A STUDY OF THE RELATIONSHIP BETWEEN AN INDIVIDUAL'S HUMAN ENVIRONMENT AND BRAIN HEMISPHERE DOMINANCE AND PERCEPTUAL SKILLS AND BRAIN HEMISPHERE DOMINANCE

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

Change is a tool that can be utilized to achieve personal and professional growth. Without change in our natural and man-made processes, our society would be static.

Creativity is a major component of change. It is through creativity that innovative solutions to problems evolve. In every type of discipline, whether it is an educational or professional system, there is the concept of creativity. Every day of our lives, whether we realize it or not, we are asked by our peers, employers, and teachers, to be, in some, way creative. This effort to be more creative in our problem-solving process may be conscious or unconscious, however, it is always present.

Creativity, because it is a component of change, becomes an important tool to be taught in our educational system, beginning in pre-school years and continuing throughout a person's lifetime. Teachers themselves should be concerned with instructing and presenting their materials in an innovative manner. Employers should be concerned with proposing viable and creative methods of work production amongst their employees, and students should be concerned with solving their educational problems in a method never seen before. It is through these creative methods of problem-solving, that our society can continue to change and grow.

Over the years, it has been generalized that some people are more creative than others. To some extent this is true. In our educational and professional worlds, there are some disciplines that stress the creative processes more than others. For example, Interior Design, Architecture, Landscape Architecture, English and Liberal Arts stress the creative aspect more than disciplines such as mathematics, engineering and the physical and biological sciences. However, the fact that some people are more creative than others, does not mean that the population that does not use their creative skills cannot develop their creative levels.

Several studies show that the brain is the major component that controls our thinking processes and bodily movements (Gregory, 1973; Wittrock, Teyler and Beatty, 1977; Ittleson, 1960). The brain is composed of two major sections: the left hemisphere and the right hemisphere (Gregory, 1973; Wittrock, Teyler, and Beatty, 1977; Ittleson, 1960). The left hemisphere of the brain has been proven to be more analytical whereas the right hemisphere of the brain has been proven to be more creative and perceptive (Gregory, 1973; Ittleson, 1960; Even, 1978; Edwards, 1976, 1979).

Because the brain is the catalyst of our thinking processes, it is important to understand the basis of how it functions. Specifically, in the field of Interior Design where creativity is the heart of the profession, it is imperative to investigate why a certain hemisphere becomes dominate over the other.

In the educational discipline Interior Design, creativity is a necessary component that must be exercised by a designer. The left hemisphere, which has been proven to be analytical (Gardner, 1975; Nekes, 1974), is also the hemisphere that is trained and used more in our general educational system. Therefore, most individuals become left hemisphere dominate, which can make creativity seem difficult or foreign. Because of this, attitudes of "I can't be creative" or "I'm not good at creating ideas" are common among most individuals.

These attitudes or mental blocks towards creativity should always be a concern, however, in disciplines such as Interior Design, it becomes imperative to educate students in the use of the right hemisphere so that creativity can become a natural part of the problem solving process.

When speaking of creativity, it is very difficult not to include the concept of perception. Throughout the process of creativity, the mind is constantly picturing or perceiving what reaction the solution will cause or what the outcome will look like. Therefore, perception is a necessary, intricate component of creativity.

This concept of perception has been generalized to say that some people can perceive more easily than others. There are studies that show that perceptual levels vary according to sex, age, and education (Durio, 1976; Allen, 1974; Eliot and Dayton, 1976). The sexual, societal and cultural differences also begin to affect how a person's perceptual skills develop (Durio, 1976; Allen, 1974; Eliot and Dayton, 1976). It would seem that those individuals who have more cultural exposure in their surroundings (galleries and museums), would have developed their creative and perceptual skills more so than those individuals who were exposed in a culture that did not stress creativity, the arts, and did not have as much exposure to cultural activities. An individual's human environment may also influence brain hemisphere development. Those individuals who have been exposed to culture, metropolitan areas, design surroundings, and design-orientated occupations may have developed the right hemisphere of the brain more than those students that have only been in surroundings and cultures that stress the left hemisphere. Therefore, there is a possible cycle that could formulate between an individual's human environment, hemisphere dominance and perceptual skills and hemisphere dominance.

The present study investigates the relationship between an individual's human environment, and the brain dominate hemisphere, and the perceptual level of that individual, and brain dominate hemisphere.

Statement of the Problem

Creativity and perception are major components of a design profession. Several studies explain the technical process and development of perception (Attneave, 1971; Gibson, 1969), the sexual differences of perception levels (Durio, 1976; Allen, 1974; Harris, 1981), and factors that influence perceptual skills for an individual such as culture, age, and education (Durio, 1976; Olson, 1966). Studies also show that the brain is the major component that affects the human's thinking and body movements (Wittrock and Beatty, 1977), and that one of the two hemispheres, left or right, usually becomes dominant (Evans, 1978). However, this researcher found few studies that investigated the psosibility of a cycle that may develop between an individual's human environment, the brain hemisphere that becomes dominant, and an individual's perceptual skills.

Since perception is an important skill in disciplines such as Interior Design, there is a need to look at all aspects of perception and its development. If indeed, there is a relationship between an individual's human environment, brain dominance and perceptual level, it is a definite benefit to the design profession to examine such relationships so that the educational system can better train and teach an individual to improve their perceptual levels.

Purpose and Objectives

The purpose of this study was to determine if an individual's human environment has an affect on which brain hemisphere becomes dominate, and if brain hemisphere dominance affects the perceptual skills for that individual.

The objectives of the study were as follows:

1. To determine each student's demographic background through the use of the Oklahoma State University Human Environment Questionnaire.
2. To determine each student's biographical background through the use of the Oklahoma State University Human Environment Questionnaire.
3. To determine the characteristics of each student's human environment through the use of the Oklahoma State University Human Environment Questionnaire.
4. To determine each student's brain dominance (left or right) through the use of the Brain Dominance Verbal Test.
5. To determine each student's three-dimensional perceptual level through the Space Relations Section of the Differential Aptitude Test (DAT).
6. To determine each student's three-dimensional perceptual level through the "Draw A Cube Test".
7. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), from their responses to the Oklahoma State University Human Environment Questionnaire.
8. To compare the scores of the students in Graphics

for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), on the Verbal Brain Dominance Test.

9. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), on the Space Relations section of the Differential Aptitude Test (DAT).

10. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), on the "Draw A Cube Test".

11. To determine if there is any correlation between an individual's human environment and brain hemisphere dominance, and perceptual level and brain hemisphere dominance, as indicated by the test scores.

Statement of Hypotheses

The following hypotheses were derived from the objectives and were analyzed in terms of comparing the scores of the design students with the scores of the humanity students (control group):

H_{01}: There is a significant correlation between the amount of design-related coursework a student has completed, as indicated by the OSU Human

Environment Questionnarie and brain hemisphere dominance.

H_{02}: There is a significant correlation between the amount of a student's work experience as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

H_{03}: There is a significant correlation between a student's travel experience and brain hemisphere dominance as indicated by the OSU Human Environment Questionnaire.

H_{04}: There is a significant correlation between a student's life-long residence setting (rural or urban), and brain hemisphere dominance as indicated by the OSU Human Environment Questionnaire.

H_{05}: There is a significant correlation between a student's score on confidency level of specific skills as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

H_{06}: There is a significant correlation between a student's dominate brain hemisphere as indicated by the Verbal Brain Dominance Test and the scores on the Draw-A Cube Test.

H_{07}: There is a significant correlation between a student's dominate brain hemisphere as indicated by the Verbal Brain Dominance Test, and scores on the Space Relation Section of the Differential Aptitude Test (DAT).

H_{08}: There is a significant correlation between a student's human environment and brain dominate hemisphere, and perceptual skills, and brain dominate hemisphere.

Assumptions

The following assumptions were considered throughout the course of the study:

1. That the students in Graphics for Interiors (HDCR 2123), were not previously exposed to advanced design courses.
2. That the students in Introduction to Humanities (HUMAN 1014), were good representatives for a control group and weren't previously exposed to any advanced design courses.
3. That the researcher has developed a valid scale in which to measure the responses on the Oklahoma State University Human Environment Questionnaire, Space Relations Test, Draw a Cube Test, and the Verbal Brain Dominance Test.

Definition of Terms

Perception - for the purpose of this study, perception will be defined as the ability to transform one- and two-dimensional drawings, descriptive readings or verbal explanations of three-dimensional space into a concrete understanding of what the space would or does look like in reality (Bennet, Seashore and Wesman, 1959).

Creativity - for the purpose of this study, creativity will be defined according to Edwards (1979), as "the ability to find new solutions to problems or new modes of expression; the bringing into existance of something new to the individual" (p. 200).

Brain Hemisphere Dominance - The brain consists of two major hemispheres, i.e., left and right hemispheres. Most individuals consciously or unconsciously develop the use of one hemisphere over the other. Thus, one of the hemispheres becomes dominate. This is called Brain Hemisphere Dominance (Edwards, 1979).

Left Hemisphere - this side of the brain controls the right side of the body and has the following characteristics: speech/verbal skills, logical/mathematical thinking, intellectual, analytical, perception of significant order and complex motor skills (Evan, 1978).

Right Hemisphere - this side of the brain controls the left side of the body and has the following characteristics: spatial/musical skills, artistic, intuitive/creative, receptive, emotional and perceptual skills of abstract figures (Evan, 1978).

Human Environment - for the purpose of this study, human environment will be defined according to Sells (1963) as reported by Milieus (1954):

1. background characteristics such as age, sex, and socioeconomic status, and skill

characteristics such as ability, experience and training;

2. external reference characteristics, e.g. biologically defined factors such as height, weight, physique, race and physical abnormalities or injuries;
3. factors related to geographic position and/or socioeconomic status, such as rural or urban residence, income, occupational classification, amount of savings, number of dependents, and education;
4. family and primary or marriage group factors, such as legal status, status in family, and number of children; and
5. group membership factors, including number of group memberships, types of groups and social status of groups (p. 13).

CHAPTER II

REVIEW OF LITERATURE

Introduction

There has been extensive research on various factors that have direct influence on the purpose of the study. Therefore, the following categories have been established for this review in order that the reader can develop an understanding of these factors:

- Human Environment Influences on Perception and Creativity
- The Brain and Its Role in Perception
- The Hemispheres of the Brain
- The Minor Hemisphere
- Perception
- Diversity in Perception
- Factors that Affect Perception
- Improving Perceptual Skills.

Human Environment Influences on Perception and Creativity

To study perception as a separate entity is impossible. There are several factors that influence perception and how this skill develops (Ittleson, 1979). Some of these factors include child-rearing processes, education, cultural, and sexual differences (Durio, 1976; Allen, 1974; Eliot and Dayton, 1976; Linderman and Herberholz, 1965).

Several studies show that as a child grows and develops, the creative and perceptual skills of that child decrease (Durio, 1976; Linderman and Herberholz, 1965; Allen, 1974; Evan, 1978). Children usually have more vivid imaginations and express their creativity more easily and freely before their formal education begins (Linderman and Herberholz, 1965; Durio, 1976). This decrease in creativity and perceptual skills takes place because the educational system stresses the analytical concrete disciplines (mathematics, sciences and languages) more than creative disciplines (arts, music and design) (Edwards, 1976, 1979; Jensen, 1979; Evan, 1978). This educational background that begins at the elementary level, has a direct influence on the mode of thinking. Because the educational system is generally directed towards concrete solutions to problems, human minds are more analytically than creatively trained. This educational training often causes an individual to feel that creativity, art and perception are difficult tasks (Edwards, 1976 and 1979).

Creative and perceptual skills are not characteristics of only art or design-related fields. There are also creative businessmen, chemists, and doctors. The point to be made clear is that creativity and good perceptual skills can be a characteristic of anyone (Linderman and Herberholz, 1965).

According to Linderman and Herberholz (1965), a parent and an educational system can "rear" a child so that creative awareness and perceptual skills will improve or at least stabilize, throughout that child's lifetime. A parent's method of teaching a child and developing one's awareness of a person's surroundings will develop one's creative skills (Linderman and Herberholz, 1965; Edwards, 1976 and 1979). Developing one's awareness can be done through traveling, developing alertness, exploring, taking the time to "see" things as they truly are, and letting a child create whatever he wants (within reason), with as many different mediums as he desires (Linderman and Herberholz, 1965).

Through several different cultural experiences such as traveling, visiting museums, and education, children develop awareness, and self esteem which will aid them in viewing new experiences as exciting, which in turn will develop creative maturation (Linderman and Herberholz, 1965).

It is important to realize that to maximize an individual's creative and perceptual skills, it is best to provide an environment that will compliment these attributes early in life (childhood) so that preconceived notions that inhibit or retard creative and perceptual growth will be limited (Linderman and Herberholz, 1965; Edwards, 1976, 1979; Durio, 1976). Developing a creative environment will provide a setting with new experiences that will cause the child to learn to see and perceive objects as they truly are. The more a child learns to see and practices through drawing or creating what he sees, the more that child will develop proportion, ideas of perspective, shapes of objects and details (Linderman and Herberholz, 1965).

The Brain and Its Role in Perception

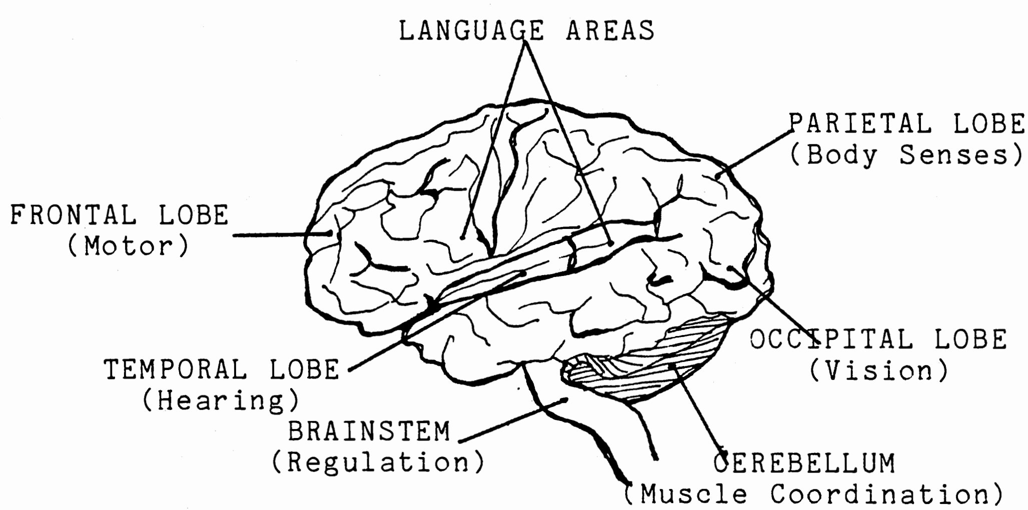
The brain is one of the most important organs of the body. It is this organ that controls our thinking and bodily functions (Teyler, 1977). The human brain is very complex and this author will only touch the surface of its mechanism and functions.

The brain is about the size of a fist at the time of birth and will continue to grow and develop until puberty (Teyler, 1977).

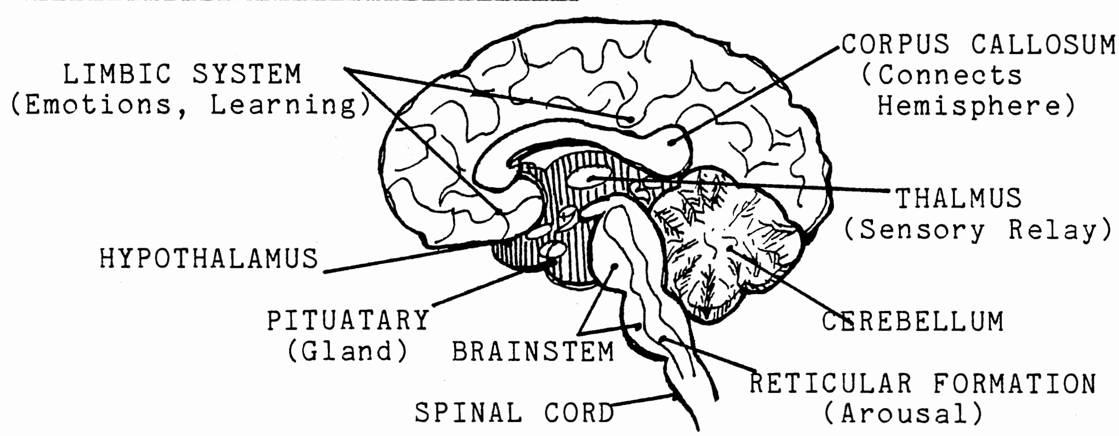
There are several functions of the brain. As a brief overview, the following components of the brain will be defined according to Teyler (1977, pp. 33-34) (see Figure 1):

FRONTAL LOBE: motor areas for all of the skeletal muscles in the body; cells in these zones send axons to neurons in other parts of the brain as well as long axons (23 feet in man, 30 feet in the blue whale) to neurons in the spinal cord which, in turn, send axons directly to muscles.

BRAIN SURFACE - LEFT HEMISPHERE



MIDLINE VIEW - RIGHT HEMISPHERE



Source: Teyler, T.J. <u>An Introduction to the Neurosciences in the Human Brain</u>, New Jersey: Prentice-Hall, 1977, p. 72.

Figure 1. The Components of the Left and Right Hemispheres of the Brain

PARIETAL LOBE: bodily sense areas receiving axon projections from other brain areas (subcortical areas), whose function is to process and pass on body sense information gained from receptors located in the skin, joints and other tissues.

TEMPORAL LOBE: auditory sense areas receiving information indirectly from the cochlea of the ear. There are multiple auditory analyzers in the temporal lobe, each probably dealing with a different aspect of the auditory world.

OCCIPITAL LOBE: cortical sensory analyzers for information from the retina of the eye. This is crucial for visual perception (Gregory, 1975).

CORPUS CALLOSUM - a large bundle of fibers, the corpus callosum, serve to connect the two cortical hemispheres.

The Hemispheres of the Brain

The brain is composed of two major hemispheres, i.e., the left hemisphere and the right hemisphere, that are connected by the bundle of fibers called the corpus callosum (Tyler, 1977; Beatty, 1977; Edwards, 1976, 1979; Gardner, 1975). These two hemispheres interact with each other, however, each hemisphere has distinct features and functions of their own. The corpus callosum is the "cord" that connects these hemispheres and allows for messages from one hemisphere to cross over to the other (Beatty, 1977; Teyler, 1977). However, when this cord is severed, these hemispheres become separate and act independently of each other (Nebes, 1977, 1974; Gardner, 1975; Gregory, 1973).

Figure 2 shows an illustration of the human brain with an overview of the left and right hemisphere's characteristics. Through several studies,the left hemisphere is proven to be the analytical hemisphere which excells in language, mathematics, logic, reading, writing, complex motor skills and controls the right side of the body (Evan, 1978; Garner, 1975; Beatty, 1977; Teyler, 1977; Nebes, 1974). The right hemisphere has been proven to be the side of the brain with creativeness, artistic ability, pattern recognition, spatial perception, and controls the left side of the body (Evan, 1978; Harned, 1972; Beatty, 1977; Teyler, 1977). Therefore, it can be said that the people who are "right-handed" are left hemisphere dominate and those people who are "left-handed" are right hemisphere dominate.

This phenomenon of the hemispheres controlling distinct sides of the body is supported by research. Gardner (1975) in his hemisphere specialization research showed that a person with one hemisphere (left or right) damaged, could only function with the opposite side of the body with the undamaged hemisphere. For example, a patient that was blindfolded, would be touched on the undamaged side of his body. This patient was not able to reach with the opposite hand, over to the part of the body that had been touched, nor, was the patient able to point to the opposite side to show where the body had been touched (Gardner, 1975).

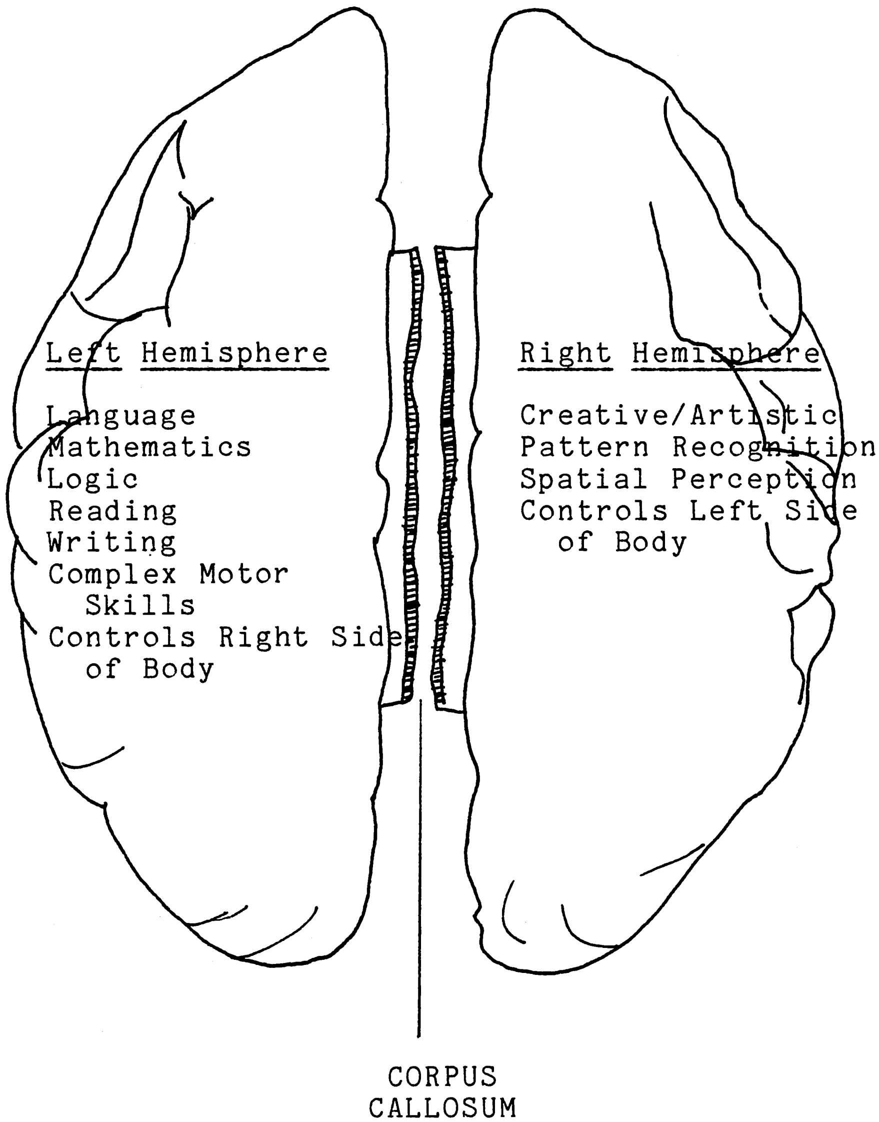


Figure 2. Brain Hemisphere Characteristics

The study of hemisphere specialization has developed over the years and there is now a better understanding of the functions of the left and right hemispheres.

As stated earlier, the hemispheres do interact with each other through the connecting fibers located in the brain, called the corpus callosum. However, when brain damage of one hemisphere occurs, or when the corpus callosum is severed, the hemispheres act independently of each other. This phenomenon is often referred to as "the Split Brain in Man" (Gazzaniga, 1972).

The overwhelming majority of hemisphere research has been performed on victims of brain damage-related accidents or people treated for severe epilepsy through the surgical separation of the corpus callosum called commisurotomy or callosectomy (Nebes, 1977; Gardner, 1975; Gregory, 1973).

Through the studying of brain damaged or commissurotomized people, the theories on the characteristics of the two hemispheres of the brain have been proven to be accurate.

The right hemisphere has often been referred to as the minor hemisphere (Harnad, 1972; Nebes, 1977; Bakan, 1969). This so-called "minor Hemisphere" has been underestimated in its capabilities for a long time. Several studies show that the right-hemisphere is the hemisphere of the brain that controls a person's spatial perception, musical ability, and pattern recognition (Bakan, 1969; Nebes, 1974, 1977; Teyler, 1977).

Nebes (1974) speaks of a study on commissurotomy patients performed by Levy-Agristic and Sperry (1968) in which spatial perception ability was tested. For this particular research, each patient was told to blindly feel a three-dimensional, solid form with either their left or right hand, while simultaneously looking at two-dimensional fold-out patterns. The goal of the study was to determine if the patients could feel the solid form (without seeing it), and point to the correct two-dimensional, fold-out form, that, if folded into a three-dimensional object, would match the three-dimensional form they were holding (Levy-Agresti and Sperry, 1968, as reported by Nebes, 1974). The results of the study showed that those patients who blindly held the three-dimensional form in their left-hand (right hemisphere controls the left side of the body), excelled in their ability to match the object with the flat, two-dimensional, fold-out patterns, than those patients who held the objects in their right hands.

It was also noted that the left-handed, right-hemisphere patients were able to visually "fold-up" the two dimensional pattern form and relate it as a whole, to the three-dimensional object in their hand, whereas the right-handed, left hemisphere patients paid closer attention to sharp linear differences in the objects as well as specific details (attention to details is a characteristic of the left-hemisphere of the brain). Therefore, these patients were unable to match the three-dimensional object to the correct pattern configuration.

To conclude that a person with right-hemisphere brain damage cannot perceive properly is incorrect (Gardner, 1975; Nebes, 1974). The fact is that an impaired right-hemisphere person can perceive an object, however, it is the sense of proportion and spatial relationships that are damaged (Gardner, 1975).

Studies performed by Gardner (1975) showed that persons with right-hemisphere damage can draw an illustration of a house with specific details (i.e., doors, windows, chimneys), however, the overall, general configuration of the house is out of proportion (Gardner, 1975). Also, because this is a right-hemisphere damaged person, more often than not, the left side of the drawing was left incomplete (Gardner, 1975).

Gardner (1975) administered the same test to left-hemisphere damaged patients. As expected, the results showed that these patients were able to draw the general configuration of the house, however, they were unable to draw any specific details.

In general, the right-hemisphere damaged patient contains perceptual skills, however, the overall sense of proportion is not present (Gardner, 1975). However, since the patient's left hemisphere isn't damaged, the patient's verbal skills are still good and he/she is able to explain verbally what the object should look like and therefore, help in his/her own understanding of the object (Gardner, 1975). In the case of the left-hemisphere damaged person, the right hemisphere is in good condition, therefore, he/she is able to draw the house and/or object, however, because his/her language capabilities are impaired, this person is unable to recognize and explain what the object should contain in terms of details. However, the overall proportions, shapes and drawings of the house are far better than the right-hemisphere, damaged patient (Gardner, 1975).

The Minor Hemisphere

All of these studies discussed have helped the physical and social sciences better understand the human brain and the characteristic of each hemisphere.

The question that needs to be considered is why is it that the right hemisphere, with its vital perceptual functions, is considered to be the "minor hemisphere"?

Our educational system generally stresses concrete thinking and analytical processes (Beatty, 1977; Edwards, 1976, 1979). Coursework requirements, teaching styles, and testing procedures for the most part, tend to develop the concrete thinking and memorization skills of students (McKeachie, 1978; Hoover, 1980). Since these are left hemisphere characteristics (Nebes, 1974, 1977; Gardner, 1975; Beatty, 1977, Evan, 1978), the left hemisphere becomes dominate, forcing the right side of the brain to become the minor hemisphere (Nebes, 1974, 1977; Bakan, 1969; Harnad, 1972).

Educators need to be aware of the characteristics of the brain hemispheres and to make an attempt to identify hemisphere dominance in each of their students (Beatty, 1977). Being alert to hemisphere dominance will enable the teacher to instruct students complimenting the strengths of their dominate hemisphere (Beatty, 1977).

It is important to realize that just because one hemisphere becomes dominate, it does not mean that the other hemisphere cannot be equally useful. There are studies that show with proper training, an individual could be trained to "switch" hemisphere modes whenever a situation demanded (Edwards, 1976, 1979; Linderman and Herberholz, 1965).

By training an individual to exercise and utilize the right hemisphere characteristics, a person is able to use both brain hemispheres to a maximum level (Edwards, 1979).

Edwards (1979) has tested several teaching techniques concerning the development of the right hemisphere. One of Edward's (1979) most successful techniques was found to be having a group of students draw a given portrait of a person, turned up-side-down. This forces the student to take time to "see" the person they are drawing and to concentrate on what the true form, texture and shape of the person is. After several exercises and the training of the eye to truly "see", most students are able to increase their creative levels and art ability (Edwards, 1976, 1979). In other words, the right hemisphere is exercised and becomes more utilzied. The individual, therefore, is now able to switch hemisphere modes to compliment a particular situation (Edwards, 1976, 1979).

Although the educational system stresses analytical thinking, the biological and social sciences are beginning to recognize the importance of the right hemisphere (Nebes, 1977). With the continuation of research in this area, social scientists do believe that the educational system will change so that the right "minor" hemisphere will begin to be trained and utilized in the educational system (Nebes, 1977; Evan, 1978).

Perception

Perception, like creativity, is a very subjective characteristic of every human being. No two people perceive an object in exactly the same way, therefore, studying and defining perception becomes very difficult (Hart, 1975). Also, because perception varies greatly from individual to individual, determining if an individual is perceiving "correctly" or "incorrectly" is again, difficult (Hart, 1975).

Perception is an inherent characteristic of humans (Arnheim, 1954). Although we may never be able to understand or "see" an object as another person perceives an object, it is the responsibility of our educational system to help others improve their perceptual skills (Huxley, 1954).

Although definitions on perception are widely varied among psychologists, there has been a great deal of research and in an attempt to define common characteristics of this phenomenon.

According to Ittelson (1979), the following three attributes of perception exist:

1. Facts on perception always present themselves through concrete individuals dealing with concrete situations and may be studied only in terms of transactions in which they can be observed

2. Within such transactions, perceiving is done by a particular person from his own position in space and time and with his own combination of experiences and needs.

3. Within particular transaction and operating from his own personal behavioral center, each of us, through perceiving, creates for himself his own psychological environment by attributing certain aspects of his experience to an environment which he believes independent of the experience called externalization (pp. 11-12).

Gregory (1973) defines perception as:

> Perception is not determined simply by the stimulum patterns; rather it is a dynamic searching for the best interpretation of the available data.
>
> Perceiving and thinking are not independent: 'I see what you mean', is not a puerile pun, but indicates a connection which is very real (p. 12).

To study perception as a separate entity is impossible. Perception always takes place simultaneously with another activity (Ittleson, 1979). In other words, it cannot be examined in a pure state (Ittleson, 1979; Gregory, 1973).

External factors that influence perception include sight, taste, smell, hearing and tactile abilities (Ittleson, 1979). Without at least one of these factors in existance, an individual would not be able to perceive (Ittleson, 1979).

According to Gregory (1973), "vision representation corresponds to the brain's representation of touch" (p. 44). Therefore, the sense of touch and sight are closely related. Since we often perceive what we cannot touch, at times, perception becomes a difficult feat (Gregory, 1973).

As well as external factors that affect perceptual ability, there are internal and physical factors that also act as a stimulus. The most major stimuli for perception is the eye and the brain (Gregory, 1973; Attneave, 1971).

The retina or lens of the eye is the transitional component to the brain (Arnheim, 1954; Gregory, 1973). The object is seen by the retina and then transposed to either the right or left cortex of the brain (Arnheim, 1954; Attneave, 1971; Gregory, 1973). The right and left cortexes are the bodies of tissues that contain the intricate and imperative components for perceptual processes (Gregory, 1975.) Therefore, the retina is the catalyst to visual perception in that it first sees the object and then transmits the image to the left or right cortex of the brain (Arnheim, 1954). The cortex then allows the person to see an object as it truly is and to perceive the two-dimensional object onto three-dimensional form (Arnheim, 1954).

The mechanics of perception i.e., the retina transfering the image to the cortex, seems to make the concept of perception easily understood. Actually, quite the contrary is true. Although the mechanical process of perception is generally the same for all humans, all individuals perceive differently (Beatty, 1977). For example, perception can be measured by observing the eye's pupil constriction and contraction (Beatty, 1977). Beatty (1977) explains that when an individual is confronted with a difficult, perceptual task, the pupil constricts (becomes smaller). However, as the solution to this task becomes apparent, the pupil begins to contract (becomes larger) until the solution is found and the pupil returns to normal size. The point to be made here is that what is considered to be a difficult perceptual task to one individual, may be considered simple to another. Therefore, two individuals confronted with the same percpetual task may solve the problem in two entirely different ways and in different amounts of time (Beatty, 1977).

When researching the concept of perception, one must ask the question how does the brain know when to "tell" the individual what it is perceiving? For example, how does the brain recognize the object it is seeing?

There are two major theories to address this question. The Gesalt psychologists believe that the brain sees an object as a whole, stores this object in its memory and whenever an individual looks at the same object, the brain recognizes it (Noton and Stark, 1971; Gregory, 1973). The major point that the Gesalt psychologists believe is that the brain perceives objects as whole units (Noton and Stark, 1972; Gregory, 1973).

A contrasting theory on perception is that the brain perceives an object after it has been examined in components or parts. According to Noton and Stark (1971), the brain looks at an object in a disassembled fashion. Then, the brain choosing recognizable parts, puts them together until it perceives or recognizes the object.

Noton and Stark (1971) came to this conclusion after several studies performed on their concept called the "feature ring" (p. 40). In their studies, Noton and Stark were interested in determining if their concept of the brain perceiving an object in a disassembled fashion was true (the feature ring). In one of their experiments, subjects were allowed to view five pictures which they had never seen before, for 20 seconds each. Noton and Stark (1971) refer to this segment of the experiment as the learning phase since the subjects had never seen the objects before. Eye movements were recorded during this phase. Immediately after the learning phase, the subjects were to participate in what was called the recognition phase. This phase consisted of the subjects viewing the previous five pictures intermixed with five pictures that they had never seen before. The purpose of introducing five pictures in this phase was to make recognition less easy. The subjects were allowed to view each picture five seconds. While this phase was taking place eye movements were recorded.

The results of this study supported Noton's and Stark's (1971) theory on the brain perceiving objects in broken segments. Analyzing the eye recordings, it was found that the eye scanned the object in broken parts. When comparing these recordings with the eye recordings of the recognition phase, Noton and Stark (1971) discovered that the eye followed the same scanning pattern as in the learning phase, until the object was recognized. This is referred to as the "feature ring." As a conclusion to their study, Noton and Stark (1971) support their theory that the eye, during the learning phase (seeing an object for the first time), will observe distinct features until an object is formed, then, when the eye sees the object again, it will follow the same scanning pattern, i.e., will notice the same features determined in the learning phase, until the object is recognized. This concept is the feature ring (Noton and Stark, 1971).

There are several studies that support the "feature ring" theory on perception. For example, numerous studies show that an individual takes more time to recognize an object than to not recognize an object (Gregory, 1973; Attneave, 1971; Rock, 1971). This supports the feature ring concept in that it would take more time to observe features of an object a person recognizes than it would to observe features of an object that is not recognizable (Noton and Stark, 1971).

Further support for the "feature ring" concept can be found in a study by Leonard Zusner and Kenneth M. Michels at Purdue University as reported by Noton and Stark (1971). In this research, it was found that the eye of an individual will search for sharp angles of an object and anything usual in terms of form or shape. It is believed that reasoning for this type of eye movement is that angles and unusual features of an object are most easily remembered by the brain, therefore, making recognition of the object possible when it is seen again (Zusner and Michels, as reported by Noton and Stark, 1971).

Gregory (1973) in his studies on perception, found that the eye selects distinct features of an object that can be easily recognized, making repeated perception of the object less difficult. These studies on perception support Noton's and Srark's concept of the "feature ring".

Diversity in Perception

Perception is a complex process that greatly varies from one individual to another. Attneave (1971, p. 143) refers to this variability as "multistability in perception."

When the retina of the eye looks at an object, it is perceived by the brain and it usually remains stable. In other words, the perception of the object ususally does not change (Attneave, 1971). However, when the object is "ambiguous", the eye and the brain can perceive the object in several different ways and at different times (Attneave, 1971). Attneave (1971) explains examples of several ambiguous figures and characteristics of ways people perceive such figures. Perhaps the most classic example of an ambiguous figure is the Necker cube (Figure 3) developed by Louis Albert Necker, in 1832 (Attneave, 1971). When a person stares at this cube, at one point the cube could be perceived as if the top plane of the cube is seen, and yet at another moment, the cube could be perceived as if the bottom plane of the cube is seen. There is no right or wrong in terms of how this cube is perceived. However, this Necker cube object is one example of diversity in perception (Attneave, 1971).

Another example of variability in perception is the concept of figure-ground reversal (Attneave, 1971). An example of this concept is the Reversible Goblet developed by Edgar Rubin in 1915 (Figure 4). As seen in this goblet and the figure-ground reversal concept, one line can be representative of two or more objects. For example, by looking at the white space in the Reversible Goblet, a person can see the goblet shape. By shifting the eye to the dark area or outline of the goblet, a person could see the contour of two faces looking at each other.

Again there is no right or wrong way to perceive figure

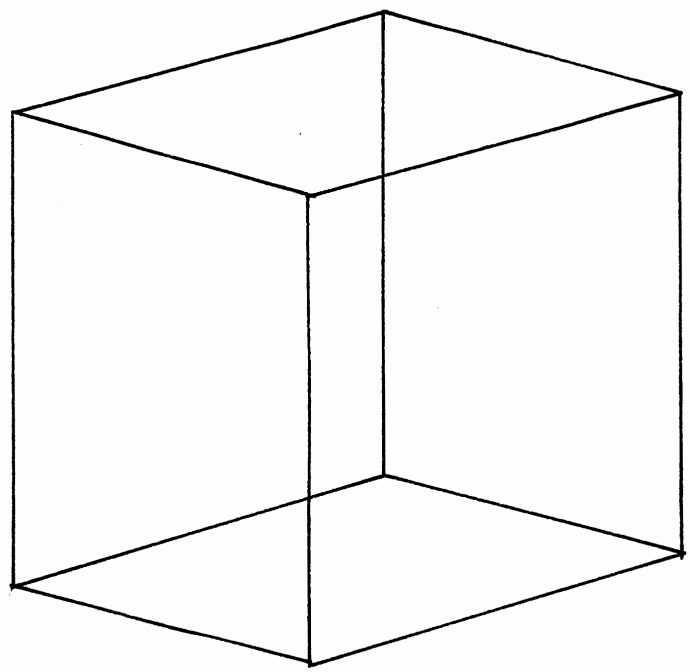


Figure 3. The Necker Cube

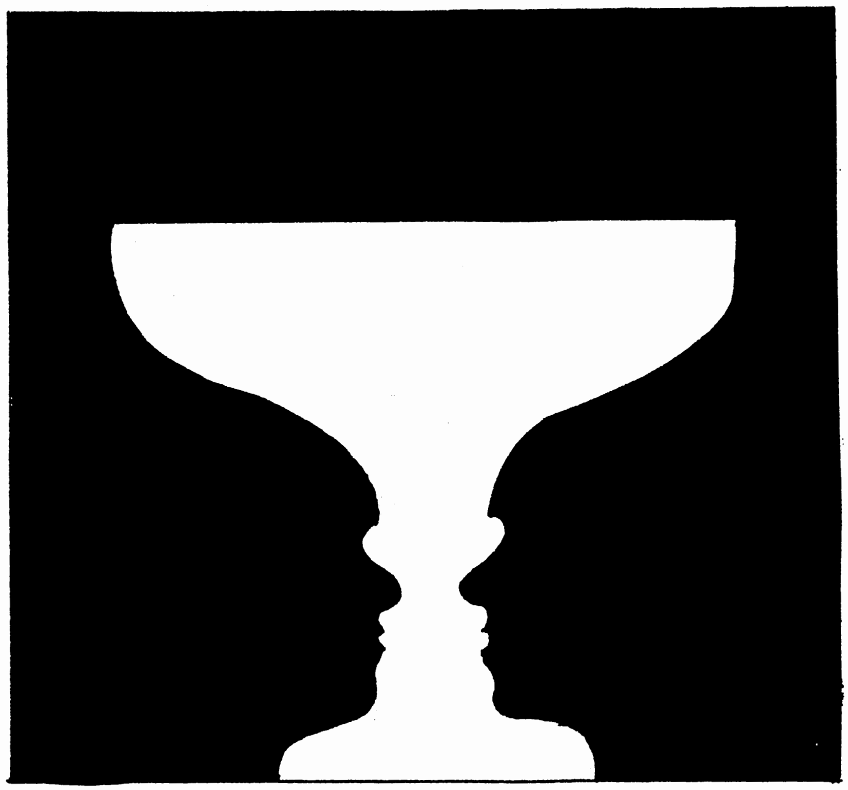


Figure 4. The Reversible Goblet And Figure-Ground Reversal

ground reversal objects. Such a concept further explains variability in perception (Attneave, 1971).

A person may be able to perceive one aspect of an ambiguous figure but not the other (Attneave, 1971). In other words, a person may be able to see the two faces in the Rubin Goblet Figure-Ground Reversal example, but not the Goblet or visa-versa (Attneave, 1971). However, once both objects in an ambiguous figure are pointed out to an individual, usually they are both seen (Attneave, 1971). It is not uncommon for the mind to be confronted with several objects to be perceived at one time.

If there are a series of figures or objects, the perceptual system has a tendency to group these objects together. Those that seem to be most alike or similar are grouped together (Attneave, 1971). For example, Attneave (1971), in his research found that a series of dots are usually grouped in columns if the spacing between the dots are greater horizontally than vertically, and if the spacing is greater vertically than horizontally, that series of dots are seen as rows.

There are several theories on how one perceives one object before another. Attneave (1971) has concluded that a person perceives the simplest, most compact and symmetrical figures over a complex and unfamiliar object. An expansion of this theory is presented by the Gesalt psychologists and called Pragnanz (Attheave, 1971). This concept says that "one perceives the 'best' figure that is consistant with a given figure. By best, we mean simplest" (Attneave, 1971, p. 147).

Gregory (1973) has also researched theories on why one figure is more easily perceived over another and has concluded that it is much easier to perceive, draw and recognize familiar objects than it is to perceive or recognize unfamiliar objects.

These theories all believe that unfamiliar or complex objects are more difficult to perceive than simple and familiar objects (Attneave, 1971; Gregory, 1973). However, this does not mean that complex, and unfamilar objects are not perceived. More complex figures are perceived more easily in depth, whereas, simple figures are usually perceived in two-dimensional form (Attneave, 1971). Also, depth is more easily perceived if associated with pattern (Pick, 1979).

Factors That Affect Perception

Our perceptual ability is affected by what we are expected to see which sometimes interferes with what we should actually be perceiving (Buckhout, 1974; Edwards, 1976; Julex, 1965).

Buckhout (1974) reported on a study performed by Jerome S. Bruner and Leo Postman at Harvard University in 1930, that researched a person's preconceived notions with perceptual ability. In one experiment, Bruner and Postman had a series of aces of hearts, spades, diamonds and clubs (from a deck of game cards). From the selection of aces, each subject was to look at the aces and tell the researchers how many aces of spades they saw. The overwhelming majority of subjects reported seeing three aces of spades. Actually, there were three, black aces of spades and two red aces of spades, therefore, a total of five aces of spades were present. However, because people are so accustomed to seeing only black spades, the subjects preconceived notions interfered with perceiving the correct number of spades.

Depending on the mind to remember how something operates or looks like is likely to lead to misrepresentations of that object or situation (Buckholt, 1974). For example, in a study performed by Buckholt (1974), several subjects were asked to look at a partially drawn triangle (see Figure 5). One month later, the same subjects were asked to draw what they had seen a month earlier. The majority of subjects drew an almost completed the triangle (see Figure 6). Three months later, the same subjects were asked to again draw the same object they had seen at the beginning of the experiment. This time, the majority of subjects drew a completed triangle (see Figure 7). These findings support the concept that what people believe an object should look like often interferes with perceiving how the object truly is shaped (Buckholt, 1974).

What we "know" or pre-conceived notions often get in the way of perceiving an object correctly (Hart, 1975). As

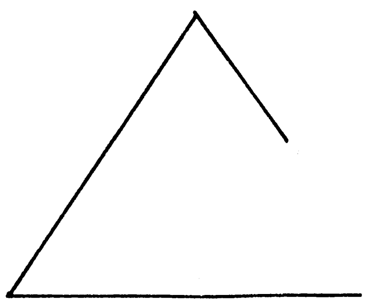


Figure 5. Partial Triangle Shown to Subjects

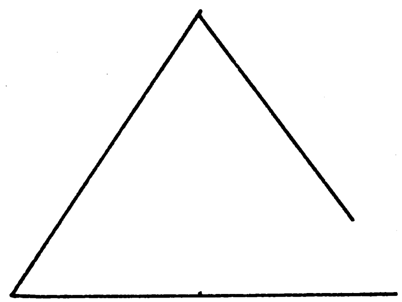


Figure 6. Triangle Drawn by Subjects One Month Later

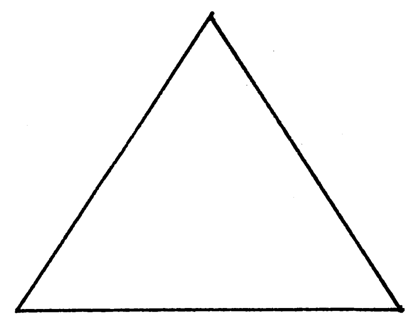


Figure 7. Triangle Drawn by Subjects Three Months Later

long as we perceive a good presentation of the actual object, then we are alright. However, we often "think" we know about the object in discussion, when actually we do not, and our perceptions become distorted (Hart, 1975).

Improving Perceptual Skills

Learning to see and overcoming our preconceived notions is the key to increasing perceptual skills (Edwards 1976 and 1979). Edwards (1979) believes that by learning to draw, a person is forced to train the eye to "see" and "perceive" objects as they truly are:

> . . . learning to draw could provide a means, through perceptual - skill training, of tapping into abilities which often remain untapped in our predominantely verbal and analytical culture (p.8).

Awareness of what is around us in our world will also improve perceptual skills (Linderman and Herberholz, 1965). We are surrounded daily with so many different objects, colors, and textures, that we take them for granted. We have to make distinctions and develop appreciation of what we have (Julez, 1965). By recognizing that every object that we see or perceive is not identical, we can train our eyes to see objects in detail and as they truly are (Edwards, 1976, 1979). This can improve our perceptual skills by eliminating any pre-conceived notions or obstacles that will interfere with perceiving objects correctly (Edwards, 1976, 1979; Julez, 1965).

Summary Statement

An individual's human environment includes factors from background and skill characteristics, to socioecomonic status (Milieus, 1974). All of these factors contribute to the formulation of an individual's values, attitudes, status and achievement levels in specific skills such as spatial perception.

The study of perception as a separate entity, however, is very difficult, if not, impossible. The brain plays a major role in the function of perception, therefore, it is necessary to investigate the components of the brain when researching spatial perception.

Studies on brain hemisphere dominance reveal specific characteristics of the two hemispheres that affect perceptual levels for an individual. Right hemisphere dominate people seem to have a higher competency level when tested on perception, whereas, left hemisphere dominate individuals find perception a more difficult task.

A review of literature pertinent to the study of possible relationships between an individual's human environment, brain dominate hemisphere and perceptual skills reveals that there is a valid need to research these potential relationships. Although the author found no research specifically examining any existance of relationships, the literature review does show that characteristics of human environments, hemispheric dominance and perception do overlap, suggesting that relationships between these three variables exists.

CHAPTER III

METHODOLOGY

The purpose of this chapter is to identify the methodological and statistical procedures used in this study. This chapter will discuss the research design of the study and will specifically address the sampling procedures, instrumentation, data gathering processes and statistical analysis procedure.

Research Method

The purpose of this study was to determine if there is a relationship between an individual's human environment, brain hemisphere dominance and perceptual level. Since this study is concerned with relationships between non-controllable variables, descriptive research was the most appropriate research design for the study (Best, 1981). According to Best, descriptive research can be defined as

> . . . nonexperimental, for they deal with relationships between non-manipulated variables in a natural rather than artificial settings. Since the events or conditions have already occurred or exist, the researcher selects the relevant variables for an analysis of their relationships (p. 106).

Population and Sampling Procedures

The population of this study included all officially admitted, Oklahoma State University students, in the Department of Housing, Design and Consumer Resources, enrolled in HDCR 2123, Graphics for Interiors, for the Fall, 1982 semester.

The samples of interior design students and students to serve as a control group were selected through purposive sampling. Purposive sampling is a non-probability sampling method, that allows the researcher to select a sample that meets certain standards or critieria necessary for the validity of the study (Babbie, 1979).

The sample of Interior Design students was selected based on the purpose of the study. Because of the limited number of members of the design population, the sample consisted of the entire population. The students enrolled in Graphics for Interiors (HDCR 2123), were beginning design students, and previous design experience was very limited. Therefore, the majority of the students were on the same basic level of design competency. In other words, very few, if any, students would have had the advantage of having advanced design training or previously been administered any of the tests used in this study (instrumentation is discussed later in this chapter). These characteristics of limited design experience and no previous exposure to the instruments, were important so that each subject's human environment was being measured as the variable and not any advanced training in design or familiarity with testing procedures which may influence hemispheric dominance and perceptual level.

Students officially admitted to Oklahoma State University, and in the Department of Humanities and enrolled in HUMAN 1014, Introduction to Humanities served as the control group. These 23 students were selected as the control group with the assumption that they would have had minimal, if any, design-related experience. Therefore, by comparing the data from the design population with the data from the control group, it would be possible to see if the results of the study were characteristic of the design student, the control group, or both.

Instrumentation

In order to test the hypotheses of the research and to achieve the purpose of the study, valid and reliable instrumentation must be utilized. For the purpose of this study, one questionnaire and three instruments were used. The questionnaire selected was an adaptation of the Oklahoma State University Biographical/Demographical Questionnaire by Louis Steinbrink Harris (1981). The purpose of this questionnaire (see Appendix A) was to gather information about an individual's human environment. Questions were designed specifically to gather information on age, education, travel experience, work experience, skill characteristics, and rural or urban residency.

In order to determine the brain hemishpere dominance of each subject, an adaptation of the Verbal Brain Dominance test used in a similar study: An Experiment in Perceptual Skills in Drawing by Betty A. Edwards, Ed.D., was utilized. This test consisted of three verbal questions (for an example of the test, see Appendix B), in which the subject's thinking processes were examined and eye movements recorded. Studies show that when an individual is asked an analytical question or one that requires reflection, their eyes tend to move in the opposite direction of their dominate brain hemisphere (Bakan, 1969).

Therefore, each subject was asked three analytic and reflective questions in which their eye movements were recorded immediately after exposure to each verbal question. Three out of three or two out of three eye movements in one direction indicated the opposite side as the dominate hemisphere for that individual. In other words, if a subject's eyes moved twice to the right, that individual was considered left hemisphere dominate. If an individual's eyes moved in three different directions or didn't move at all, that subject was considered inconclusive (neither right or left hemisphere dominate).

Testing each subject for perceptual level was accomplished by two tests: the Draw A Cube Test developed by the researcher, and the Space Relations Section, Form T, of the Differential Aptitude Tests (DAT) by Benner, Seashore and Wesman (1959).

The Draw A Cube Test consisted of written instructions on drawing five specific cube shapes which all subjects were to draw. The subjects were requested to read five written instruction statements and then graphically draw what the instructions requested (see Appendix C). The purpose of this test was to determine how well a student could read a description of a three-dimensional cube, perceive what this shape looked like, and then, graphically draw this cube. Three design professonals and professors in the Department of Housing, Design and Consumer Resources at Oklahoma State University, subjectively examined the test to assure the researcher that the test was clear and valid for testing of spatial perception.

The identical panel of professionals who validated the Draw A Cube Test also scored each test. Each panel member received a separate packet that contained the results of the test. In other words, the tests were scored individually by each panel member to assure that the subject was given a valid score. The panel members were given written instructions (see Appendix C) that explained scoring procedures. The highest possible score was five and the lowest was one. Included in the instructions was a key which showed the ideal solutions to the test. Therefore, all students were scored on equal criteria.

After the panel members completed the scoring process, the three individual scores for each subject were averaged into one score. If a score averaged into a decimal numeral, and if that decimal was .5 or greater, then the numeral was rounded up to the nearest whole number. For example, if a subject's score averaged to 3.7, then the whole score of four was recorded. However, if a score was average to be 3.2, then, the whole score of three was recorded.

The second test used to measure perceptual skill was the Space Relations Test, Form T of the Differential Aptitude Test (Bennet, Seashore and Wesman, 1959). This test measures the subject's ability to perceive three-dimensional, solid forms by looking at flat, two-dimensional patterns and transforming these patterns into the correct three-dimensional solid.

This test consisted of 60 multiple choice questions which tested spatial perception. The scoring procedure consisted of subtracting the amount of errors from the 60 possible points. For example, if a student missed ten questions, the score was then recorded as 50.

Method of Data Collection

The Human Environment Questionnaire was administered to the subjects during the regularly scheduled class times during the Fall Semester of 1982. The questionnaire was distributed to each subject after this researcher verbally explained the purpose of the questionnaire and that no identity was associated with the questionnaires. The students were allowed to take as much time as needed to complete the questionnaire, however, most students completed the information in 15 to 20 minutes.

The Verbal Brain Dominance Test was administered by the researcher at the same time that the Human Environment Questionnaire was being completed. Since neither instrument was timed or required strenuous thinking, interrupting a student from the questionnaire so that they could take the Verbal Brain Dominance Test was not considered disruptive to the student or to the validity of the instruments themselves.

On an individual basis, each student was asked to come out into the hall where the researcher was sitting at a desk. By administering the verbal test in a different setting than where the questionnaire was taking place, the possibility of the subjects hearing the questions previous to their actual testing time was avoided. Each subject was given the explanation that the verbal test was not graded, nor was there any association between this testing and the actual course grade.

By the time the verbal brain dominance testing was completed, the questionnaire was also completed. In the remaining time, the Draw A Cube Test and the Space Relations Test were completed. The subjects were first given the Space Relations Test which was a 25 minute, timed examination. This researcher verbally explained the purpose of this test and the instructions (included examples), before the actual testing time bagan. After the 25 minutes expired, the tests were collected and all the students were administered the final test: The Draw A Cube Test. The researcher explained the purpose of the test verbally to the subjects and also explained that there was no association between the Draw A Cube Test and course grade. This test was not timed, however, most of the subjects did not require more than ten minutes to complete the test.

Data Analysis

Two major statistical analyses were used to test the hypotheses of this study. These analytical procedures which included analysis of variance (ANOVA) and chi-square, were computed by the Statistical Analysis System at the Computer Center of Oklahoma State University.

The data was analyzed in two separate groups, i.e., the design group, consisting of students enrolled in Graphics for Interior Designers and the control group (the Introduction to Humanities students). This was done so that comparisons could be made.

Specific statistics were derived from the data by comparing variables such as hemisphere dominance and the data collected from the Human Environment Questionnaire, hemispheric dominance and the scores from the Draw A Cube Test and hemispheric dominance and the scores from the Space Relations Test. These comparisons were tested by the chi-square and analysis of variance statistical procedures. The alpha level of .05 was used as the level of significance.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this chapter is to explain the results of the data analyses. The results of this study will be described according to the hypotheses in Chapter I.

Sample Description

The Human Environment Questionnaire provided descriptive statistics for both the design and control groups. An overview of these statistics can be seen in Tables I and II.

It was found that of the Design Students, 8.30 percent were freshmen, 44.50 percent were sophomores, 33.30 percent were juniors, 5.60 percent were seniors and 8.30 percent were graduate students. Seventy-five percent of the students declared their major as Interior Design, 5.60 percent major in Graphic Design, 5.60 major in Housing, and 5.60 percent are undecided. Art was a major for 2.80 percent, Home Economics Education was a major for 2.80 percent and the remaining 2.80 percent declared a major in business. The age of the design students varied from 5.60 percent being 18 years old, 47.20 percent were 19, 22.00 percent were 20, 5.60 percent were 21, 11.00 percent were ages 22-30, 5.60 percent were ages 31-40, and 2.80 percent were 40

TABLE I

CHARACTERISTICS OF THE DESIGN GROUP SAMPLE
(N=36)

Characteristics	Frequency	Percent
EDUCATIONAL STATUS		
Freshman (0-29 Hours)	3	8.30
Sophomore (30-44 Hours)	16	44.50
Junior (45-74 Hours)	12	33.30
Senior (75 or More Hours)	2	5.60
Graduate Student	3	8.30
Other	0	0.00
MAJOR AT OSU		
Interior Design	27	75.00
Art	1	2.80
Graphic Design	2	5.60
Housing	2	5.60
Home Economics Education	1	2.80
Business	1	2.80
Undecided	2	5.60
AGE		
18	2	5.60
19	17	47.20
20	8	22.00
21	2	5.60
22-30	4	11.00
31-40	2	5.60
Over 40	1	2.80
HEMISPHERE DOMINANCE		
Right	9	25.00
Left	23	64.00
Inconclusive	4	11.00

TABLE II

CHARACTERISTICS OF THE CONTROL GROUP SAMPLE
(N=23)

Characteristics	Frequency	Percent
EDUCATIONAL STATUS		
Freshman (0-29 Hours)	6	26.09
Sophomore (30-44 Hours)	0	0.00
Junior (45-74 Hours)	12	52.18
Senior (75 or More Hours)	5	21.73
Graduate Student	0	0.00
Other	0	0.00
MAJOR AT OSU		
Engineering	4	17.00
Advertising	2	9.00
Economics	1	4.00
Geology	2	9.00
Physical Education	1	4.00
Biology	2	9.00
Art	2	9.00
Business Administration	9	39.00
AGE		
18	2	8.70
19	3	13.04
20	11	47.83
21	4	17.39
22-30	3	13.04
HEMISPHERE DOMINANCE		
Right	3	13.04
Left	12	52.18
Inconclusive	8	34.78

years of age or older. The right side of the brain was considered dominate for 25.00 percent of the design students, 64.00 percent were left hemisphere dominant, and 11.00 percent were inconclusive brain dominate.

The descriptive data for the humanity students revealed that 26.09 percent were freshmen, 52.18 percent were juniors, and 21.73 percent were seniors. Seventeen percent of the students declare their major as Engineering, 9.00 percent major in Advertising, 4.00 percent in Economics, 9.00 percent in Geology, 4.00 percent in Physical Education, 9.00 percent in Biology, 9.00 percent in Art and 39.00 percent in Business Administration. The ages of the humanity students varied from 8.70 percent being 18 years of age, 13.04 percent were 19, 47.83 percent were 20, 17.39 percent were 21 and 13.04 percent were between the ages of 22-30. The right side of the brain was considered dominate for 13.04 percent of the students, 52.18 percent were left hemisphere dominate and 34.78 percent were inconclusive brain dominate.

Analyses by Research Hypotheses

As stated in Chapter III (p. 43 and p. 49), purposive sampling was utilized to meet the specific purpose of the study and the analysis of data tested the hypotheses in terms of comparing the design students' scores with the humanity students' scores (control group). Because of the sampling procedures and method of data analysis, it should be recognized that this study investigates trends between a students' human environment and brain hemisphere dominance and perceptual levels and brain hemisphere dominance.

One of the assumptions of the use of chi square is that the expected cell frequency not equal zero. The statistical results of the study sometimes violate that assumption. Therefore, the validity of the chi square coefficent should be used with caution (Loether and McTavusgm 1974).

Hypothesis 1: There is a significant correlation between the amount of design-related coursework a student has completed, as indicated by the OSU Human Environment Questionnaire, and brain hemisphere dominance.

The chi-square statistical procedure was used to test the hypothesis. The null hypothesis was assumed for statistical testing and the predetermined level of significance was .05.

Chi-square coefficients were determined by comparing each course completed by a student as listed in question 7 of the OSU Human Environment Questionnaire, with the dominate brain hemisphere of each student. Tables III and IV show the results of the testing.

Based upon the results of the analyses, the following conclusions pertaining to Hypothsis 1 can be made:

1. There is no significant correlation between the amount of design related coursework completed by a student and which hemishpere becomes dominant.

Tables III and IV show that none of the chi-square coefficients are significant at, or below, the critical value of .05 level of significance. Therefore, the null hypothesis is accepted.

Hypothesis 2: There is a significant correlation between the amount of a students work experience, as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

The chi-square statistical procedure was used to test the hypothesis. The null hypothesis was assumed for statistical testing and the pre-determined level of significance was .05.

Chi-square coefficients were determined by comparing the amount of design related work experience of a student, as indicated in question 8 of the OSU Human Environment Questionnaire, with the brain hemisphere dominance of that student. Tables V and VI show the results of the statistical testing.

Based upon the results of the analyses, the follwing conclusion pertaining to Hypothesis 2 can be made:

1. There is no significant correlation between the amount of a student's work experience, as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

Tables V and VI show that the chi-square coefficients are not significant at the .05 level. The chi-square

TABLE III

CHI-SQUARE CORRELATIONS THAT MEASURE DESIGN STUDENTS COMPLETING DESIGN-RELATED COURSES VERSUS DESIGN STUDENTS NOT COMPLETING DESIGN-RELATED COURSES BY BRAIN HEMISPHERE DOMINANCE

	Courses									
Hemisphere Dominance	Art		Technical Drawing		Freehand Drawing		Painting		Architecture	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Right	8	1	1	8	3	6	4	5	1	8
Left	22	1	7	16	12	11	12	11	4	19
Inconclusive	3	1	0	4	2	2	2	2	1	3
Percentage Total	91.67	8.33	22.22	77.78	47.22	52.78	50.00	50.00	16.67	89.33
Chi-Square	2.0240		2.6830		0.9350		0.1550		0.8290	
Level of Significance	0.3635		0.2614		0.6265		0.9256		0.6608	

TABLE III (Continued)

Hemisphere Dominance	Courses									
	Sculpture		Psychology		Design		Industrial Art		Mechanical Operations	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Right	1	8	9	0	2	7	0	9	0	9
Left	4	19	16	7	8	15	2	21	1	22
Inconclusive	0	4	2	2	0	4	0	4	0	4
Percentage Total	13.89	86.11	75.00	25.00	27.78	72.22	5.56	94.44	2.87	97.22
Chi-Square	0.9390		4.6960		2.5430		1.1970		0.5810	
Level of Significance	0.6253		0.0956		0.2803		0.5497		0.7478	

NOTE: N = 36; Accepted Level of Significance: 0.05.

TABLE IV

CHI-SQUARE CORRELATIONS THAT MEASURE HUMANITY DESIGN STUDENTS COMPLETING DESIGN-RELATED COURSES VERSUS HUMANITY STUDENTS NOT COMPLETING DESIGN-RELATED COURSES BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Courses									
	Art		Technical Drawing		Freehand Drawing		Painting		Architecture	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Right	1	2	0	3	0	3	0	3	0	3
Left	6	6	4	8	2	10	2	10	2	10
Inconclusive	4	4	2	6	3	5	3	5	0	8
Percentage Total	47.83	52.17	26.09	73.91	21.74	78.26	21.74	78.26	8.07	91.30
Chi-Square	0.2900		1.3910		2.1830		2.1830		2.0080	
Level of Significance	0.8648		0.4989		0.3357		0.3664		0.6608	

TABLE IV (Continued)

Hemisphere Dominance	Courses									
	Sculpture		Psychology		Design		Industrial Art		Mechanical Operations	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Right	0	3	2	1	0	3	1	2	0	3
Left	2	10	11	1	4	8	1	11	3	9
Inconclusive	0	8	6	2	1	7	1	7	2	6
Percentage Total	8.70	91.30	82.61	17.32	21.74	78.26	13.04	86.96	21.74	78.26
Chi-Square	2.0080		1.5380		2.1830		1.3260		0.9580	
Level of Significance	0.3664		0.4634		0.3357		0.5154		0.6193	

NOTE: N = 23; Accepted Level of Significance: 0.05.

TABLE V

CHI-SQUARE CORRELATION THAT MEASURES A DESIGN STUDENT'S WORK EXPERIENCE BY BRAIN DOMINATE HEMISPHERE

Hemisphere Dominance	Work Experience		
	Art	Architecture	Construction
Right	1	0	0
Left	2	1	1
Inconclusive	0	0	0
Percentage Total	8.33	2.78	2.78

Hemisphere Dominance	Work Experience			
	Psychology	Design	Other	None
Right	0	0	1	7
Left	1	2	2	14
Inconclusive	0	1	0	3
Percentage Total	2.78	8.33	8.33	66.67

N = 36
Accepted Level of Significance: .05
Chi-Square: 4.9470
Level of Significance: 0.9597

TABLE VI

CHI-SQUARE CORRELATION THAT MEASURES A HUMANITY STUDENT'S WORK EXPERIENCE BY BRAIN DOMINATE HEMISPHERE

Hemisphere Dominance	Work Experience		
	Technical Drawing	Construction	Psychology
Right	0	1	0
Left	0	4	1
Inconclusive	2	1	1
Percentage Total	8.70	26.09	8.70

Hemisphere Dominance	Work Experience		
	Design	None	Work Experience in More than One Area
Right	0	2	0
Left	1	4	2
Inconclusive	0	2	2
Percentage Total	4.35	34.78	17.39

N = 23
Accepted Level of Significance: .05
Chi-Square: 7.8260
Level of Significance: 0.6458

coefficient for the design student's work experience as compared with brain dominate hemisphere is 4.9470 which is not significant. The chi-square coefficient for the humanity students' work experience as compared with brain dominate hemisphere is 7.8260 which is also not significant. Since these coefficients are not significant at the .05 level, the null hypothesis is accepted.

Hypothesis 3: There is a significant correlation between a student's travel experience, as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

The chi-square coefficients statistical procedure was used to test the hypothesis. The null hypothesis was assumed for the testing. In order for the hypothesis to be statistically significant, the chi-square coefficients could not have been more than the critical point of the .05 level.

The chi-square coefficients were determined by comparing the amount of states and countries traveled, as indicated by questions 12 and 13 of the OSU Human Environment Questionnaire and brain hemisphere dominances. Tables VII, VIII, IX, and X show the results of the testing.

Based on the results of the chi-square testing, the following conclusions pertaining to Hypothesis 3 can be made:

1. There is a near statistically significant correlation (chi-square coefficient of 35.7560 was statistically significant at the .0580 level), between

TABLE VII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S TRAVEL EXPERIENCE BY BRAIN HEMISPHERE DOMINANCE

Hemishere Dominance	Number of States Traveled						
	0	2	3	4	5	6	7
Right	1	2	0	0	2	0	0
Left	2	1	6	2	1	6	4
Inconclusive	1	0	1	0	0	0	1
Percentage Total	11.11	8.33	19.44	5.56	8.33	16.67	13.89

Hemishere Dominance	Number of States Traveled					
	8	9	10	11	14	16
Right	0	1	1	1	0	0
Left	0	0	0	0	1	0
Inconclusive	1	0	0	0	0	0
Percentage Total	2.78	2.78	1.28	2.78	2.78	2.78

N = 36
Accepted Level of Significance: .05
Chi-Square: 35.7560
Level of Significance: 0.0580

TABLE VIII

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S TRAVEL EXPERIENCE BY BRAIN HEMISPHERE DOMINANCE

Hemishere Dominance	Number of States Traveled					
	0	1	2	3	4	5
Right	0	0	1	1	1	0
Left	1	2	1	3	0	1
Inconclusive	1	0	0	0	0	1
Percentage Total	8.70	8.70	8.70	17.39	4.35	8.70

Hemishere Dominance	Number of States Traveled					
	6	7	8	9	10	18
Right	0	0	0	0	0	0
Left	1	1	0	2	0	0
Inconclusive	0	1	2	1	1	1
Percentage Total	4.35	8.70	8.70	13.04	4.35	4.35

N = 23
Accepted Level of Significance: .05
Chi-Square: 23.6390
Level of Significance: 0.0580

the amount of traveling experience in the United States by a design student as indicated by the OSU Environment Questionnaire and brain hemisphere dominance.

TABLE IX

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S TRAVEL EXPERIENCE BY BRAIN HEMISPHERE DOMINANCE

Hemishere Dominance	Number of Countries Traveled				
	0	1	2	3	4
Right	6	2	0	0	1
Left	17	3	1	1	1
Inconclusive	4	0	0	0	0
Percentage Total	75.00	13.89	2.78	2.78	5.56

N = 36
Accepted Level of Significance: .05
Chi-Square: 3.3510
Level of Significance: 0.9105

The critical value of .05 or less is the accepted level of significance. The chi-square coefficient of 35.7560 was statistically significant at the .0580 level. Since this level exceeds the established .05 critical value, statistically speaking, the null hypothesis is accepted. However, it should be noted that the chi-square coefficient is near the critical value, therefore, deserves acknowledgement for establishing what seems to be a possible trend between travel experience and hemisphere dominance.

TABLE X

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S TRAVEL EXPERIENCE BY BRAIN HEMISPHERE DOMINANCE

Hemishere Dominance	Number of Countries Traveled 0	1	2	5	7
Right	1	1	0	0	1
Left	9	1	2	0	0
Inconclusive	1	5	1	1	0
Percentage Total	47.83	30.43	13.04	4.35	4.35

N = 23
Accepted Level of Significance: .05
Chi-Square: 17.7640
Level of Significance: 0.0231

By examining Table VII, it can be seen that the right hemisphere dominate, design students traveled more states than the left hemisphere dominate or inconclusive dominate students. This indicates that the students with more traveling experience are usually right hemisphere dominate.

2. There is no statistical significance between the amount of traveling experience in the United States by a humanity student as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

The null hypothesis was assumed for statistical testing. Because the chi-square coefficient of 23.6390 exceeded the established significance level of .05 (chi-square of 23.6390 is significant at the 0.3664 level), the null hypothesis was accepted.

3. There is no significant correlation between the number of countries traveled by a design student as indicated by the OSU Human Environment Questionnaire, and brain hemisphere dominance.

The null hypothesis was assumed for statistical testing. The chi-square coefficient was determined to be 3.3510 which surpasses the established significance level of .05 (chi-square of 3.3510 is significant at the 0.9105 level), therefore, the null hypothesis is accepted.

4. There is significant correlation between the number of countries traveled by a humanity student as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

The null hypothesis was assumed for statistical testing. The chi-square coefficient of 17.7640 was statistically significant at the 0.0231 level (this level is below the established .05 level for statistical significance), therefore, the null hypothesis is rejected.

Table X shows that the humanity students who were either right-hemisphere dominate or inconclusive brain dominate traveled more countries than those students who were left-hemisphere dominate. In fact, nine out of twelve left-hemisphere dominate students had not traveled to any countries (besides the United States), whereas the right-hemisphere or inconclusive brain dominate students traveled to at least one other country and as many as seven.

Hypothesis 4: There is a significant correlation between a student's life-long residence setting (rural or urban) as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

The chi-square statistical procedure was used to test the hypothesis. The null hypothesis was assumed for statistical testing and the pre-determined level of significance was .05.

Chi-square coefficients were determined by comparing the residence setting of each student as indicated by Question 14 of the OSU Human Environment Questionnaire and the dominate brain hemisphere. The results of the testing can be seen in Tables XI and XII.

Based on the results of the chi-square testing, the following conclusions pertaining to Hypothesis 4 can be made:

1. There is no significant correlation between a design student's residence setting, as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

TABLE XI

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S RESIDENCE SETTING BY BRAIN HEMISPHERE DOMINANCE

Hemishpere Dominance	Residence Setting	
	Urban	Rural
Right	8	1
Left	18	5
Inconclusive	3	1
Percentage Total	80.59	19.44

N=36
Accepted Level of Significance: .05
Chi-Square: 0.5550
Level of Significance: 0.7576

TABLE XII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S RESIDENCE SETTING BY BRAIN HEMISPHERE DOMINANCE

Hemishpere Dominance	Residence Setting		
	Urban	Rural	No Response
Right	8	1	0
Left	18	5	1
Inconclusive	3	1	0
Percentage Total	80.59	19.44	4.35

N=23
Accepted Level of Significance: .05
Chi-Square: 1.9490
Level of Significance: 0.7452

The null hypothesis was assumed for statistical testing. The chi-square coefficient of .5550 was not statistically significant (the level is above the predetermined .05 level of significance), therefore, the null hypthesis was accepted.

2. There is no statistical significance between a humanity student's residence setting as indicated by the OSU Human Environment Questionnaire, and brain hemisphere dominance.

The null hypothesis was assumed for statistical testing. The chi-square coefficient of 1.9490 was not significant (the level is above the pre-determined .05 level of significance), therefore, the null hypothesis was accepted.

Hypothesis 5: there is a significant correlation between a student's scores on confidency level of specific skills as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

The chi-square statistical procedure was used for statistical testing. The established level of significance was .05 and the null hypothesis was assumed for statistical testing.

Chi-square coefficients were obtained by comparing feelings of confidence towards mathematics, art, drawing and designing, English and writing, working with people, working with things, working with numbers, typing, and playing a musical instrument, drawing/designing, physical sciences, working with puzzles and athletics, as indicated by Questions 22 and 23 of the OSU Human Environment Questionnaire and brain hemisphere dominance. Tables XIII through XXXVI show the results of the testing.

Based on the analyses of the statistical testing, the following conclusions pertaining to Hypothesis 5 can be made:

1. There is no significant correlation between a student's scores on confidency level of specific skills as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

Upon examining the chi-square coefficient on Tables XIII through XXXVI, it can be determined that none of the coefficients are significant at, or below, the accepted level of significance of .05. Therefore, the null hypothesis, which was assumed for statistical testing, was accepted for all of the specific skills that were listed.

TABLE XIII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS MATHEMATICS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	0	3	5	0	1
Left	3	9	5	5	1
Inconclusive	0	1	2	0	1
Percentage Total	8.33	36.11	33.33	13.89	8.33

N=36
Accepted Level of Significance: .05
Chi-Square: 9.1850
Level of Significance: 0.3269

TABLE XIV

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS ART, DRAWING, AND DESIGNING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	0	2	4	2	1
Left	0	2	9	10	2
Inconclusive	0	0	2	1	1
Percentage Total	0.00	11.11	41.67	36.11	11.11

N=36
Accepted Level of Significance: .05
Chi-Square: 3.4620
Level of Significance: 0.7490

TABLE XV

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS ENGLISH AND WRITING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	0	0	2	2	5
Left	0	9	4	6	4
Inconclusive	0	1	2	0	1
Percentage Total	0.00	27.78	22.22	22.22	27.78

N=36
Accepted Level of Significance: .05
Chi-Square: 9.6570
Level of Significance: 0.1399

TABLE XVI

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH PEOPLE BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	0	0	3	2	4
Left	0	1	5	7	10
Inconclusive	0	0	0	3	1
Percentage Total	0.00	2.78	22.22	33.33	41.67

N=36
Accepted Level of Significance: .05
Chi-Square: 4.7330
Level of Significance: 0.5785

TABLE XVII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH THINGS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	0	0	3	5	1
Left	0	0	3	11	9
Inconclusive	0	0	1	2	1
Percentage Total	0.00	0.00	19.44	50.00	30.56

N=36
Accepted Level of Significance: .05
Chi-Square: 3.2260
Level of Significance: 0.5208

TABLE XVIII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH NUMBERS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	1	2	4	1	1
Left	3	4	10	4	2
Inconclusive	0	1	2	0	1
Percentage Total	11.11	19.44	44.44	13.89	11.11

N=36
Accepted Level of Significance: .05
Chi-Square: 2.3270
Level of Significance: 0.9693

TABLE XIX

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS TYPING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	0	2	1	2	4
Left	4	5	10	3	1
Inconclusive	1	0	1	1	1
Percentage Total	13.89	19.44	33.33	16.67	16.67

N=36
Accepted Level of Significance: .05
Chi-Square: 11.753
Level of Significance: 0.1626

TABLE XX

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS PLAYING A MUSICAL INSTRUMENT BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	2	2	2	3	0
Left	6	6	6	4	1
Inconclusive	1	2	0	0	1
Percentage Total	25.00	27.78	22.22	19.44	5.56

N=36
Accepted Level of Significance: .05
Chi-Square: 6.9200
Level of Significance: 0.5453

TABLE XXI

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS DRAWING AND DESIGNING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	0	3	3	2	1
Left	0	1	8	11	3
Inconclusive	0	0	2	1	1
Percentage Total	0.00	11.11	36.11	38.89	13.89

N=36
Accepted Level of Significance: .05
Chi-Square: 7.3670
Level of Significance: 0.2883

TABLE XXII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS PHYSICAL SCIENCES BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	1	2	4	2	0
Left	1	7	10	5	0
Inconclusive	0	3	1	0	0
Percentage Total	5.56	33.33	41.67	19.44	0.00

N=36
Accepted Level of Significance: .05
Chi-Square: 4.4340
Level of Significance: 0.6181

TABLE XXIII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH PUZZLES BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	0	1	1	5	2
Left	0	3	9	6	5
Inconclusive	0	0	0	3	1
Percentage Total	0.00	11.11	27.78	38.89	22.22

N=36
Accepted Level of Significance: .05
Chi-Square: 6.5700
Level of Significance: 0.3625

TABLE XXIV

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S FEELINGS OF CONFIDENCE TOWARDS ATHLETICS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	1	0	4	1	3
Left	1	2	6	6	8
Inconclusive	0	0	2	2	0
Percentage Total	5.56	5.56	33.33	25.00	30.56

N=36
Accepted Level of Significance: .05
Chi-Square: 6.0270
Level of Significance: 0.6442

TABLE XXV

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS MATHEMATICS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	1	0	0	2	0
Left	1	1	3	1	6
Inconclusive	0	1	2	2	3
Percentage Total	8.70	8.70	21.74	21.74	39.13

N=23
Accepted Level of Significance: .05
Chi-Square: 2.9020
Level of Significance: 0.9404

TABLE XXVI

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS ART, DRAWING AND DESIGNING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	1	1	1	0	0
Left	2	5	2	1	2
Inconclusive	3	3	1	0	1
Percentage Total	26.09	30.13	17.39	4.35	13.04

N=23
Accepted Level of Significance: .05
Chi-Square: 2.9020
Level of Significance: 0.9404

TABLE XXVII

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS ENGLISH AND WRITING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	0	1	0	1	1
Left	0	1	5	5	1
Inconclusive	0	1	5	2	0
Percentage Total	0.00	13.04	43.48	34.78	8.70

N=23
Accepted Level of Significance: .05
Chi-Square: 6.3090
Level of Significance: 0.3895

TABLE XXVIII

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH PEOPLE BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	0	0	2	1	0
Left	0	0	3	7	2
Inconclusive	0	0	2	2	4
Percentage Total	0.00	0.00	30.43	43.48	26.09

N=23
Accepted Level of Significance: .05
Chi-Square: 5.7410
Level of Significance: 0.2194

TABLE XXIX

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH THINGS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	0	1	1	1	0
Left	0	2	4	3	3
Inconclusive	0	0	1	3	4
Percentage Total	0.00	13.04	26.09	30.43	30.43

N=23
Accepted Level of Significance: .05
Chi-Square: 5.2710
Level of Significance: 0.5026

TABLE XXX

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH NUMBERS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	1	0	1	1	0
Left	1	2	2	1	6
Inconclusive	0	1	1	2	4
Percentage Total	8.70	13.04	17.39	17.39	43.48

N=23
Accepted Level of Significance: .05
Chi-Square: 6.6280
Level of Significance: 0.5772

TABLE XXXI

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS TYPING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	1	0	0	1	1
Left	1	5	3	2	1
Inconclusive	1	1	2	3	0
Percentage Total	13.04	26.09	21.74	26.09	8.70

N=23
Accepted Level of Significance: .05
Chi-Square: 9.9030
Level of Significance: 0.4491

TABLE XXXII

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS PLAYING A MUSICAL INSTRUMENT BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	1	1	0	0	1
Left	4	2	3	1	2
Inconclusive	4	2	2	0	0
Percentage Total	39.13	21.74	21.74	4.35	13.04

N=23
Accepted Level of Significance: .05
Chi-Square: 4.5150
Level of Significance: 0.8079

TABLE XXXIII

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS DRAWING AND DESIGNING BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	1	1	0	1	0
Left	2	5	1	1	3
Inconclusive	1	3	2	1	1
Percentage Total	17.39	39.13	13.04	13.04	17.39

N=23
Accepted Level of Significance: .05
Chi-Square: 4.2590
Level of Significance: 0.8330

TABLE XXXIV

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS PHYSICAL SCIENCES BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con-fident	Very Confident
Right	0	1	1	0	1
Left	0	1	3	4	4
Inconclusive	0	0	3	3	2
Percentage Total	0.00	8.70	30.43	30.43	30.43

N=23
Accepted Level of Significance: .05
Chi-Square: 4.2440
Level of Significance: 0.6437

TABLE XXXV

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS WORKING WITH PUZZLES BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Con- fident	Very Confident
Right	0	1	2	0	0
Left	0	4	4	3	1
Inconclusive	0	0	3	3	2
Percentage Total	0.00	21.74	39.13	26.09	13.04

N=23
Accepted Level of Significance: .05
Chi-Square: 6.0160
Level of Significance: 0.4214

TABLE XXXVI

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S FEELINGS OF CONFIDENCE TOWARDS ATHLETICS BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Not at All Confident	Not Very Confident	Somewhat Confident	Confident	Very Confident
Right	0	1	1	0	1
Left	0	0	3	4	5
Inconclusive	0	0	1	4	3
Percentage Total	0.00	4.35	21.74	34.78	39.13

N=23
Accepted Level of Significance: .05
Chi-Square: 8.859
Level of Significance: 0.1816

Hypothesis 6: There is a significant correlation between a student's dominate brain hemisphere, as indicated by the Verbal Brain Dominance Test, and the scores on the Draw A Cube Test.

The chi-square statistical procedure was used for testing Hypothesis 6. The pre-determined level of significance was .05 and the null hypothesis was assumed for statistical testing.

Chi-square coefficients were obtained by comparing the students' scores on the Draw A Cube Test with their dominate brain hemisphere. Tables XXXVII and XXXVIII show the results of the testing.

Based on the analyses of the statistical testing, the following conclusions pertaining to Hypothesis 6 can be made:

1. There is no significant correlation between a design student's dominate brain hemisphere, as indicated by the Verbal Brain Dominance Test, and the scores on the Draw A Cube Test.

Table XXXVII shows that the chi-square coefficient is equal to 5.6830, which is not statistically significant. Since this coefficient is above the pre-determined .05 level of significance, the null hypothesis is accepted.

2. There is no significant correlation between a humanity student's dominate brain hemisphere, as indicated by the Verbal Brain Dominance Test, and the scores of the Draw a Cube Test.

TABLE XXXVII

CHI-SQUARE CORRELATIONS THAT MEASURE A DESIGN STUDENT'S SCORE ON THE DRAW A CUBE TEST BY BRAIN HEMISHPERE DOMINANCE

Hemisphere Dominance	Draw A Cube Test Scores				
	Poor	Fair	Average	Good	Excellent
Right	0	3	3	2	2
Left	1	5	7	6	4
Inconclusive	0	0	2	0	2
Percentage Total	2.78	22.22	33.33	22.22	19.44

N = 36
Accepted Level of Significance: .05
Chi-Square: 5.6830
Level of Significance: 0.6827

Table XXXVIII shows that the chi-square coefficient equals 9.7810 which is not significant. Since this coefficient is above the predetermined .05 level of significance, the null hypothesis is accepted.

Hypothesis 7: There is a significant correlation between a student's dominate brain hemisphere as indicated by the Verbal Brain Dominance Test, and scores on the Space Relation Section of the Differential Aptitude Test (DAT).

TABLE XXXVIII

CHI-SQUARE CORRELATIONS THAT MEASURE A HUMANITY STUDENT'S SCORE ON THE DRAW A CUBE TEST BY BRAIN HEMISPHERE DOMINANCE

Hemisphere Dominance	Draw A Cube Test Scores				
	Poor	Fair	Average	Good	Excellent
Right	1	0	1	1	0
Left	0	2	4	4	2
Inconclusive	0	0	2	4	2
Percentage Total	4.35	8.70	30.43	39.13	17.39

N = 23
Accepted Level of Significance: .05
Chi-Square: 9.7810
Level of Significance: 0.2807

Analysis of variance statistical procedure was used for testing Hypothesis 7. The pre-determined level of significance was .05 and the null hypothesis was assumed for statistical testing.

The means of the Space Relations Scores for each brain hemisphere type were calculated for both the Design and Humanity students. The means for each group are shown in Tables XXXIX and XL.

Based upon the analyses of the mean scores, the following conclusions pertaining to Hypotheses 7 can be made:

1. There is no significant correlation between a design student's dominate brain hemisphere, as indicated by the Verbal Brain Dominance Test, and the scores on the Space Relation Section of the Differential Aptitude Test (DAT).

TABLE XXXIX

ANALYSIS OF VARIANCE THAT MEASURES CORRELATION BETWEEN THE DESIGN STUDENTS' BRAIN HEMISPHERE DOMINANCE AND THEIR SCORES ON THE SPACE RELATION SECTION OF THE DIFFERENTIAL APTITUDE TEST (DAT)

Hemisphere Dominance	Number of Students	DAT Mean Score
Right	9	38.3333
Left	23	40.5217
Inconclusive	4	39.2500

N = 36
F = .015
Prob. = 0.8584

TABLE XL

ANALYSIS OF VARIANCE THAT MEASURES CORRELATION BETWEEN THE HUMANITY STUDENTS' BRAIN HEMISPHERE DOMINANCE AND THEIR SCORES ON THE SPACE RELATION SECTION OF THE DIFFERENTIAL APTITUDE TEST (DAT)

Hemisphere Dominance	Number of Students	DAT Mean Score
Right	3	32.6666
Left	12	37.3333
Inconclusive	8	38.1250

N = 23
F = .027
Prob. = 0.07672

The difference between the mean for the right hemisphere students and the mean for the left hemisphere student is 2.1884. The difference between the mean for the left hemisphere students and the inconclusive hemisphere students is 1.2717. The difference between the mean for the right hemisphere students and the mean for the inconclusive hemisphere students is .9167.

The analysis of variance statistical procedure shows that these mean scores are too simimlar for any significant correlation between hemisphere dominance and DAT scores to occur. The calculated F statistical value for the design students is equal to 0.15 which is not statistically significant. The F value surpasses the pre-established statistical significant level of .05. Therefore, the null hypothesis is accepted.

2. There is no significant correlation between a humanity student's dominate brain hemisphere, as indicated by the Verbal Brain Dominance Test, and the scores on the Space Relation Section of the Differential Aptitute Test.

The difference between the mean for the right hemisphere students and the mean for the left hemisphere students is 4.6667. The difference between the mean for the left hemisphere students and the mean for the inconclusive students is 0.7917. The difference between the mean for the right hemisphere students and the inconclusive hemisphere students is 5.4584.

According to the analysis of variance procedure these means scores are too similar for any significant correlation to occur. The calculated F statistical value for the humanity student is 0.27. This is not significant because it surpasses the pre-determined significant level of .05. The null hypothesis, therefore, is accepted.

Hypothesis 8: There is a significant correlation between a student's human environment and their dominate brain hemisphere, and their perceptual skills and dominate brain hemisphere.

Hypotheses 1 through 5 tested the possible statically significant correlation between a student's human environment and their dominate brain hemisphere. It was found that no statistically significant correlation existed between these two variables. Tables III to IIIVI show the results of the testing of these hypotheses.

Hypotheses 6 and 7 tested the possible statistically significant correlation between a student's dominate brain hemisphere and perceptual skills. It was also found, that there is no statistically significance between hemisphere dominance and perceptual skills. Tables XXXVII to XL show the results of the testing of the hypotheses.

Therefore, through the analyses of the statistical testing of Hypotheses 1 to 7, the following conclusion can be made pertaining to Hypothesis 8:

1. There is no significant correlation between a student's human environment, and brain hemisphere dominance and perceptual skills and brain hemisphere dominance.

The pre-determined, statistically significant level of .05 was surpassed in the overwhelmingly majority of statistical testing (conclusions 1 and 4, pertaining to Hypothesis 3 are exceptions), in this study. Therefore, there is no significant, statistical evidence that a relationship between an individual's human environment and brain hemisphere dominance and perceptual skills and brain hemisphere dominance.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The profession of interior design emphasizes the creation of innovative solutions to design problems as a means to promote creativity and change in our society. When addressing the process of creativity, it is also necessary to speak of perception.

Developing one's ability to perceive space and design concepts is imperative to the survival of an interior designer. Without perceptual skill, an individual's ability to create, solve and execute solutions to problems is weak.

Recent studies show that there is a link between the hemispheres of the human brain and perceptual skills (Edwards, 1976 and 1979). Tart (1975) explains in his research that the human brain consists of two hemispheres, the left and the right, and that the two sides of the brain have specific functions. The left side of the brain is characterized as the analytical and detail-oriented hemisphere, whereas the right side of the brain is known for its creative and perceptual ability (Edwards, 1976 and 1979; Tart, 1975).

Recent research is investigating the possibility that the key to developing perceptual skill is to exercise and train the right hemisphere of the brain and to instigate this training early in a person's life.

Summary

Developing the right side of the brain becomes important to the development of perceptual skills since the characteristics of this hemisphere are creativity and perceptual ability. Determining how an individual develops the right side of the brain becomes important research in a creative and perceptive field such as interior design. The purpose of the study was to determine if an individual's human environment influences which side of the brain becomes dominate and if brain hemisphere dominance influences perceptual skills.

The following objectives were derived from the purpose of the study:

1. To determine each student's demographic background through the use of the Oklahoma State University Human Environment Questionnaire.
2. To determine each student's biographical background through the use of the Oklahoma State University Human Environment Questionnaire.
3. To determine the characteristics of each student's human environment through the use of the Oklahoma State University Human Environment Questionnaire.

4. To determine each student's brain dominance (left or right) through the use of the Brain Dominance Verbal Test.
5. To determine each student's three-dimensional perceptual level through the Space Relations Section of the Differential Aptitude Test (DAT).
6. To determine each student's three-dimensional perceptual level through the "Draw A Cube Test".
7. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), from their responses to the Oklahoma State University Human Environment Questionnaire.
8. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), on the Verbal Brain Dominance Test.
9. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), on the Space Relations section of the Differential Aptitude Test (SAT).
10. To compare the scores of the students in Graphics for Interiors (HDCR 2123), with the scores of the students in Introduction to Humanities (HUMAN 1014), on the "Draw A Cube Test".
11. To determine if there is any correlation between an

individual's human environment and brain hemisphere dominance, and perceptual level and brain hemisphere dominance, as indicated by the test scores.

In order to fulfill the purpose of this study, the following hypotheses were tested:

H_{01}: There is a significant correlation between the amount of design-related coursework a student has completed, as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

H_{02}: There is a significant correlation between the amount of a student's work experience as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

H_{03}: There is a significant correlation between a student's travel experience and brain hemisphere dominance as indicated by the OSU Human Environment Questionnaire.

H_{04}: There is a significant correlation between a student's life-long residence setting (rural or urban), and brain hemisphere dominance as indicated by the OSU Human Environment Questionnaire.

H_{05}: There is a significant correlation between a student's score on confidency level of specific skills as indicated by the OSU Human Environment Questionnaire and brain hemisphere dominance.

H_{06}: There is a significant correlation between a student's dominate brain hemisphere as indicated by the Verbal Brain Dominance Test and the scores on the Draw A Cube Test.

H_{07}: There is a significant correlation between a student's dominate brain hemisphere as indicated by the Verbal Brain Dominance Test, and scores on the Space Relation Section of the Differential Aptitude Test (DAT).

H_{08}: There is a significant correlation between a student's human environment and brain dominate hemisphere, and perceptual skills, and brain dominate hemisphere.

Data was collected during the Fall semester of 1982 from the 36 students enrolled in Graphics for Interiors (HDCR 2123) in the Department of Housing, Design and Consumer Resources and 23 students enrolled in Introduction to Humanities (HUMAN 1014), in the Department of Humanities, at Oklahoma State University. The instruments used to collect the data consisted of a Human Environment Questionnaire adapted from Harris (1981) that was used in a similar study, a Verbal Brain Dominance Test adapted from Edwards (1976), also used in a similar study, and the Space Relation Section of the Differential Aptitude Test (DAT) developed by Bennett, Seashore and Wesman (1955).

Findings

The Oklahoma State University Human Environment

Questionnaire provided descriptive statistics for both humanity (control) and the design groups. It was found that 52.80 percent of the design students were either beginning their first or second year of college. Seventy-five percent of the students declared their major Interior Design. The age range of the design students varied from 18 to over 40 years of age, however, 52.80 percent were between the ages of 18 to 19.

The descriptive data for the humanity students revealed that 26.09 percent were first-year students, no sophomores were in the sample, and that 52.18 percent of the students were juniors. Thirty-nine percent of the students declared their major as Business Administration while the remaining percentage of students declared a variety of major fields of study. The age range for the humanity students varied from 18 to 30 years of age, however, 47.83 percent were 20 years old.

The Verbal Brain Dominance Test adapted from Edwards (1976) revealed that of the design students, 64.00 percent were left hemisphere dominate, 25.00 percent were right hemisphere dominate and 11.00 percent were inconclusive. The humanity students were characterized by 52.18 percent being left hemisphere dominate, 13.04 percent were right hemisphere dominate and 34.78 percent were inconclusive. For the total 59 students, 59.4 percent were left hemisphere dominate, 20.3 percent were right hemisphere dominate and 20.3 percent were inconclusive.

The chi-square and analysis of variance statistical testing procedures were utilized to test the hypotheses. The chi-square coefficients revealed that no significant correlation existed between the amount of coursework a student had completed and brain hemisphere dominance. In other words, there is no statistical evidence from this study, that shows that an individual's design-related education influences which hemisphere of the brain becomes dominate.

The chi-square test also showed that there is no significant correlation between the amount of a students work experience and brain hemisphere dominance. The chi-square coefficient of 4.9470 surpassed the 0.05 level of significance which statistically indicates that a person's dominate brain hemisphere is not influenced by the amount of design-related work experience that the student has.

Further testing of correlations between a student's human environment and brain hemisphere dominance showed that there is no statistically significant realtionship between a student's travel experience in the United States and hemisphere dominance. It was found through the chi-square statistical testing procedure that correlation between these two variables did not exist at the 0.05 pre-determined, level of significance.

Although there was no statistical significance between travel experience in the United States and hemisphere dominance, it was found through chi-square testing, that there was a significant correlation between the numbers of countries traveled and brain hemisphere dominance for the humanity students. It was found that the humanity students who were either right-hemisphere dominate or inconclusive brain dominate traveled more countries than those students who were left hemisphere dominate.

The chi-square statistical procedure was also used to measure any significant correlation between a student's life-long residence setting (urban or rural) and brain hemisphere dominance. The chi-square coefficients showed that there was no statistical significance between the type of residence setting in a student's human environment and which hemisphere of the brain became dominate.

The Human Environment Questionnaire was used to collect data investigating the possible correlation of a student's feelings of confidence towards mathematics, art, drawing, and designing, English and writing, working with people, working with things, working with numbers, typing, playing a musical instrument, the physical sciences, jigsaw puzzles, and athletics, and which hemisphere of the brain becomes dominate. The chi-square test revealed that there was no significant correlation between a student's feelings of confidence towards specific skills and brain hemisphere dominance.

The Draw A Cube Test was one of the instruments used to determine a student's level of perceptual skill. It was hypothesized that there would be a significant correlation between a student's dominate brain hemisphere and perceptual skill. It was found through chi-square testing, that no significant correlation between these two variables existed. In other words, there was no statistical significance between how well a student performed on the Draw A Cube Test and hemisphere dominance.

The analysis of variance statistical procedure was used to measure any significant correlation between how well a student performed on the Space Relations Section of the Differential Aptitude Test (DAT) and brain hemisphere dominance. It was found through comparing the mean scores from each hemisphere classification of students, that no significant correlation between the scores of the Space Relations Test and brain hemisphere dominance exists.

Through the analyses of hypotheses 1 through 7, it was found that there is no statistical correlation between a student's human environment and brain hemisphere dominance and perceptual skills and brain hemisphere dominance.

Limitations

In order to explain the entire scope of this research, the limitations of the study must be discussed. The limitations are as follows.

1. Due to the size of the population studied, the proportions of one hemisphere dominant type to another were not equal. The design sample consisted of nine right hemisphere brain dominate

students, 23 left hemisphere brain dominate students and four inconclusive brain dominate students. The humanity sample consisted of three right hemisphere brain dominate students, 12 left hemisphere brain domniate students and eight inconclusive brain dominate students. Because these proportions of dominate hemisphere types are unbalanced, the results of the study may be significantly affected.

2. The samples used for the purpose of this research, consisted of approximately equal proportions of males to females. This researcher recognizes that studies reveal perceptual skills vary according to the sex of an individual. Although the purpose of this study did not consider sexual differences with perception, it should be recognized that the results of the study may be affected if these sexual differences were considered.

3. Purposive sampling was utilized to meet the specific purpose of the study and the data analysis tested the hypotheses in terms of comparing the design students' scores with the humanity students' scores (control group). Because of the sampling procedure and method of data analysis it should be recognized that this study investigates trends between a student's human environment and brain hemisphere dominance and perceptual levels and

brain hemisphere dominance. Due to the limited sample size, the cell count in the chi-square analysis may be in itself, limited. Therefore, the Chi-Square Coefficients should be used with caution.

4. Due to the limited sample sizes of 36 design students and 23 humanity students, results of this study cannot be generalized to an entire population.

Conclusions

Based on the analyses of the data for this study, and considering the limitations and methodological procedures, the following conclusions can be made:

1. The human environment of an individual does not significantly influence which hemisphere of the brain becomes dominate. The research indicates that aspects of a person's human environment such as travel, work experience, education, and lifelong residence setting do not play a major role in influencing brain hemisphere dominance.
2. The dominate brain hemisphere of an individual does not significantly influence perceptual skills. The research indicated that right hemisphere individuals did not significantly perform any better on perceptual skills than did left hemisphere or inconclusive brain dominate students, nor

did the left hemisphere or inconclusive brain dominate student significantly score any higher on perceptual skills than did right hemisphere dominate students. Therefore, there is no significant correlation between brain hemisphere dominance and perceptual ability.

Discussion

Recent studies have investigated the role of human environment factors on hemisphere dominance (Linderman and Herberholz, 1965; Durio, 1976; Edwards, 1979). These studies suggest that an individual's education has great impact on which side of the brain becomes more trained and exercised, thus becoming the dominate hemisphere.

Although this study indicated no significant correlation between an individual's education and hemisphere dominance, does not mean that this will always be the case in future studies. The educational system of today's schools is not geared to stressing the use and development of both hemispheres of the brain (Edwards, 1979). Therefore, to statistically test to see if there are any relationships between these two variables will always be difficult unitl the curriculum of our schools change.

This study also indicated that no significant correlation between an individual's dominate brain hemisphere and perceptual skill exists. This can be interpreted to mean that perceptual skill is not "naturally" more developed in a right hemisphere dominate person than it is in a left-hemisphere dominate individual. It seems the key to perceptual skill development is training the right-hemisphere of the brain to exercise the creative and perceptive characteristics. This indicates that a left-hemisphere dominate person could learn to switch thinking modes to the right hemisphere whenever the creative and perceptual skills dictates such a need. In other words, which brain hemisphere that is dominate in an individual is not what is important, as much as the ability to utilize both sides of the brain to their fullest potential.

Recommendations

The following recommendations are made for further research based on the results of this study:

1. In order to increase the validity of the research, this study should be repeated using a larger sample size.
2. A longitudinal study that would research and observe the development of brain hemisphere dominance of an individual from birth to young adulthood, would aid researchers in better understanding factors that cause a certain hemisphere to become dominate.
3. Further research should investigate if human environments and perceptual skills vary between right-hemisphere dominate females and

right-hemisphere dominate males. Through researching exclusive samples of right-hemisphere dominate males and females, researchers may develop a further understanding of how hemisphere dominance develops for males and females, if there are any differences, and if these factors influence perception.

4. Further research is needed to investigate the human environmental factors characteristic of a right-hemisphere dominate sample. Through studying common environmental factors of an exclusively right-hemisphere dominate sample, researchers may have a basis for establishing criteria that influences the development of the right-hemisphere.
5. Further research should investigate the development of a teaching technique that will aid in the establishment of a curriculum designed to develop the right hemisphere of the brain.

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APPENDIXES

APPENDIX A

OKLAHOMA STATE UNIVERSITY

HUMAN ENVIRONMENT

QUESTIONNAIRE

OKLAHOMA STATE UNIVERSITY
HUMAN ENVIRONMENT QUESTIONNAIRE

The purpose of the following questionnaire is to provide the instructor with background information from each student. The information will aid the instructor in knowing the class's strengths and weaknesses and will also help in planning projects that will compliment each student's needs. The answers will provide only background information to the instructor. There is no correlation between this questionnaire and a course grade. The questionnaire is not a test, nor is there a right or wrong answer. Please answer the questions as honestly as possible. Identity is not imperative to this questionnaire, therefore, your name is not necessary.

For all of the following questions please check the appropriate blank provided to the left of each answer. You may check more than one answer if necessary.

1. What section of HDCR 2123 are you registered in?

_____Section 1

_____Section 2

2. What is your educational Status?

_____Freshman (0-29 Hours)

_____Sophomore (30-44 Hours)

_____Junior (45-74 Hours)

_____Senior (75 or More Hours)

_____Graduate Student

_____Other

3. What is your Major(s)

_____Interior Design

_____Architecture

_____Art

_____Clothing, Textiles, Merchandising

_____Food Nutrition and Institutional Administration

_____Family Relations and Child Development

_____Housing

_____Consumer Resources

_____Home Economics Education

_____Other (Please Specify)

4. Do you have a Minor? _____Yes _____No

If yes, what is your minor?______________________

5. How likely is it that you will continue your education in your Current Major?

1	2	3	4	5
Not Likely		Undecided		Very Likely

6. What is your Age (Check One)?

_____1. 17 _____4. 20 _____7. 22-30
_____2. 18 _____5. 21 _____8. 31-40

_____3. 19 _____6. 22 _____9. Over 40

7. Please indicate if you have had any of the following courses and at what level. Check the appropriate space.

Course			Level					
	Yes	No	High School	Summer Program	Vo-Tech	Junior College	College	Other Please Specify
Art								
Technical Draw.								
Freehand Draw.								
Painting								
Sculpture								
Architecture								
Psychology								
Design								
Industrial Arts								
Mech. Operations								
Other (Specify)								

8. Please indicate if you have had any work experience in the following areas:

_____Art

_____Architecture

_____Technical Drawing

_____Construction

_____Psychology

_____Design

_____Industrial Arts

_____Other (Please Specify)

9. Have you lived in Oklahoma all of your life? _____Yes _____No

10. If no, what other states and countries have you lived in?_______________

____

____

How long of time did you live in each of the state/countries you have listed above:

_____ _____ _____ 0-3 Months

_____ _____ _____ 4-7 Months

_____ _____ _____ 8-12 Months

_____ _____ _____ 1-2 Years

_____ _____ _____ More than two Years

11. What is your native Language?_______________________________

12. List the States (spent one week or more in that particular state) in which you have traveled?

____

____

13. List the Countries (spent two weeks or more in that particular country) in which you have traveled?

____

____

14. Where have you lived most of your Life? _____Urban Setting _____Rural

15. Where have your parents or guardians lived most of their lives?

FATHER	MOTHER	
______	______	Urban Area
______	______	Rural Area

16. Where do you currently reside while attending school?

_____Stillwater

_____Tulsa

_____Oklahoma City

_____Other (Please Specify)

17. What type of housing do you reside in while attending school?

_____Resident Hall

_____Sorority/Fraternity House

_____Apartment

_____House without your Parents/Guardians

_____House with your parents/Guardians

_____Other (Please Specify)

18. What is the occupation of your Father (Guardian)?_______________________

What is the occupation of your Mother (Guardian)?_______________________

19. What are the highest levels of education of your parents or guardians that they have completed?

FATHER	MOTHER	
______	______	1. 1-8 Grade
______	______	2. 9-12 Grade
______	______	3. 12+ Some College or Vo-Tech School
______	______	4. College Graduate
______	______	5. Advanced Degree

20. How often do you go to art museums? (Or Galleries)

_____Every Month or More

_____Every 2-4 Months

_____Every 5-6 Months

_____Every 7-12 Months

_____Every Year

_____Every 1-2 Years

_____Every 2 years or More

21. What are your favorite leisure activities?

____

____

22. On the chart below, please indicate by circling a response on a scale of 5 (very confident) to 1 (Not at all confident) where you feel your ability is.

	Very Confident	Somewhat Confident	Confident	Not Very Confident	Not at All Confident
A. Mathematics	5	4	3	2	1
B. Art, Drawing/Designing	5	4	3	2	1
C. English/Writing	5	4	3	2	1
D. Working with People	5	4	3	2	1
E. Working with Things	5	4	3	2	1
F. Working with Numbers	5	4	3	2	1

23. Please indicate by circling a response of your level of ability on a scale of 5 (Very Confident) to 1 (Not at all confident) where you feel your ability is.

	Very Confident	Somewhat Confident	Confident	Not Very Confident	Not at All Confident
A. Typing	5	4	3	2	1
B. Playing Musical Instrument	5	4	3	2	1
C. Drawing/Designing	5	4	3	2	1
D. Physical Sciences	5	4	3	2	1
E. Working with Jigsaw Puzzles	5	4	3	2	1
F. Athletics (Sports)	5	4	3	2	1

24. Have you previously taken the Space Relations Test that you have just completed?

_____Yes

_____No

The above questionnaire was an adaptation from Lou Harris's Study "A Study of the Analytical Spatial Perception Ability of Selected Students in Art, Architecture, Landscape Architecture, and Interior Design," Master Thesis, Oklahoma State University, May, 1981.

APPENDIX B

RESEARCH INSTRUMENT - VERBAL BRAIN DOMINANCE TEST

VERBAL BRAIN DOMINANCE TEST

Each student was verbally asked the listed questions. Eye movements were recorded and then analyzed to determine the dominate brain hemisphere of each student (Edwards, 1976).

1. What is the sum of 57 and 22?
2. What is the meaning of "A bad peace is better than a good war?"
3. How many sides does a cube have?

APPENDIX C

RESEARCH INSTRUMENT - THE DRAW
A CUBE TEST

Please complete the following problem in the best manner possible. This problem is to help in determining at what level the class's perceptual skills are at so that class assignments can be better planned. This is not a graded test and identity is not required. Draw your answers in the space provided.

1. Draw a Square.
2. Draw a cube, using the square you have just drawn as the front of the cube.
3. Draw a cube with two sides (or planes), and the top of the cube showing in front.
4. Draw a cube with the bottom of cube and two sides (or planes), showing in front.
5. Draw a cube with only 2 sides or planes showing (no bottom or top).

1-2.

3.

4.

5.

Oklahoma State University

COLLEGE OF HOME ECONOMICS
Department of Housing, Design and Consumer Resources

STILLWATER, OKLAHOMA 74078
HOME ECONOMICS WEST BUILDING
(405) 624-5048

January 22, 1983.

MEMO TO: Betsy Gabb, Jay Gabb and Margaret Weber
FROM: Jane Kolar
SUBJECT: Evaluation of the "Draw a Cube Test"

Enclosed in each envelope are the results of the "Draw a Cube Test" from both the Design Group and the Control Group. Thank you for agreeing to help me in the scoring of these tests.

In order to develop a consistant and valid scale for rating the tests, please use the following criteria:

1. Keep each group's tests in the given envelope. In other words, put the design groups tests in the design envelope and the control group's tests in the control envelope.

2. Rate each student's work on a scale of 1-5 based on how well the student could read the description/instructions of the object (cubes), and then draw it. Therefore, we aren't as concerned about quality of the drawings as much as we're concerned about how well each student could perceive and sketch the object. The following scale should be used when scoring the subject's perceptual skill:

1	2	3	4	5
Weak		Average		Good

3. Enclosed in the Design envelope is a test marked SAMPLE. This test was completed by me and is an example of what would be considered a good level of perceptual skill or a good test.

4. This test was designed to take, at a maximum, approximately 15 minutes. Most students completed the test in 5-10 minutes. No student requested that they needed more time. Therefore, if a subject didn't complete the test, it can be assumed that it was because they didn't understand the problem or that they couldn't draw it, not that they didn't have enough time.

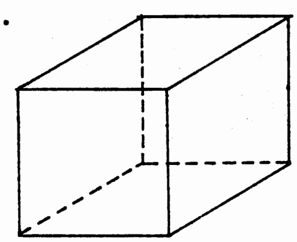
Thank you for helping me with yet another phase of my thesis. It is very much appreciated.

SAMPLE

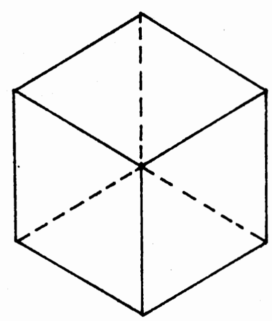
Please complete the following problem in the best manner possible. This problem is to help in determining at what level the class's perceptual skills are at so that class assignments can be better planned. This is not a graded test and identity is not required. Draw your answers in the space provided.

1. Draw a Square.
2. Draw a cube, using the square you have just drawn as the front of the cube.
3. Draw a cube with two sides (or planes), and the top of the cube showing in front.
4. Draw a cube with the bottom of cube and two sides (or planes), showing in front.
5. Draw a cube with only 2 sides or planes showing (no bottom or top).

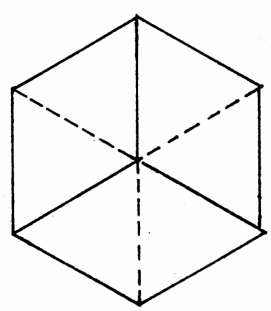
1-2.



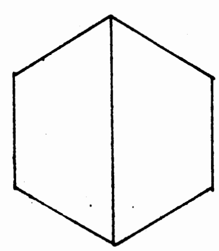
3.



4.



5.



Dotted Lines Representing the Complete Cube Were Optional

/

VITA

Jane Marie Kolar

Candidate for the Degree of

Master of Science

Thesis: A STUDY OF THE RELATIONSHIP BETWEEN AN INDIVIDUAL'S HUMAN ENVIRONMENT AND BRAIN HEMISPHERE DOMINANCE AND PERCEPTUAL SKILLS AND BRAIN HEMISPHERE DOMINANCE

Major Field: Housing, Design, and Consumer Resources

Biographical:

Personal Data: Born in Lincoln, Nebraska, December 3, 1958, the daughter of Mr. and Mrs. Joseph J. Kolar

Education: Graduated from Lincoln East High School, Lincoln, Nebraska, in June, 1977, received Bachelor of Science in Home Economics degree from University of Nebraska-Lincoln, in 1981; completed requirements for the Master of Science degree at Oklahoma State University in May, 1983.

Professional Experience: Sales Assistant and Supervisor, Departments of Fabrics and Needleart, Miller and Paine, Lincoln, Nebraska, 1980-1981; Associate Member of American Society of Interior Designers, 1981-1982; Graduate Teaching Assistant, Department of Housing, Design, and Consumer Resources, Oklahoma State University, 1981 - present; Interior Designer for Student Services, Oklahoma State University, 1982 - present.