during this time; if they study at other times, it takes longer for them to learn.

Dunn, Dunn and Price System Inc. 1998

Appendix D

Sample Learning Style Inventory

NAME
LAST NAME FIRST

GRADE OR EDUCATION

USE A NO. 2 PENCIL, DO NOT FOLD OR STAPLE

PRINT INSIDE BOXED IN AREA ONLY

Major or Occupation

DO NOT MARK HERE

SEX

BIRTHDAY

SPECIAL CODES

IDENTIFICATION NUMBER

Write your name, sex, and birthdate in the space provided.
Blacken the bubbles below each of the boxes you filled out.

1.	I prefer working in bright light.	SD	D	U	A
2.	I like to work alone.	SD	D	U	A
3.	It is easy for me to concentrate late at night.	SD	D	U	A
4.	I like to draw or use diagrams when I work.	SD	D	U	A
5.	I often have to be reminded to complete certain tasks or assignments.	SD	D	U	A
6.	The one job I like doing best, I like to do with an expert in the field.	SD	D	U	A
7.	I can think better lying down than sitting.	SD	D	U	A
8.	I prefer cool temperatures when I need to concentrate.	SD	D	U	A
9.	I can block out noise or sound when I work.	SD	D	U	A
10.	People keep reminding me to do things.	SD	D	U	A
11.	It is difficult for me to concentrate when I am warm.	SD	D	U	A
12.	The one job I like doing best, I do with two or more people.	SD	D	U	A
13.	I prefer to work or read where the lights are shaded.	SD	D	U	A
14.	When I concentrate I like to sit on a soft chair or couch.	SD	D	U	A
15.	I usually finish what I start.	SD	D	U	A
16.	The things I remember best are the things that I hear.	SD	D	U	A
17.	I enjoy tasks that allow me to take breaks.	SD	D	U	A
18.	I can work more effectively in the afternoon than in the morning.	SD	D	U	A
19.	I like to "snack" when I'm concentrating.	SD	D	U	A
20.	When I have a lot of work to do I like to work with several colleagues.	SD	D	U	A
21.	Noise or extraneous sound usually keeps me from concentrating.	SD	D	U	A
22.	I often forget to do things I said I would do.	SD	D	U	A
23.	I take lots of notes in a lecture, to help me remember.	SD	D	U	A
24.	I like to work or analyze an assignment with another individual.	SD	D	U	A
25.	I prefer cool temperatures when I'm working.	SD	D	U	A
26.	The one job I like doing best, I do with several people.	SD	D	U	A
27.	I concentrate best in the late afternoon.	SD	D	U	A
28.	The things I remember best are the things that I read.	SD	D	U	A
29.	I usually complete tasks that I start.	SD	D	U	A
30.	I can concentrate better when I sit up rather than when I recline.	SD	D	U	A
31.	I like to learn or work with a person in authority.	SD	D	U	A
32.	I work best early in the morning.	SD	D	U	A
33.	I get a lot done when I work on my own.	SD	D	U	A
34.	When I work I turn all the lights on.	SD	D	U	A
35.	I prefer that others share responsibility for a task we're doing.	SD	D	U	A
36.	I really enjoy television.	SD	D	U	A
37.	I like either a teacher or supervisor to outline tasks I have to complete.	SD	D	U	A
38.	I like to sit on a straight-back chair when I concentrate.	SD	D	U	A
39.	I work or study best by myself.	SD	D	U	A
40.	I can remember things best when I study them in the evening.	SD	D	U	A
41.	I remember best the things I read in a book or magazine.	SD	D	U	A
42.	I always finish tasks that I start.	SD	D	U	A
43.	If I have to learn something new, I prefer to learn about it by hearing a record, tape, or lecture.	SD	D	U	A
44.	I am most alert in the evening.	SD	D	U	A

NAME
LAST NAME FIRST

GRADE OR EDUCATION

USE A NO. 2 PENCIL, DO NOT FOLD OR STAPLE

PRINT INSIDE BOXED IN AREA ONLY

Major or Occupation

DO NOT MARK HERE

SEX

BIRTHDAY

SPECIAL CODES

IDENTIFICATION NUMBER

Write your name, sex, and birthdate in the space provided.
Blacken the bubbles below each of the boxes you filled out.

1.	I prefer working in bright light.	SD	D	U	A	S
2.	I like to work alone.	SD	D	U	A	S
3.	It is easy for me to concentrate late at night.	SD	D	U	A	S
4.	I like to draw or use diagrams when I work.	SD	D	U	A	S
5.	I often have to be reminded to complete certain tasks or assignments.	SD	D	U	A	S
6.	The one job I like doing best, I like to do with an expert in the field.	SD	D	U	A	S
7.	I can think better lying down than sitting.	SD	D	U	A	S
8.	I prefer cool temperatures when I need to concentrate.	SD	D	U	A	S
9.	I can block out noise or sound when I work.	SD	D	U	A	S
10.	People keep reminding me to do things.	SD	D	U	A	S
11.	It is difficult for me to concentrate when I am warm.	SD	D	U	A	S
12.	The one job I like doing best, I do with two or more people.	SD	D	U	A	S
13.	I prefer to work or read where the lights are shaded.	SD	D	U	A	S
14.	When I concentrate I like to sit on a soft chair or couch.	SD	D	U	A	S
15.	I usually finish what I start.	SD	D	U	A	S
16.	The things I remember best are the things that I hear.	SD	D	U	A	S
17.	I enjoy tasks that allow me to take breaks.	SD	D	U	A	S
18.	I can work more effectively in the afternoon than in the morning.	SD	D	U	A	S
19.	I like to "snack" when I'm concentrating.	SD	D	U	A	S
20.	When I have a lot of work to do I like to work with several colleagues.	SD	D	U	A	S
21.	Noise or extraneous sound usually keeps me from concentrating.	SD	D	U	A	S
22.	I often forget to do things I said I would do.	SD	D	U	A	S
23.	I take lots of notes in a lecture, to help me remember.	SD	D	U	A	S
24.	I like to work or analyze an assignment with another individual.	SD	D	U	A	S
25.	I prefer cool temperatures when I'm working.	SD	D	U	A	S
26.	The one job I like doing best, I do with several people.	SD	D	U	A	S
27.	I concentrate best in the late afternoon.	SD	D	U	A	S
28.	The things I remember best are the things that I read.	SD	D	U	A	S
29.	I usually complete tasks that I start.	SD	D	U	A	S
30.	I can concentrate better when I sit up rather than when I recline.	SD	D	U	A	S
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32.	I work best early in the morning.	SD	D	U	A	S
33.	I get a lot done when I work on my own.	SD	D	U	A	S
34.	When I work I turn all the lights on.	SD	D	U	A	S
35.	I prefer that others share responsibility for a task we're doing.	SD	D	U	A	S
36.	I really enjoy television.	SD	D	U	A	S
37.	I like either a teacher or supervisor to outline tasks I have to complete.	SD	D	U	A	S
38.	I like to sit on a straight-back chair when I concentrate.	SD	D	U	A	S
39.	I work or study best by myself.	SD	D	U	A	S
40.	I can remember things best when I study them in the evening.	SD	D	U	A	S
41.	I remember best the things I read in a book or magazine.	SD	D	U	A	S
42.	I always finish tasks that I start.	SD	D	U	A	S
43.	If I have to learn something new, I prefer to learn about it by hearing a record, tape, or lecture.	SD	D	U	A	S
44.	I am most alert in the evening.	SD	D	U	A	S

45. The one job I like doing best, I do with a group of people.. SD D
46. I am uncomfortable when I work or try to study in a warm room. SD D
47. I prefer to have teachers or supervisors set deadlines for my work. SD D
48. I like to eat while I am concentrating. SD D
49. I prefer completing one thing before I start something else. SD D
50. It is difficult for me to start a new task before I finish the task I am doing. SD D
51. I really enjoy movies.. SD D
52. I have to be reminded to do things I've said I would do.. SD D
53. I work best when the lights are shaded.. SD D
54. I prefer that persons in authority stay away until I have completed my work. SD D
55. I keep trying to accomplish a task even if it appears that I may not succeed.. SD D
56. I like to learn about something new by hearing a tape or a lecture. SD D
57. I feel I am self-motivated. SD D
58. The one job I like doing best, I prefer doing alone.. SD D
59. Eating something would distract me when I'm working. SD D
60. My performance improves if I know my work will be checked.. SD D
61. I prefer to work with music playing. SD D
62. I stay at a task until it is finished, even if I don't like what has to be done. SD D
63. I learn best by being directly involved in what I am doing. SD D
64. I always do the best I can. SD D
65. I prefer to learn how to do a new task by actually doing it. SD D
66. I often read in dim light.. SD D
67. If I have to learn something new, I like to learn about it by reading. SD D
68. I prefer someone else carefully outline how a task should be done.. SD D
69. I would rather start work in the morning than in the evening. SD D
70. I constantly change positions in my chair.. SD D
71. The things I remember best are the things that I hear.. SD D
72. I like my instructor(s) or supervisor(s) to recognize my efforts.. SD D
73. I learn better by reading than by listening to someone.. SD D
74. I get more done in the afternoon than in the morning. SD D
75. I can block out most sound when I work. SD D
76. I really like to build things. SD D
77. I prefer to work under a shaded lamp with the rest of the room dim. SD D
78. I choose to eat, drink or chew only after I finish working. SD D
79. I remember things better when I study in the evening. SD D
80. If I have to learn something new, I like to learn about it by seeing a movie. SD D
81. I feel good when my spouse, colleague or supervisor praises me for doing well at my job. SD D
82. I prefer a cool environment when I try to study. SD D
83. It's difficult for me to block out sound (music, TV, talking) when I work. SD D
84. I would rather learn by experience than by reading. SD D
85. I like being praised for a "job well done." SD D
86. It is difficult for me to sit in one place for a long time.. SD D
87. I like to have something to drink when I work.. SD D
88. I enjoy doing experiments.. SD D
89. If a task becomes very difficult, I tend to lose interest in it. SD D
90. I like to learn new things.. SD D
91. I can sit in one place for a long time.. SD D
92. I can concentrate best in the evening. SD D
93. I prefer to study with someone who really knows the material. SD D
94. I often change my position when I work. SD D
95. I would work more effectively if I could eat while I'm working. SD D
96. If I can go through each step of a task, I always remember what I learn. SD D
97. I learn better when I read the instructions than when someone tells me what to do. SD D
98. I only begin to feel wide awake after 10:00 A.M.. SD D
99. I often complete unfinished work on a bed or couch where I can recline. SD D
100. I often wear a sweater or jacket indoors. SD D

STOP

Appendix E

Price Systems Permission Letter

Price Systems, Inc.

If students don't learn the way we teach, let's teach the way they learn!

April 18, 2005

Myrthlyn Elliott
PO Box 305602
St. Thomas, Virgins Islands 00803-5602
Fax 340 774-3499

Dear Ms. Elliott,

Thank you for your letter requesting permission to use the Learning Style Inventory (LSI) in your study. I want to let you know that you have permission to use the LSI for conducting the research.

If you can send me a proposal to approve in advance, I have a special approved rate of $0.70 per person, which includes the Individual Profile. If you would like your data written out to disk, there would be an additional charge of $5.00, as well as shipping and handling.

Your study sounds very interesting. Please let me know if you have any additional questions.

Sincerely,

Gary E. Price, Ph.D.
President

PO Box 1818 • Lawrence, KS 66044-8818 USA• (785) 843-7892 • Fax: (785) 843-0101
www.learningstyle.com

Appendix F

Instructions for Administering LSI Questionnaires

Myrthlyn Elliott

April 25, 2005

Instructions for Learning Styles Inventory Questionnaires

My name is **Myrthlyn Elliott** and I am a student in the Master of Arts Program in the Division of Education. I am presently enrolled in EDU 600/ Thesis and have chosen to conduct a research project on the learning styles of freshmen in the Developmental Skills Program.

I am therefore requesting your participation in filling out a Learning Styles Inventory questionnaire consisting of **100 questions**. This questionnaire should take at least **20 minutes** to complete.

You are not required to write your **identification and special codes**. Ignore these areas. However, you are expected to fill in your **name, date of birth** and indicate whether you are a **male or female.**

Please return these questionnaires to your instructor on April 26 or 27, Tuesday or Wednesday **(your next appointed class session).**

If you have filled out a questionnaire that was distributed by Ms. Elliott before, **do not fill one out again.**

Thanks to both students and instructors for your assistance and cooperation.

Appendix G

N Par Tests

NPar Tests

Mann-Whitney Test

Ranks

	status	N	Mean Rank	Sum of Ranks
Light	pass	30	19.00	570.00
	repeat	6	16.00	96.00
	Total	36		
Temperat	pass	29	18.26	529.50
	repeat	6	16.75	100.50
	Total	35		
Design	pass	30	18.77	563.00
	repeat	6	17.17	103.00
	Total	36		
Motivation	pass	30	19.00	570.00
	repeat	6	16.00	96.00
	Total	36		
Persistent	pass	30	18.85	565.50
	repeat	6	16.75	100.50
	Total	36		
Responsi	pass	30	19.35	580.50
	repeat	6	14.25	85.50
	Total	36		
Structure	pass	30	17.85	535.50
	repeat	6	21.75	130.50
	Total	36		
AlonePee	pass	30	18.70	561.00
	repeat	6	17.50	105.00
	Total	36		
Authority	pass	30	18.92	567.50
	repeat	6	16.42	98.50
	Total	36		
Sevways	pass	30	18.62	558.50
	repeat	6	17.92	107.50
	Total	36		
Auditory	pass	30	18.97	569.00
	repeat	6	16.17	97.00
	Total	36		
Visual	pass	30	18.42	552.50
	repeat	6	18.92	113.50
	Total	36		
Tactile	pass	30	18.70	561.00
	repeat	6	17.50	105.00
	Total	36		
Kinesth	pass	30	18.40	552.00
	repeat	6	19.00	114.00
	Total	36		
Intake	pass	30	18.27	548.00
	repeat	6	19.67	118.00
	Total	36		

Ranks

	status	N	Mean Rank	Sum of Ranks
Morneve	pass	30	18.67	560.00
	repeat	6	17.67	106.00
	Total	36		
Latemorn	pass	30	17.50	525.00
	repeat	6	23.50	141.00
	Total	36		
Afternoon	pass	30	18.95	568.50
	repeat	6	16.25	97.50
	Total	36		
Mobility	pass	30	18.13	544.00
	repeat	6	20.33	122.00
	Total	36		
NoisLevel	pass	30	18.50	555.00
	repeat	6	18.50	111.00
	Total	36		

Test Statistics[b]

	Light	Temperat	Design	Motivation	Persistent	Responsi	Structure
Mann-Whitney U	75.000	79.500	82.000	75.000	79.500	64.500	70.500
Wilcoxon W	96.000	100.500	103.000	96.000	100.500	85.500	535.500
Z	-.639	-.330	-.341	-.641	-.449	-1.085	-.836
Asymp. Sig. (2-tailed)	.523	.741	.733	.522	.654	.278	.403
Exact Sig. [2*(1-tailed Sig.)]	.548[a]	.749[a]	.756[a]	.548[a]	.664[a]	.287[a]	.418[a]

Test Statistics[b]

	AlonePee	Authority	Sevways	Auditory	Visual	Tactile	Kinesth
Mann-Whitney U	84.000	77.500	86.500	76.000	87.500	84.000	87.000
Wilcoxon W	105.000	98.500	107.500	97.000	552.500	105.000	552.000
Z	-.255	-.535	-.151	-.596	-.107	-.257	-.129
Asymp. Sig. (2-tailed)	.799	.592	.880	.551	.915	.797	.897
Exact Sig. [2*(1-tailed Sig.)]	.820[a]	.605[a]	.885[a]	.576[a]	.918[a]	.820[a]	.918[a]

Test Statistics[b]

	Intake	Morneve	Latemorn	Afternoon	Mobility	NoisLevel
Mann-Whitney U	83.000	85.000	60.000	76.500	79.000	90.000
Wilcoxon W	548.000	106.000	525.000	97.500	544.000	111.000
Z	-.298	-.213	-1.293	-.578	-.471	.000
Asymp. Sig. (2-tailed)	.766	.831	.196	.563	.637	1.000
Exact Sig. [2*(1-tailed Sig.)]	.788[a]	.852[a]	.217[a]	.576[a]	.664[a]	1.000[a]

a. Not corrected for ties.

b. Grouping Variable: status

Appendix H

Interviews: Professors' Questions and Answers

1. What is the "traditional method" of teaching and testing?

2. To what degree, if any are different learning styles taken into consideration for teaching or testing?

3. What are the instructors typical teaching methods on a typical day?

4. What are the instructors typical testing methods?

5. Do the instructors try to assess learning style distinctions?

6. Do the instructors try to accommodate different learning styles in their teaching or testing?

1. In response to question one, "What is the "traditional method" of teaching and testing?" some professors related the methods they use. For example, as an instructor of reading, Professor A uses the chalkboard for teaching and uses test papers for quizzes and exams. Professor B, a math instructor, gives lectures and administers written tests. Professor C uses routine methods by allowing students to read.

2. In response to question two, "To what degree, if any, are different learning styles taken into consideration for teaching or testing?", Professor A says she does not take different learning styles into consideration in her reading classes. Professor D takes different learning styles into consideration for example; students are encouraged to use visual learning by visualizing something before they write a descriptive report about it. Professor C, a reading instructor, also takes learning styles into consideration. Combinations of styles are combined to increase retention and enhance student ability through association. Professor E emphasizes learning styles. For instance, students are guided to become more self-directed and this in turn encourages them to experience the

styles of learning that they are most comfortable with. For instance, students work on projects such as "The Life Expectancy of Male and Female" and "Sea Life: Conchs" in which mathematical concepts are utilized. These projects provide them with the opportunity to use tactile abilities by using graphing calculators. Professor B takes different learning styles into consideration. She observes distinct learning styles through students' use of writing, reading and computer use, and concludes that some students are more auditory than visual. In Professor F's classes' students enjoy the opportunity of creating Power Point presentations and applying what they have been taught by using the computer lab to research topics of interest on the Internet and use media to enhance their auditory skills.

3. In response to question three, "What are the instructors' typical teaching methods on a typical day?" the majority of the professors felt there were no typical teaching methods on a typical day. However, for Professor B, on a typical day student learning would be of an interactive nature. For example, students might assemble in groups and engage in hands on activities while she serves as a facilitator. Students in Professor F's writing classes use the Internet for research and she suggests that such learning is visual in nature. The same is true of creating slide shows in Power Point. Professor F's students assist each other in groups as a means of developing social skills. The students find these activities fun and such activities motivate them to write

4. In response to question four, "What are the instructors' typical testing methods?" the majority of the professors felt there were no typical testing methods. However, Professor

G says that her students are motivated by the administration of the Nelson Denny Test which measures progress of a student's performance. Professor D places students in groups to analyze each others' writing assignments. Professor E's students are given a chance to develop their visual and auditory skills by using the Gateway Computer Lab software to complete quizzes and tests.

5. In response to question five, "Do the instructors try to assess learning style distinctions?" the majority of professors interviewed agree that there is no indication that the instructor try to assess learning style distinctions. Professor B suggests that the computer assignments that she uses, assists her in assessing students learning styles. Professor G says that it is difficult for a teacher to assess the learning styles of every student. However, her students are encouraged to demonstrate responsibility by keeping a journal and feedback is given for the purpose of correction.

6. In response to question six, "Do the instructors try to accommodate different learning styles in their teaching or testing?", Professor C and Professor D said that instructors do try to accommodate different learning styles in their teaching. Professor A sometimes accommodates students' learning styles by putting them into groups to complete assignments on various subjects and independently use the learning style of their choice. Professor E students are allowed to search the Internet to find subjects that they find interesting and can be used from a mathematical perspective. These kinds of interactive approaches provide students with hands-on activities, and experience the styles of learning that they are most comfortable with.