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Impacting Science Observation Skills Through Drawing Training

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ABSTRACT

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The research addressed was, how does drawing training impact the observational abilities of students? The list of motivating factors for this capstone includes students exhibiting a lack of ability to sit still and observe details of the world around them as well as exhibiting a lack of ability to design and communicate through drawings used in engineering. The author teaches art and science and has experienced these deficiencies. The author used an in-class project currently in the curriculum as the basis for the research. This project involved observing a reptile habitat as a subject for drawing. Betty Edwards' book *Drawing on the Right Side of the Brain* (1999) was a key influence and resource for analyzing and supporting the impact drawing training has on observational skills in science class, but also in being a more complete observer of the world these students live.

IMPACTING SCIENCE OBSERVATION SKILLS

THROUGH DRAWING TRAINING

by

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CHAPTER ONE

INTRODUCTION

Personal Art Story

Sunsets on the farms of rural Indiana are explosions of bright, vivid colors. Autumn foliage of the maples, oaks, and sycamores are bursting with obvious hues painting the woods as the backdrop for the golden shine of corn stalks waiting for the harvest. The chatter of birds, bugs and frogs echoes in the warm summer nights sitting around a campfire watching the blaze as it crackles and adds floating orange to the sky already lit with silver stars. This is a small taste of how growing up in the farmland of Indiana appeals to my senses and the memories of these sights and sounds come flooding to mind often and I am taken to those great campfires, fields, and woods.

The old saying that "there is more than corn in Indiana" is very true, but that "more" is honestly limited. Living in a small farm town the few options that were available for recreation were playing basketball, fishing, exploring, and mischief.

This is close to an exhaustive list. During my years of living in this environment I mostly chose the first two on this list, basketball and fishing. One activity requires much energy allowing no time to sit and be still, while fishing requires the opposite. Fishing around the ponds and lakes is definitely suited for those who enjoy a couple of hours to just sit and be still.

During the many hours spent sitting on the banks of the ponds or lakes, or when confined to the aluminum row boat in the middle of the lake, my senses would come alive. Instead of seeing the colors of the foliage, instead of hearing a ton of chatter from those trees, instead of seeing yet another sunset explosion, I would begin to observe the details of this beauty. I would not only see the explosion, but the variations of purples, oranges, pinks, and more. I would begin to identify the different species of birds and bugs. I would be amazed at the individual leaves that were becoming red yellow and brown. I would realize that our Creator God has given us much more than I am often seeing or that I am trained to observe.

Eventually, my list of recreational options was broadened once I became more aware of my dad's engineering background and artistic abilities. As a mechanical engineer, my dad had rolls of blueprints and sketches that once uncovered opened my eyes to the world of drafting, sketching, and designing. I was amazed when my dad's personal sketchbooks were pulled out of storage, dusted off, and leafed through. The blueprints with all the detailed measurements and inclusion and representation of the many components needed to build a machine

grabbed my attention every time they were unrolled. The sketchbooks were even more amazing to me as they showed the ability to capture the intricate textures, values, and details that made an object seem to pop from a two dimensional surface.

This newly discovered interest compelled me to add drawing to my list of ways to pass time in the small town. I began filling sketchbooks of my own with drawings of objects I was observing while spending time outdoors. Partnering my observation and attention to detail with my pencil and paper, I created drawings that would portray those details on paper. I began to give the illusion of depth and reality on those two dimensional surfaces.

Ultimately, finding this love for drawing led me to pursue art further. My university years were spent studying art at Olivet Nazarene University where I received a degree in art education. After earning this degree, I spent 12 years in the art classroom teaching elementary and high school art students. The focus of each of my classes was to train the student to observe their subject and their world with a different approach, an approach that looks deeper into the details and beauty that often goes unseen by the casual observation.

Personal Science Story

After 12 years of teaching art in the elementary and high school classrooms, my career took a turn into the science classroom. I began teaching middle school

life science and then elementary physical science. When talking about this shift with those who knew my art background, it was always greeted with comments of how there couldn't be a more directional change from art to science. There was confusion as to how these two disciplines could be the interest of the same mind, and I was beginning to be convinced of that separation as well. It didn't take long for the connection between these content areas to be strengthened in my own mind. Conversations that would arise about my career shift from art to science were approached with a different tone as I grew to see how the two disciplines were related and how they were both enhanced, one strengthening the other.

This separation of science and art, specifically drawing, is affecting the students in elementary classroom. The separation is impacting engineering projects taught in my elementary and middle school classrooms. Students receive the challenge, limitations, and criteria and begin to dive right in to the building phase of the project. There is no consideration to planning and absolutely no thought of drawing a schematic or blueprint of their design. Verbal communication is the primary choice for most students in my classrooms. They must be reminded before each challenge how important the drawing stage is not only for their own planning and refining, but also for communicating the building process and function of the design. After seeing many of the attempts to draw the design it become obvious as to why verbal is the preferred choice. There is zero ability for most students to communicate their ideas through a detailed drawing that includes all the needed

information to carry out the project. My focus on student observation skills that were taught in the art room must carry over to these science students in order to develop future engineers and thinkers.

A World of Casual Observers

Life in America has changed since my childhood days spent in Indiana where there was not much more than corn to entertain the elementary-aged kids. There are so many opportunities for expanding the world of these young people and even more opportunities for expanding their minds. The opportunities actually seem endless. One does not have to look far to see people simply living the pace of life with little or no thought to the direction or purpose of their path, partly due to the overwhelming number of options available. The casual observer mentality is not only applied to the nature or environment that surrounds people, but it is being carried over to the belief systems, values, and expectations that seem to be pushed upon these observers. The casual observer that finds them self floundering when it comes to belief systems, values and life decisions could gain control by using some trained discernment and observational skills that can be taught in the art and the science classrooms.

Another problem that I experience in the classroom when it comes to this casual observer is in the approach to an engineering challenge that is set before the class. These students are living in an era of the disposals and endless supplies of

replacements. This replacement mentality allows the student to give no consideration to what could fail in a design before ambitiously building their design. Too often I see frustrated students being required to tear down projects that fail thus wasting precious time and resources. Many times these failures could have been avoided with a bit of planning, observing, and thorough drawings done prior to the building. If this approach is not addressed, these students will enter society and the disposal and replacement mentality will not soon go away.

Historical Thinkers on Observation

One of the most influential thinkers in engineering, art, and discovery, Leonardo da Vinci, listed four principles for the development of the complete mind. According to da Vinci, one must "Study the science of art. Study the art of science. Develop your senses – especially learning to see. Realize that everything connects to everything else" (Hernand, 2012). Leonardo's notebooks and sketches show how important these principles were in the way he approached his own mind's development. When it comes to art, engineering, and other sciences, Leonardo is a model that is not emulated enough in present day.

Another influential thinker in more modern years, Friedrich Nietzsche, took a similar approach to the development of the mind. Nietzsche encouraged young minds "To learn to see- to accustom the eye to calmness, to patience, and to allow things to come up to it; to defer judgment, and to acquire the habit of approaching

and grasping an individual case from all sides. This is the first preparatory schooling of intellectuality. One must not respond immediately to a stimulus; one must acquire a command of the obstructing and isolating instincts" (http://www.goodreads.com/quotes/417987-to-learn-to-see--to-accustom-the-eye-to-calmness).

Great minds of the past had a view of the relationship of observation and intellect that seems to have been lost in recent years. Either a person is labeled as creative and a free-spirited artist, or as an intellectual, logical thinker, but rarely are the two merged. Even more rarely are the two disciplines taught in such a way that the relationship between drawing and science as the target of education.

The Mission

Through my childhood experiences, classroom teacher observations, evidences in our world today, and studying great minds of history, I see it vital to the lives and future of our students to instill in them the importance of observation and discernment. I am convinced that one avenue that can be taken in order to build this discerning mind is using drawing training as a tool to enhance the observational skills of young students. These skills are vital for our society to get back to being appreciative of the resources that we have available to us, and drop the "dispose-and-replace" attitude which is rampant. These skills are vital in developing young minds that will be inventing new, or improving on, existing designs. Most

importantly, it is vital to instill discernment into young minds so they can do as it says in Romans 12:2 in the New International Version of The Bible. "Do not conform to the pattern of this world, but be transformed by the renewing of your mind. Then you will be able to test and approve what God's will is—his good, pleasing and perfect will."

My observations and experiences seeing the benefits of instilling observational skills have led me to this research. My research has led to this project. This project is a compilation of various types of research that have studied the effects of drawing training on the observational skills and discernment in elementary students. This project contains studies of various influential people in history, both artists and scientists, and their outlook on observation. It will include results to qualitative research carried out in elementary school settings in regards to drawing training and its effect on science and engineering. It will culminate in a partial art curriculum that can be used in grades 1-6. This curriculum will focus on drawing training which will help build observational skills in the student that can be carried over from drawing to many other aspects of life.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Leonardo da Vinci was quoted as saying "There are three classes of people: those who see, those who see when they are shown, and those who do not see" (http://www.leonardodavinci.net/quotes.jsp). This classification of people by such an acclaimed inventor artist in history compelled me to research how people see and how to show people how to see with hopes to eliminate the latter of da Vinci's categories. This chapter will discuss literature regarding studies on how the brain acts while observing, how art training impacts this brain activity, and how observation can enhance society. The brain activity will be approached by examining the two hemispheres of the brain and their roles in observation and activity. The impact of art training will be reviewed through studies of activities and methods of classroom teaching that will target the development of observation skills and enhance learning.

Brain Hemispheres

It is vital to recall that the human brain is divided into two cerebral hemispheres commonly labeled the right hemisphere and the left hemisphere.

These hemispheres communicate with each other through millions of nerve fibers called corpus callosum (Chudler, 2011). Each hemisphere is believed to specialize in various behaviors and functions for everyday life. The left cerebral hemisphere controls the muscles on the right side of the body. It appears also that the left brain specializes in math calculations, logical abilities, and verbal language. The right cerebral hemisphere controls the muscles on the left side of the body. It appears that the right brain specializes in spatial abilities, visual imagery, music, and face recognition (Chudler, 2011).

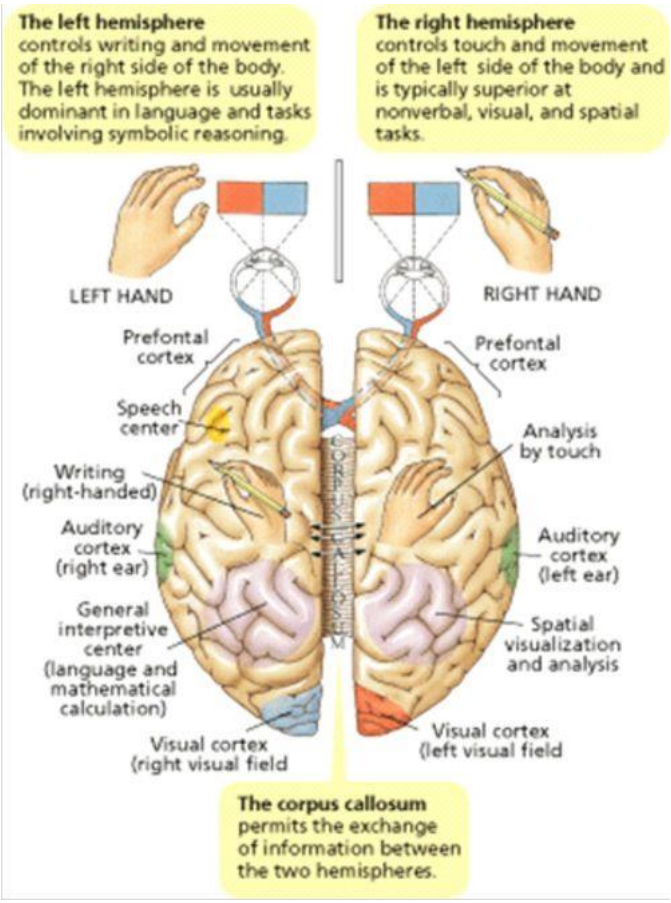


Figure 1 (http://bio217nervoussystem.wikispaces.com/)

These generalizations of each side of the brain have been reinforced through a series of studies conducted by Roger Sperry, Michael Gazzaniga, Joseph Bogen, and Dr. Vogel. These doctors performed surgery on human patients in which they separated the two cerebral hemispheres with the hopes that when the patient had an epileptic seizure in one half of the brain, the other half would be able to control the body and be essentially unaffected (Ornstein, 1977). Roger Sperry and his team developed many tests which uncovered evidence that the operation on the patients' brain had clearly separated the specialized functions of the two cerebral hemispheres (Ornstein, 1977).

These tests were then conducted on these "split brain" patients that highlighted functions of the brain. One such test was when a patient felt a pencil (hidden from sight) in his right hand, he could verbally describe it since the right hand is controlled by the left side of the brain which specializes in language. But if that pencil was in the left hand, he could not describe it at all due to the right hemispheres lack of language control (Ornstein, 1977). According to Sperry, the verbal apparatus literally did not know what was in the left hand (Ornstein, 1977). When the patient was offered a selection of objects and was asked to choose the pencil out of the pile with his left hand, he was able to do so due to the visual representation of the object felt with the left hand (Ornstein, 1977).

A second experiment tested the lateral function of the hemispheres using visual input. In this experiment the word "heart" was flashed to the patient, with

the “he” to the left eye’s focal point, and “art” to the right. When the patient was asked to name the word just presented, he or she replied “art,” since this was the portion projected to the left hemisphere, which was answering the question. However, when asked to point with the left hand to one of two cards on which were written “he” and “art”, the left hand pointed to “he.” The verbal hemisphere gave one answer, the nonverbal hemisphere another (Ornstein, 1977).

Another test conducted on these “split brain” patients concerned writing. Dr. Bogen tested the ability to write and draw with either hand. Writing abilities remained with the right hand, but this hand could no longer draw with ease. It seemed to have lost its ability to work in a relational, spatial manner. (Ornstein, 1977) The left hand, however, could do the opposite of the right. The left could draw and could copy spatial figures, but could not copy a written word.

Other tests were conducted dealing with geometric figures, written language, and spatial recognition. The ultimate result of their experiments showed the functions that each of the cerebral hemispheres specialize in. However, after further studies, Dr. Sperry concluded that the “split brain” patients using both hemispheres can simultaneously process more information than can those of a normal person. (Ornstein, 1977) Ornstein concludes that the complete scientific endeavor, then, involves working with both modes.

Perception

"Perception is foundational to learning across the continuum of knowledge acquisition" (Eberbach & Crowley, 2009, p. 43). Perception is defined as "immediate or intuitive recognition or appreciation, as of moral, psychological, or aesthetic qualities; insight; intuition; discernment (dictionary.com). In his book Eye and Brain: the Psychology of Seeing, R.L. Gregory states, "It is clear that perception in man is susceptible to modification by learning" (1966, p. 218).

This claim was explored in a lengthy experiment conducted by G.M. Stratton. Discoveries showed how the brain develops perception of reality. G.M. Stratton wore glasses that were designed to invert the image in his mind. After 8 days of seeing inverted images through these glasses he reported "reversal of everything from the previous 8 days gave the familiar scene a surprising bewildering air which lasted for several hours" (Gregory, 1966, p. 204).

J.K. Paterson followed Stratton's experiment with an extended time frame. For 14 days Paterson wore binoculars that inverted the images. He repeated this experiment 8 months later. He reported that behavior showed the perception that he had developed during the first stint of 14 days. "The learning consisted of a series of specific adaptations overlying the original perception, rather than a reorganization of the original perceptual system" (Gregory, p. 208).

Betty Edwards in her book Drawing on the Right Side of the Brain states that "the brain frequently does the expecting and the deciding, without our conscious awareness, and then alters or rearranges – or even simply disregards – the raw data of vision that has hit the retina" (1999, p. XXV).

Brain Summary

These studies are showing quite alarming yet important discoveries of the brain function when it comes to "seeing". The cerebral hemispheres specialize in different functions though when working together will allow a person to process more holistically and develop a more broad scope of what is being experienced. Therefore it is vital to develop and strengthen both hemispheres in order to develop people who can see as in da Vinci's first category of seers. Also evident through these studies is the fact that perception is easily dominated by the left hemisphere which Edwards calls "speedy and dominant and very prone to rush in with words and symbols, even taking over jobs which it is not good at" (Edwards, 1999, p. 46). So the question arises, how can these discoveries push us forward into developing students who have the ability to use both hemispheres to their fullest and develop perception skills that enhance learning and their interaction with the world around them.

How Children Learn and Observe

When considering the question of how to develop students into great observers, perceivers, and "brain users", we must first consider how children learn and build their perceptions. Catherine Eberbach and Kevin Crowley from the University of Pittsburgh wrote an article describing their findings on how children learn to observe. They claim that "children typically notice middle-sized, close, perceptible, and familiar objects" (2009, p. 47). This was evident in their observations of middle school students where 7th graders mentioned only one biological feature when comparing differences between two fish and 5th graders focused on individual plants rather than populations when tracking plant growth (Eberbach & Crowley, 2009). They also concluded that children are more likely to notice isolated instances of evidence than they are to consider all of the available evidence (2009).

Along with the fact that children notice individual objects close at hand, another aspect of building perception in children is the amount of expectations formed through various experiences. This idea of expectations building perception and affecting observation is found when talking about the moon. Eberbach explains that children begin to expect the moon to be visible during the night and soon expect it to be only in the night sky. Children often fail to see the moon in the morning sky in part due to this expectation (2009).

With a goal of showing those whom da Vinci classified as “seeing when shown”, it would seem that the odds are stacked against the accomplishment of this goal. Much of the educational system in the U.S., in a culture where observation is not the primary source of learning, children are encouraged to observe one thing at a time and to rely on explanations more than observation to learn everyday activities (Eberbach & Crowley, 2009). The left cerebral hemisphere, which deals with logic and symbol recognition, gets worked much more often and thus strengthened over the right cerebral hemisphere which deals with the spatial and visual functions. Experiences building the children’s perception of the world around them being tough, if not impossible to break through and re-build this perception. It is no surprise that systematic observation is a challenging enterprise (Eberbach, Crowley, 2009). John Dewey in Experience and Education puts it this way, “The crucial educational problem is that of procuring the postponement of immediate action upon desire until observation and judgment have intervened.” (1998, p. 81) “This seems to be the manner in which educators can break through the preconceived expectations and the cerebral hemisphere dominance. One way to procure this postponement of immediate action mentioned by Dewey is through the arts. Much of teaching is really re-teaching and challenging mental models with discrepant events, which leads to assimilation and accommodation” (Abruscato, 2000 p. 40).

Developing Perception Through Arts

Successful art changes our understanding of the conventions by altering our perceptions (Rufo, 2012). Elliot Eisner summarized this major goal of the arts in the education system. He says that "what we are after in the arts is the ability to perceive things, not merely to recognize them. We are given permission to slow down perception, to look hard, to savor the qualities that we try, under normal conditions, to treat so efficiently that we hardly notice they are there" (2002, p. 5). "One cognitive function the arts perform is to help us learn to notice the world" (2002, p. 10). This slowing down of perception and the left side of the brain dominating the symbol recognition is one effective way to strengthen the right hemisphere of the brain. Betty Edwards writes "in order to gain access to the subdominant visual, perceptual R-mode of the brain, it is necessary to present the brain with a job that the verbal, analytic L-mode will turn down" (1999, p. XX). Learning to draw is one job that the left hemisphere will turn down for sure. Learning to draw results in learning to see differently and, as the artist Rodin lyrically stated, to become a confidant of the natural world, to awaken your eye to the lovely language of forms, to express yourself in that language (Edwards, 1999).

Jill E. Fox, Ph.D. at University of Texas at Arlington conducted an experiment on a kindergarten class in a public school in Texas comparing the reports of observations of children who drew first with children who did not draw first. Her findings show that those who drew what they were observing before answering

interview questions about their observation stayed on topic in their verbal responses, answering the interviewer's questions succinctly and accurately. When the children did not draw what they were observing prior to their interviews two-thirds of them provided at least one response during the interview that was based on a hypothetical or imaginary situation (Fox, 2010). In her study, drawing their observation supported children in making an accurate verbal, rather than graphic, record of what they saw (Fox, 2010). Fox says that "The children economized during their interviews in ways that the majority of the children could not when they did not draw. They left out hypothetical questions and imaginary interjections and focused their attention on what was there" (2010, p. 7). In these situations where the children were allowed to draw before the interview process, the child is able to get to a place described by Elaine Howes as she examines John Dewey's Experience and Education. She says that "The children's experience of observation goes well beyond looking. The children act upon and transform the observational setting by recording what they observe; they take some control of their experience by changing the situation in order to explore further" (Howes, 2008, p. 542).

One movement in the right direction for accomplishing the goal of developing perception and observational skills in students is the addition of the 8th intelligence category of learning. Howard Gardner added to his 7 categories of learners the 8th category labeled "Naturalistic Intelligence" (http://www.multipleintelligencetheory.co.uk/). Being a naturalistic learner, one

would flourish from being able to touch, feel, hold, and try practical hands-on experiences, but generally outdoors within the environment, nature and animals. Whether star-gazing, collecting bugs or rock, gardening, looking after animals, cooking or even just playing out with friends, these are all ways of being "Nature-Smart" (http://www.multipleintelligencetheory.co.uk/). I would venture to add drawing, especially drawing in the outdoors, as one of the ways to become "Nature-Smart" as mentioned by this 8th category of intelligence.

These benefits of arts in the educational system are ones that will be able to combat the brain, perception, and experiences when training and developing young minds to be observers of their world.

Developing an art program

One of the greatest assets of drawing training is explained by Betty Edwards when she explains that "The brain frequently does the expecting and the deciding, without our conscious awareness, and then alters or rearranges – or even simply disregards – the raw data of vision that has hit the retina. Learning perception through drawing seems to change this process and to allow a different more direct kind of seeing. The brain's editing is somehow put on hold, thereby permitting one to see more fully and perhaps more realistically" (Edwards, 1999, p. XXV). In their article printed in the January edition of The Science Teacher, Dirnberger, McCullagh, and Howick claim that artists and natural scientists follow remarkably similar paths

in the way they learn to see the world. "The first step in the scientific process is observing the natural world. To develop truly original ideas and insights, investigators must see things outside their normal context. To draw effectively, artists must do the same" (Dirnberger, McCullah, & Howick, 2005, p. 41). Betty Edwards would add the "Drawing is not very difficult. Seeing is the problem, or to be more specific, shifting to a particular way of seeing…to see things in a different way" (1999, p. 41). According to Shepardson, "drawing is a graphic speech and noted that young children's representation often reflect what they know about the object more than what is actually perceived. Young children name and designate more than represent" (2001, p.44). With this "seeing in a different way" and the young child's representation rather than observation as obstacles in the art program development, attention must be given to the type of activities, drawings, and assignments used in such a program.

Many arguments are given as to the scope of the drawing activity and the benefits from such an activity. Dewey would say that it is not the activity per se that is educative or that is conducive to growth. It is the teacher's and student's communal interaction around the activity and its qualities that constructs purposes and educative experiences (1998). He would also say that observations are neither 'right or wrong'. This aspect of scientific processes may assist both teacher and students in developing a science-learning atmosphere that values exploration (1998). Weekes would argue that a drawing's best product is often not the work

itself, but the time it provided for quiet contemplation (2005). Whatever the argument is for the activities that should be included in a program, Eberbach and Crowley hold that mediation by a more experienced person is essential (2009). A common point through all of the studies show that teacher and student interaction is vital to the development of a drawing program not only for instruction sake, but also for the opportunity for the student to publicly organize and communicate observations and drawings that they gain in the activity process (Eberbach & Crowley, 2009).

Drawing Benefits Outside the Classroom

Many benefits from drawing training can be applied outside the art and science classrooms. Michael Canfield, a Harvard University entomologist and editor says "When you're sketching something, you have to choose which marks to make on the page. It forces you to make decisions about what's important and what's not." He claims that this skill can be transferred to the conference room, the sales floor, your backyard garden, and many other everyday decision (Paul, 2012). Other cognitive functions performed by the arts include those that allow the observer to become aware of the environment or its own consciousness. It includes the most sophisticated forms of problem solving imaginable through the loftiest flights of the imagination (Eisner, 2002, p. 9). One teacher slows her students down causing them to look, to listen, to stare. She uses drawing as a vehicle for getting them to sharpen what one called the greatest tool of all: simply sitting and watching (Weekes, 2005).

Viktor Lowenfeld and W. Lambert Brittain capture the impact of arts education and drawing training outside the classroom in their book Creative and Mental Growth. One factor that they point out is sensitivity (1964, p. 7).

> A sensitivity to problems, to attitudes and feelings of other people, and to the experiences of living. This is the ability to use eyes not only for seeing but for observing, ears not only for hearing but for listening, and hands not only for touching but for feeling. This is a high degree of awareness of a material, a situation, or anything unusual or promising. Certainly this is a central experience in working with art materials, where being sensitive to a line or form can be encouraged and developed at all levels. (1964, p. 7)

> Another factor that has been identified in the creative process is the capacity to redefine or reorganize. To be able to rearrange ideas and shift the uses and functions of objects, or to see them in a new light, is apparently a quality that utilizes what is known, but for new or different purposes. (1964, p. 8)

It is evident that obstacles are before the development of students who use the entire brain to build perceptions in order to "see" as da Vinci did, but there is hope. Betty Edwards encourages and challenges "As your perceptions unfold, you take new approaches to problems, correct old misconceptions, peel away layers of stereotypes that mask reality and keep you from clear seeing."

CHAPTER THREE

METHODS OF RESEARCH

Research Overview

The purpose of this research will be to investigate the impact of drawing training on observation skills of students in the elementary classroom setting. Being a science and art teacher in the elementary classroom, I used this process within the curriculum in the classroom to enhance the learning of both subjects taught. Students will record their observations of a scene with little or no instruction or direction from the teacher. This observation period prior to drawing lessons will be referred to as "observation period 1". After a series of drawing lessons over the next few days, they will be asked to record observations once more of the same scene. This observation period after the series of drawing lessons will be referred to as "observation period 2". The students' written record of their observations during period 1 will be referred to as "observation record 1" and the record after the completion of drawing lessons will be referred to as "observation record 2". Inductive reasoning will be applied when reviewing the two observation records which will constitute the data of this research experiment.

Based on the literature reviewed in the previous chapter, and according to Frederick Franck who said "I have learned that which I have not drawn, I have never really seen." (Edwards, 1999, p. 4), it would seem that the observation records of

the students would show more detail and have a more concrete nature upon completing the drawing training sessions than the observation records prior to the drawing sessions.

Assumptions

The results of this experiment will be gathered under a couple assumptions as the experiment has been formulated. One limiting assumption is based on Betty Edwards' book where she states that "The beginning of adolescence seems to mark the abrupt end of artistic development in terms of drawing skills for many adults" (1999, p. 69). It is assumed that these elementary students have not yet reached that level of maturity described by Edwards. It is hoped that these students still hold a love for drawing and hold to a belief that they can actually draw with some skill. Another assumption when entering this process is one of peer interaction. Time and space does not allow for this experiment to be conducted on an individual level. There will be groups sitting around the observation table. This could impact the level of concentration and the greatest tool of all "sitting and watching" (Weekes, 2005).

Student Demographics

The 60 students involved in this experiment are grades three through six. This puts their ages at eight and eleven years old. In the third grade there are ten boys and seven girls. In the fourth grade there are four boys and seven girls. In the

fifth grade there are seven boys and ten girls. And in the sixth grade there are eight boys and seven girls. This makes 29 total boys and 31 total girls between the ages of eight and eleven years of age. At the private school where these students attend there is an art program, but art is not offered to the grades involved.

Preparation for Observation

Preparations must be made prior to launching this experiment. The focus of the experiment is the observation tank. In this particular experiment, I decided to prepare a 10 gallon fish tank to support reptiles and amphibians for observation. The substrate chosen to cover the bottom was about one inch of moss purchased at the local pet shop. On this substrate was placed an imitation rock water bowl, plastic imitation plants with broad leaves and of various colors including green, maroon, and brown, natural wood sticks, various natural rocks, and a screen to enclose the tank. After the tank was established and prepared, I purchased one fire bellied toad of about 2 inches long that had three full legs and a stumpy leg and placed it in the tank. I then added one green anole lizard of about 7 inches long and one long tailed lizard of about 9 inches all purchased at the local pet store. A small light and shield was added to the top of the screen for heat and light.

After the tank was established, the observation sheets and teacher instructions were compiled. Observation period 1 was designed for the classroom teacher to facilitate. Instruction sheets were designed, copied, and delivered to the

teachers (Appendix B) along with a smaller piece of paper for the student observation record 1 (Appendix A). Three more forms needed for this experiment were designed. One with a line drawing of the Mona Lisa on a quarter of the page printed upside-down with a blank rectangle next to it for student drawing (Appendix C). Another form is needed with instructions at the top for a continuous contour line drawing of a small object and space below for the drawing (Appendix D). The next form needed contains instructions at the top describing a continuous contour line drawing of the student's hand and thumb with space below for the drawing (Appendix E). A final form needed is one used for the observation record 2 with space for a drawing of the observation tank at the top and space at the bottom for observation record 2 (Appendix F).

Observation Period 1

For observation period 1, the classroom teacher was asked to facilitate the procedure. The observation tank was brought into the classroom and remained covered by a cloth while the instructions were read by the facilitating teacher. The teacher was given one page of instructions and tips (Appendix B). This contained a script for the facilitating teacher to read verbatim not adding or omitting any instructions from this script. Students in groups of 4-6 were asked to sit around the observation tank with nothing in hand. The facilitating teacher was instructed to record the time when the group began observing the tank. The students were instructed:

> In a moment I will give you time to observe what is under this cloth. I want you to take some time to look it over trying to observe what is in the tank. Take as much time as you need. When you are finished observing the tank, raise your hand and I will bring you a piece of paper with some questions on it for you to answer. You may not talk during this exercise. (Appendix B)

When the students finished their observation period 1, they received observation record 1 and were instructed to record the time they received that form. They returned to their seats and answered the question on the page "What did you observe in the terrarium?" and these forms were collected by the facilitating teacher. After the entire group had returned to their seats and began recording their observations, the next group of 4-6 students were asked to sit around the observation tank and the facilitating teacher repeated the process with this group.

Series of Drawing Lessons

Within the seven days following observation period 1 the art teacher, in this case myself, visited the classroom to conduct a series of 3 drawing lessons with the class that has previously observed the tank. The first drawing lesson uses the form Appendix C. The students were instructed to write their name at the top of the page along with their grade and date of the lesson. On the lower portion of the form is a simple line drawing of the famous masterpiece Mona Lisa painted by Leonardo da Vinci. This drawing is inverted with Mona Lisa's head towards the bottom of the

page. The students are instructed to keep the image inverted and, in the space provided next to the image, draw what they see exactly as they see it. They are instructed to be silent in order to "shut down the left side of the brain and allow the right side to dominate." There was no time limit on this drawing, simply work as diligently as needed. This exercise is found in Edwards' book (1999, p. 55).

> Familiar things do not look the same when they are upside down. We automatically assign a top, a bottom, and sides to the things we perceive, and we expect to see things oriented in the usual way (p. 55). When the image is upside down, the visual clues don't match. The message is strange, and the brain becomes confused. We see the shapes and the areas of light and shadow. We don't particularly object to looking at upside-down pictures unless we are called on to name the image. The reason for this exercise is to experience escaping the clash of conflicting modes of the brain hemispheres. When left mode drops out voluntarily, conflict is avoided and right mode quickly takes up the task that is appropriate for it: drawing a perceived image. (p. 61)

Drawing session two involved a continuous contour line drawing of a small object or shoe. This session was again conducted by the art teacher in the classroom. Students were given form Appendix D. This form was to be used for a continuous contour line drawing. Such a drawing is done by putting the pencil on the paper and not removing it from the paper until the drawing if completed. The object's outline

is not enough for this drawing. The contours of the object must be drawn which will show the form of the object. The students were to remove a shoe or boot and place it on their desk in front of them. They were instructed to create a continuous contour line drawing of this shoe or boot going slow and concentrating on each detail, curve line on that shoe or boot. Edwards assures that "Pure Contour Drawing will permanently change your ability to perceive" (1999, p. 94).

The final drawing session conducted by the art teacher again dealt in the Pure Contour Line Drawing. This session needed form Appendix E which is concerning a contour line drawing of the hand and thumb. Before the students were given the contour line drawing form, however, they were instructed to "warm up" their "right brains" by drawing the same shoe from before. The only difference is that they may lift their pencil from the paper and add details that they observe in the shoe. Then the students were given the paper and instructed to create a "blind" continuous contour line drawing of their hand and thumb. This involves turning their body in their chair in such a way that they cannot see their drawing paper. They were instructed to go slow concentrating on each curve, crease, and wrinkle they see in their hand. Again showing form by drawing contour lines seen on the hand. This exercise is found in Edwards' book with the reason behind it being that such a drawing causes left mode to "reject the task," enabling the artist to shift to right mode (p92). After the students finished drawing their hand and thumb with a continuous contour line, they were asked to sketch the same hand right next to the

original drawing. This time they were able to lift the pencil from the paper and add details and then compare the two drawings. The results are most often surprising as to how well they could draw their hand. Again, the reason for such exercise is to cause the left hemisphere to refuse the task at hand and to allow the right hemisphere to take over.

Observation Period 2

After the series of three drawing sessions, which were conducted by the art teacher, the final stage of the experiment may be facilitated by the classroom teacher once again. The exact observation tank was returned to the classroom covered with a cloth again. The teacher has no script this time, only an observation form for the students to fill out. This form (Appendix F) was handed to the students and they were instructed to follow the steps on the form. A group of 4-6 students were allowed to sit around the observation tank once again as they did during observation period 1. They were asked to "draw what you see in the terrarium" on the top portion of the form. There was no time limit for this drawing exercise, however, they were asked to record the beginning and ending time of their observational drawing. After they finished drawing, they were instructed to return to their desks and record their observations on the bottom portion of the form. This is a written record of observation. As one spot opens up for observation, another student fills that spot and draws their observations. These forms were then collected by the facilitating teacher.

Data Analysis Method

The data gathered was in the form of the students' recorded observation forms (Appendices A and F). These forms offered data reflecting the students' observations during 2 periods. Period 1 was prior to drawing lessons and period 2 was after a series of drawing lessons. The following aspects of the records were considered in the analysis:

- male or female student with random numbers assigned and no names
- minutes spent observing for each period
- total number of words written for each period
- difference of number of words between the two periods
- total number of items mentioned as being observed for each period
- type of recording for each period (sentence form or list form)
- comments concerning the word choice, observation focus, description trends, drawing content, or other notable analyses

CHAPTER FOUR

RESULTS

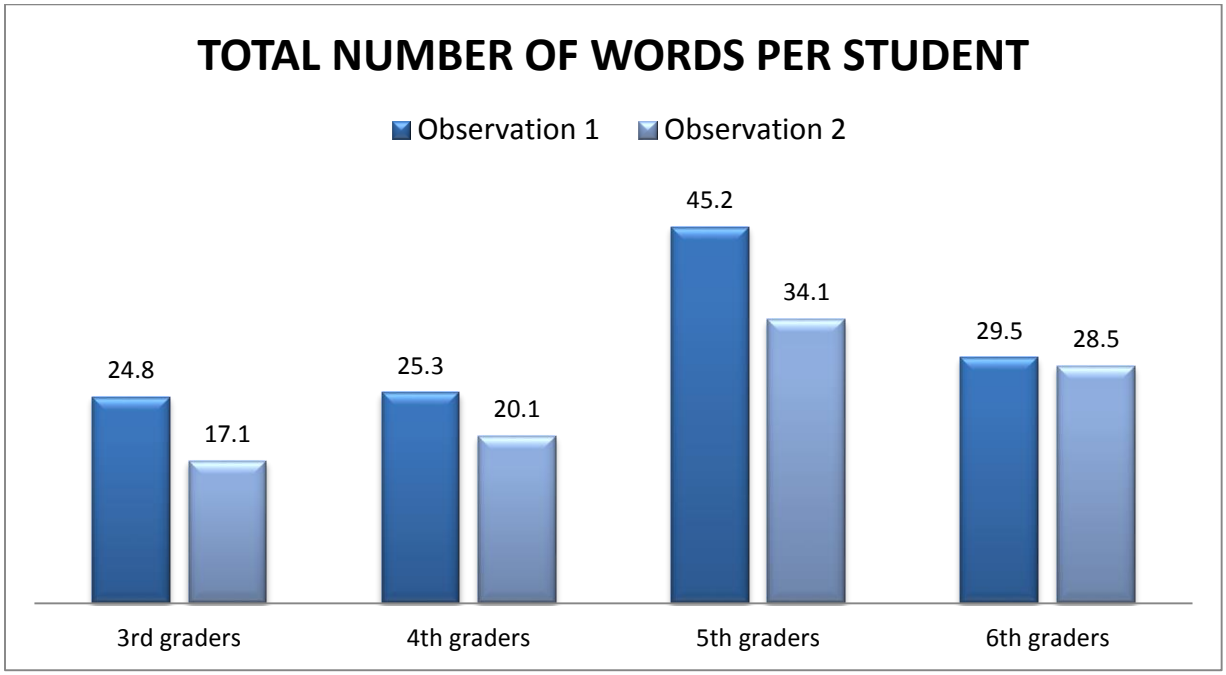
Observation Record Overview

The purpose of this study was to investigate what impact of a short series of drawing lessons would have on students' observational skills and attention to detail, to "see" common things in a different way. The results consist of two records of observation periods, one prior to drawing lessons and one after a series of drawing lessons. The first observation record was in the form of writing the observations while the second record was after an opportunity to draw the common objects before writing the observations. The common objects that were observed were a green anole, a long tailed lizard, a fire-bellied toad, and their habitat in a small glass aquarium. The same observation tank was used for both observation periods.

Observation Record Notes

- Observation 1 represents the observation period 1, prior to drawing lessons.
- Observation 2 represents the observation period 2, after drawing lessons.
- The term "animation" refers to giving the animals in the tank feelings or actions similar to humans.
- The term "seen" refers to characteristics which are able to be physically seen by the eye.

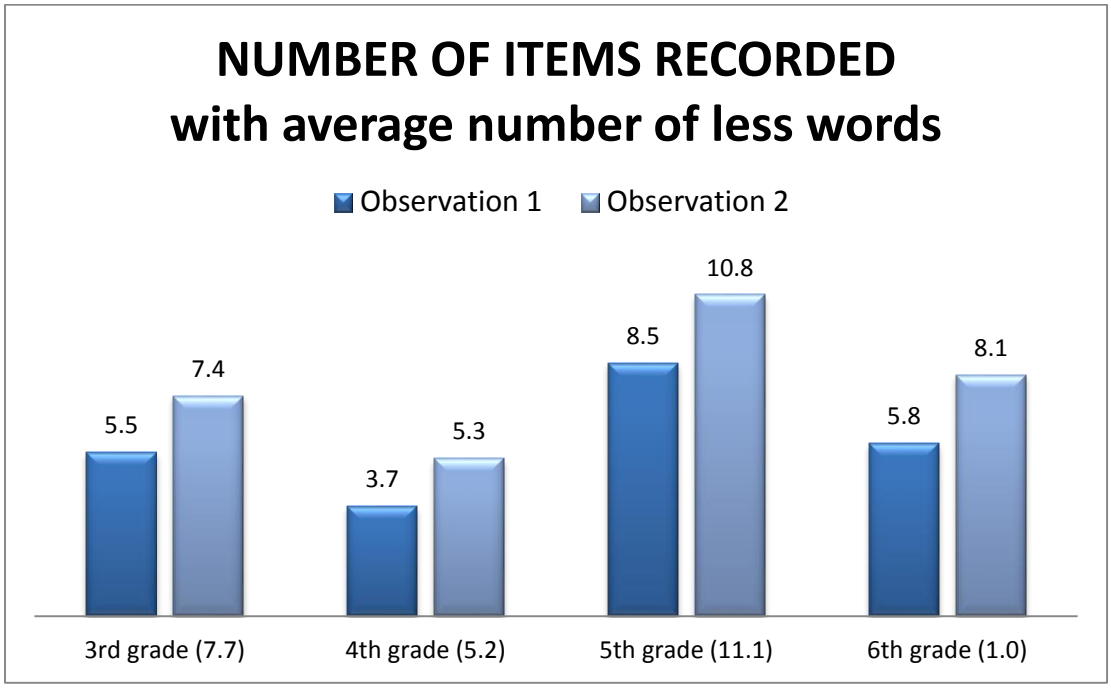
FIGURE 2: Average number of words used per students to record observations.



Summary of Results

Figure 2 shows the average number of words used in the observation records for the students in each classroom. When comparing the word usage in each observation periods, each class used fewer words during observation period 2 than in observation period 1. Although the class average drops from observation period 1 to observation period 2, that is not showing that each individual student dropped in number of words used. This data was unexpected at first, however, after looking at the detailed drawings included on the record form, these drawings may have been considered a method of recording and communicating observations.

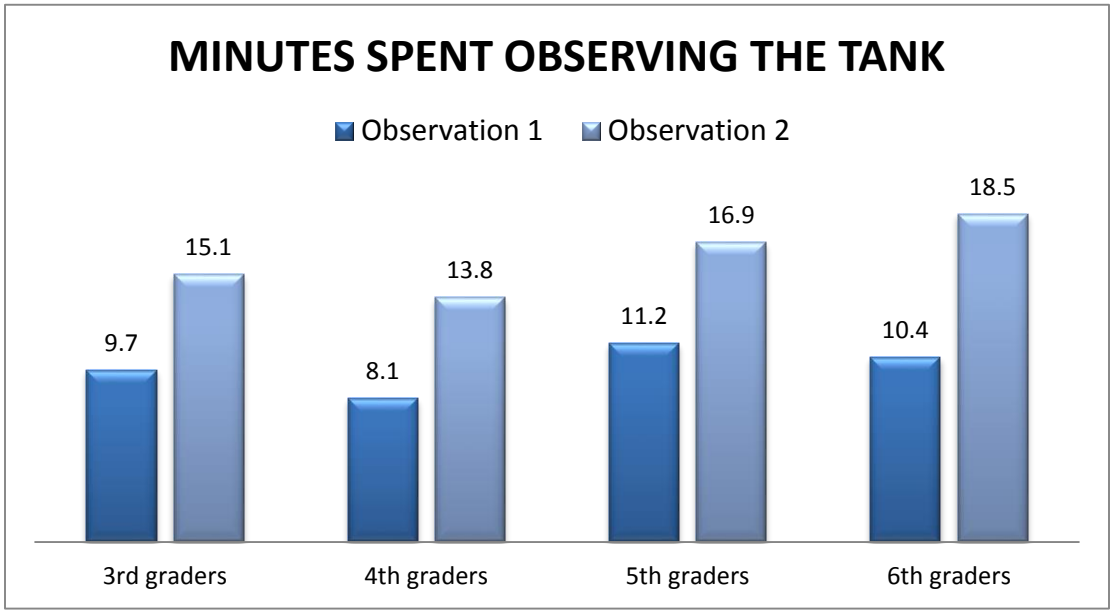
FIGURE 3: Average number of items recorded as observed using fewer words in Observation Period 2 (# of fewer words per student).



Summary of Results

Figure 3 graphs the number of items that were described by the students on their observation record forms during the two observation periods. Upon comparing the numbers of these items described, all classes observed and recorded the observations of a larger number of items during observation period 2, after drawing lessons were completed. When partnered with figure 1 which shows the number of words used, the students used fewer words to describe more characteristics after drawing their observations of the tank first. This is showing that drawing the observations prior to using words to describe the observations causes the student to be more succinct and focused with their written descriptions.

FIGURE 4: Average number of minutes spent observing per student



Summary of Results

Figure 4 compares the time the students spent in minutes observing the observation tank. It is expected and understandable that students would spend more time during observation 2 due to the option to draw what they observe. This is evidence that offering and encouraging the option of drawing their observations, students will sit and watch for a longer period of time than when drawing is not allowed. The ability to sit and watch is a critical skill to have to become an observer of the world.

FIGURE 5: Comparing "Animation" recordings with "Seen" recordings per class in Observation Period 1

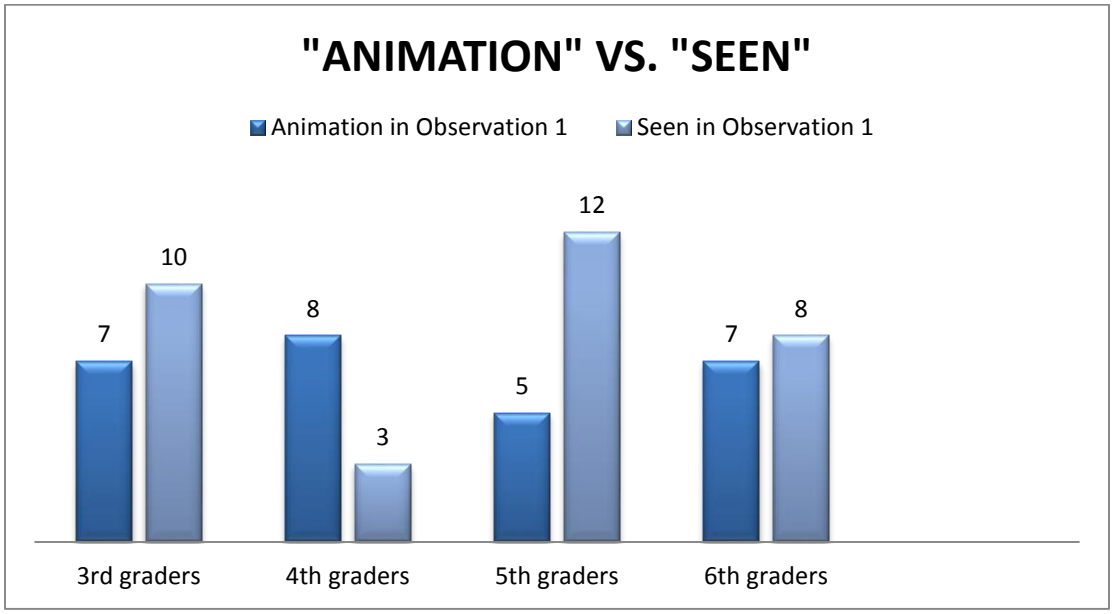
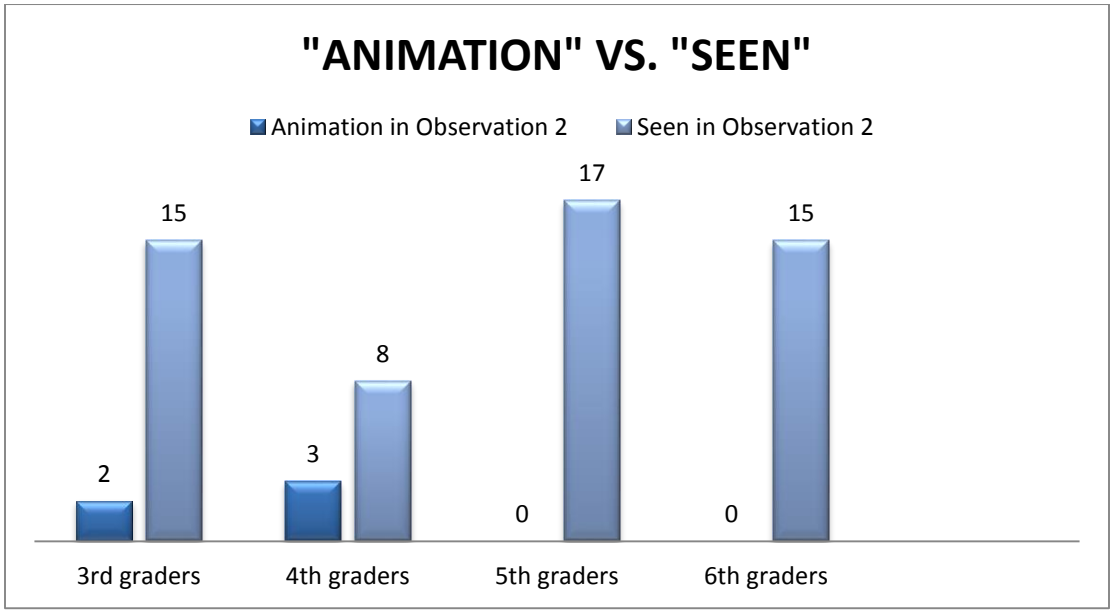


FIGURE 6: Comparing "Animation" recordings with "Seen" recordings per class in Observation Period 2.



Summary of Results

Figure 5 shows the amount of students who recorded observations with a style of adding human-like animation and actions to the animals in the tank compared to those who focused on what could be physically seen. Figure 6 graphs the same concept as figure 4 only during observation period 2, after drawing lessons were completed. Observation period 1 had more students adding “animation” to the animals than observation period 2. This was evident by the use of words in the observation records such as “winked”, “feeling at home”, “liking their home”, “star struck”, etc. This data shows that drawing forces the observer to focus more on the details of what the eye is seeing than what the imagination can apply to the objects being observed. In each grade level, the descriptive words were significantly more, indicating a deeper understanding of the visual and, as mentioned earlier, altering the perception.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Chapter Overview

This chapter will reflect on the major points learned and conclusions gained from the data collected from the classroom experiment of drawing lessons impacting observation skills. Each aspect of student observation that was analyzed through the data collected will be applied to developing the class of student that da Vinci would consider those who can "see". Also included in this chapter will be recommendations of how to present practical aspects of lessons that will allow students to become part of da Vinci's "seeing" class.

Right Hemisphere Strengthening

"In order to gain access to the subdominant visual, perceptual R-mode of the brain, it is necessary to present the brain with a job that the verbal, analytic L-mode will turn down" (Edwards, 1999, p. XX). Encouraging the students to train their eye to take notice of the tiniest details of the object they are drawing accomplished this task of appealing to the right cerebral hemisphere. This caused the left hemisphere to give in and the observer got into a "zone" in which the object was not recognized as before, but a deeper observation was a result.

Sit Still and Look

"The crucial educational problem is that of procuring the postponement of immediate action upon desire until observation and judgment have intervened." (Dewey, 1998, p. 81). One way to procure this postponement of immediate action is to strengthen the right cerebral hemisphere. "Too often the brain frequently does the expecting and the deciding, without our conscious awareness, and then alters or rearranges – or even simply disregards – the raw data of vision that has hit the retina" (Edwards, 1999, p. XXV). The more a student sits still and watches, the stronger the right hemisphere becomes. This will become the new normal for the brain not to jump to the expected prior to analyzing the reality.

R**edefining and Reorganizing**

"To be able to rearrange ideas and shift the uses and functions of objects, or to see them in a new light, is apparently a quality that utilizes what is known, but for new or different purposes" (Lowenfeld, 1964, p. 8). When developing a "seer" through the arts, the student is the foundation to build upon that will soon become the businessman or corporate woman. This skill of utilizing the known for new or different purposes is a key skill in problem solving and developing programs. This skill is honed through the arts as the perception and observation of common objects is challenged to see the intricacies and details with the right cerebral hemisphere.

Research Summary

After analyzing and drawing conclusions on the data and experiment in the classroom, the results of such an experiment support the original claim of the arts, specifically drawing training, will have a lasting positive impact on developing observers who see differently. The arts and drawing training offers opportunities for a student to strengthen the right cerebral hemisphere, redefine and reorganize, sit still and watch, and utilize the known in new and different ways. Each of these skills are critical as we "peel away layers of stereotypes that mask reality and keep you from clear seeing" (Edwards, 1999 p. 248) and develop those who would fit into da Vinci's class of "those who can see."

Personal Reflections

Conducting this research project has motivated me as a teacher in a number of ways. I have been reminded of how critical it is as a teacher to focus more on the skills being developed in my students even above the curriculum at hand. I have a refreshed outlook on my ultimate goal in the classroom which is to help these students become great thinkers and build their discerning process not only for their contribution to industry and engineering, but also for the greater good of this world they live in.

This project has motivated me to be intentional about incorporating periodic drawing exercises in the science classroom as well as the art room. The results of

this project shows many benefits to forcing the brain into “uncomfortable” situations where the L-mode of the brain will reject the project allowing the R-mode to take over and enhance the observation of the subject at hand. Data found throughout the project shows drawing fostered more of a focus on describing the details of what was being observed than simply using their imagination to animate or imagine the thoughts of the critters being observed. While the imagination has a major part role in development, education, innovation, and engineering, the ability to observe the topic at hand is a skill that is of equal importance.

The purpose of my teaching art and science has not changed, rather it has been strengthened. That purpose being to develop students who observe and analyze life situations as well as the text book claims while delaying the domination of perceptions. According to the observation records of these students, drawing training is a great place to start developing students who follow Romans 12:2 where Paul is reminding, “Do not conform to the pattern of this world, but be transformed by the renewing of your mind. Then you will be able to test and approve what God’s will is- his good, pleasing, and perfect will.”

APPENDIX A

STUDENT NAME_____ **GRADE**_____

TEACHER NAME_____ **DATE**_____

WHAT TIME IS IT NOW?_____

WHAT DID YOU OBSERVE IN THE TERRARIUM?

APPENDIX B

Script:

In a moment I will give you time to observe what is under this cloth. I want you to take some time to look it over trying to observe what is in the tank. Take as much time as you need. When you are finished observing the tank, raise your hand and I will bring you a piece of paper with some questions on it for you to answer. You may not talk during this exercise.

APPENDIX C

NAME_____

GRADE _____ DATE _____

BELOW IS A LINE DRAWING OF A VERY FAMOUS PAINTING CALLED THE

_____ _____ BY _____ _____.

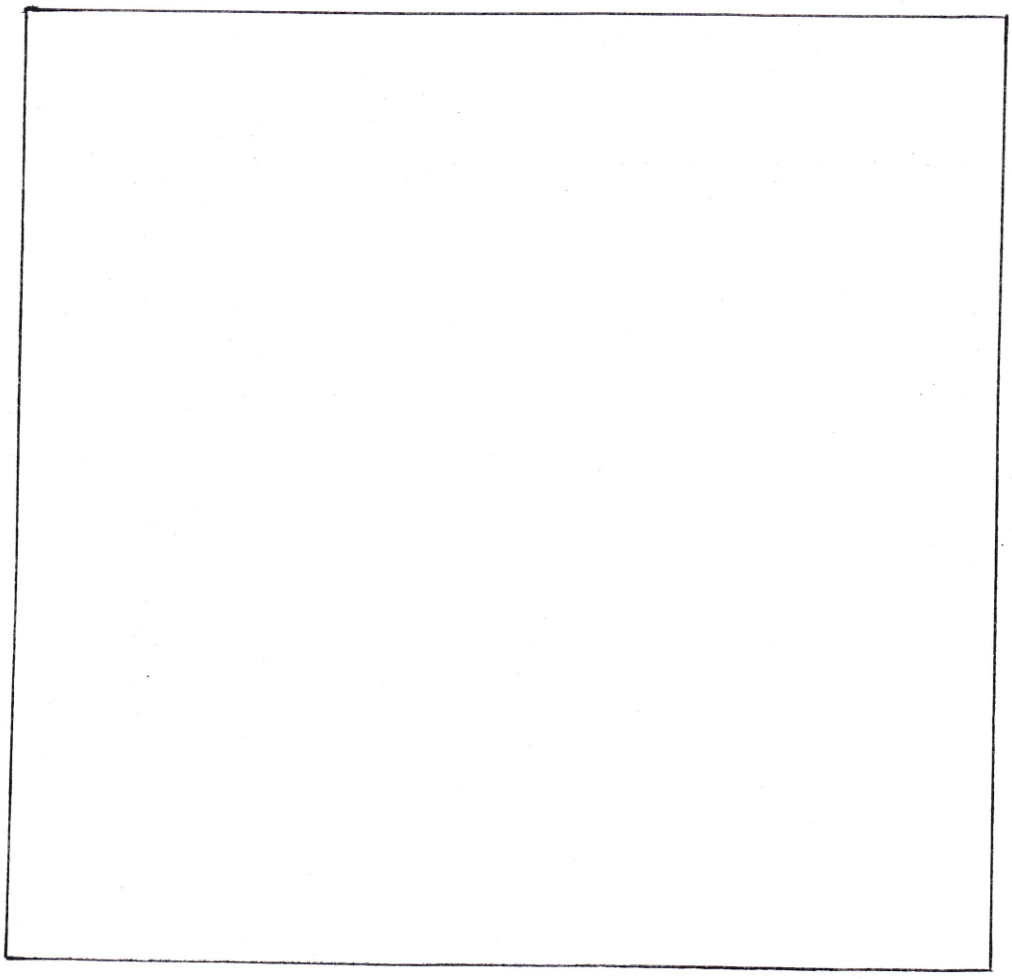
MAKE YOUR OWN UPSIDE-DOWN DRAWING IN THE BLANK RECTANGLE TO THE RIGHT OF THE DRAWING SHOWN. LEAVE THIS PAPER UPRIGHT AND DRAW YOUR PICTURE EXACTLY AS YOU SEE IT IN THE RECTANGLE ON THE LEFT.

APPENDIX D

NAME _____

GRADE _____ DATE _____

WITHOUT LIFTING YOUR PENCIL, CREATE A CONTINUOUS CONTOUR LINE DRAWING OF ONE SMALL ITEM YOU CHOOSE FROM YOUR DESK OR AROUND THE ROOM. GO SLOW CONCENTRATING ON EACH DETAIL, CURVE, LINE ON YOUR CHOSEN ITEM.

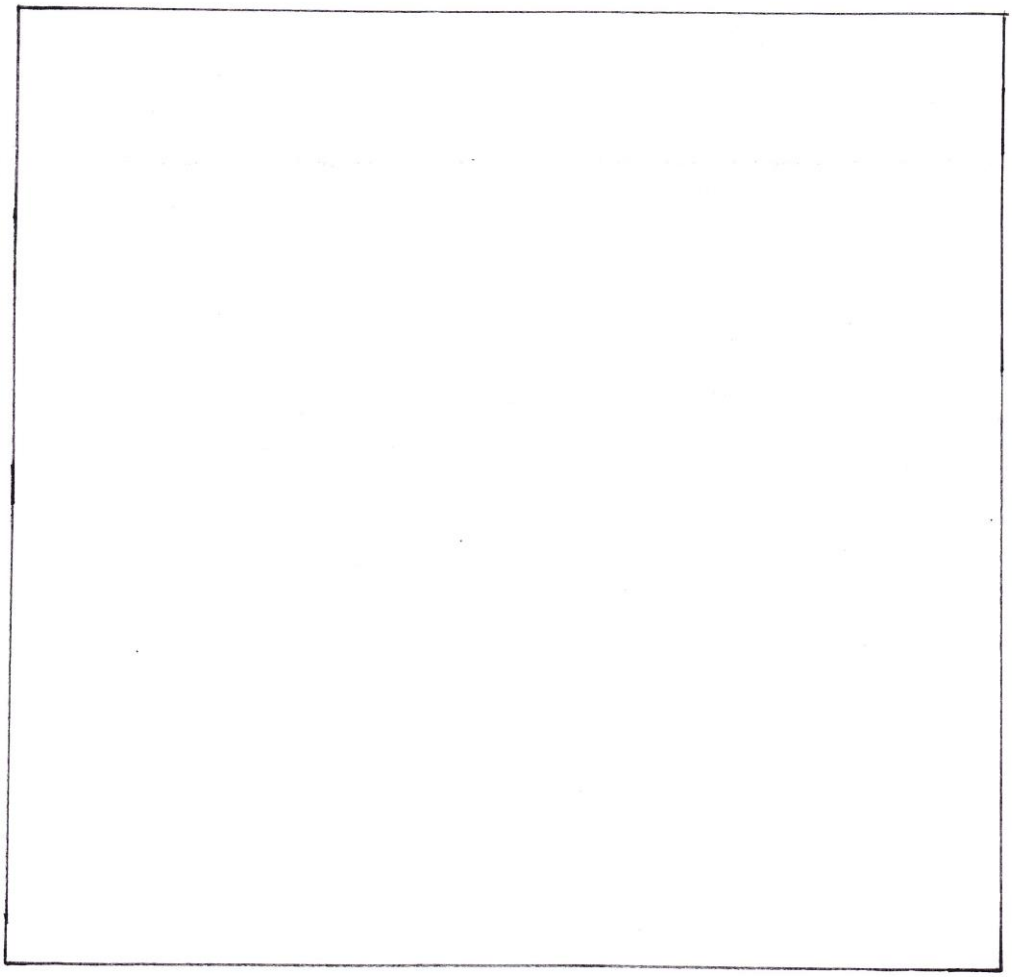


APPENDIX E

NAME _____

GRADE _____ DATE _____

WITHOUT LOOKING AT THE PAPER AND WITHOUT LIFTING YOUR PENCIL, CREATE A CONTINUOUS CONTOUR LINE DRAWING OF YOUR THUMB AND HAND. GO SLOW CONCENTRATING ON EACH CURVE, CREASE, AND WRINKLE YOU SEE.



APPENDIX F

STUDENT NAME_____

GRADE_____

TEACHER NAME_____

DATE_____

Draw what you see in the terrarium.

WHAT TIME IS IT NOW, AFTER YOU FINISH DRAWING?_____

Use your drawing as a reference, list what you observed in the terrarium?

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