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## Second grade life science curriculum design using Howard Gardner's theory of multiple intelligences

Mary Anne Stover

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SECOND GRADE LIFE SCIENCE CURRICULUM DESIGN USING  
HOWARD GARDNER'S THEORY OF MULTIPLE INTELLIGENCES

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A Project  
Presented to the  
Faculty of  
California State University,  
San Bernardino

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts  
in  
Interdisciplinary Studies:  
Integrative Studies

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by  
Mary Anne Stover

June 2003

SECOND GRADE LIFE SCIENCE CURRICULUM DESIGN USING  
HOWARD GARDNER'S THEORY OF MULTIPLE INTELLIGENCES

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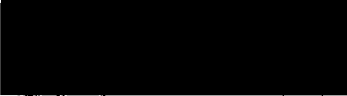
A Project  
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by  
Mary Anne Stover


June 2003


Approved by:

  
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Dr. Sue Teele, Education

## ABSTRACT

The purpose of this project was to bring the subject of life science to second grade students through a diverse curriculum design. The theory of multiple intelligences and the principles of brain-based learning were used to incorporate elements that would reach each student on an individual basis. These elements are integrated into the science curriculum to present a cohesive presentation of the material. The science curriculum becomes a medium to develop lessons that will contain multiple opportunities for students to experience the learning process through their own distinct learning style.

By using the theory of multiple intelligences the students are given multiple opportunities to absorb information in many different ways. This allows students to experience learning through multiple measures. Using the principles of brain-based, learning students can become an integral part of the learning experience. These theories complement each other because of the opportunities for students to master materials through different processes.

## ACKNOWLEDGMENTS

I want to thank my family for their continual support throughout this long process. Special thanks go to my wonderful friend and mentor Sue Teele. Without her constant support, and encouragement this project would not have become a reality. My son has also always been my source of special inspiration. Thank you Shawn. Thanks also go to my friend Barbara Dudeck who stuck to me through thick and thin. A special word of gratitude go to Sam Crowell and Bob London because of their guidance, advice, encouragement, and understanding through my many personal set backs towards the end of my project. Thank you also to my friends who were there to support me when I was ready to give up. I also need to give a special thanks in remembrance of my loving and devoted husband Tanner. His continual understanding and support made it possible for me to be who I am and where I am today in my life.

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## CHAPTER ONE

### INTRODUCTION

As educators we are responsible for educating students to become the thinkers and doers of tomorrow. We live in an era of high technology and a rapidly changing society. Students are exposed repeatedly to a barrage of fast paced, high tech computer/video games, which stimulate their sensory systems in a very different way than students were during the early years of education. Student's needs for rapid stimulation are far exceeding the standard educational setting still present in our educational system. Our educational system was designed around the industrial revolution with the goal of producing individuals who could sustain a mechanical industrial nation. This system has become outdated by the rapid predominance of technology in our society.

Research is showing us new ways to tap into student's modes of learning. As educators we need to be aware of these new findings and begin to change our methods of delivery. As teachers we are responsible for educating our students. In so doing we are integrating brain research more and more into the classroom. Because of



that we need to become informed as to how the brain functions in the educational environment. We need to be aware of how students acquire information and what methods of presentation will facilitate their individual capacities to uncover the new information that they need to become more successful individuals. Two methods of possible educational reform come from the study of the theory of multiple intelligences and brain-based learning research.

This investigation began as an opportunity to explore the possibilities of using multiple intelligences and brain-based learning principals in a classroom setting. Using this research to implement a life science unit allowed me to question the possible validity of linking these teaching strategies and assessments to the individual intelligences found in the classroom. By using these strategies would the students become more motivated to learn new information because their dominant intelligences were being utilized.

This paper presents a curriculum unit designed to be an orchestrated immersion in complex experiences unit on the Rain Forest. This unit will be taught using Gardner's theory of multiple intelligences and brain-based learning

research. Activities will include as many of the seven intelligences as possible to reach all the students learning styles. The unit will be taught through relaxed alertness which "refers to a state of mind that allows optimal performance" (Crowell, Caine, 1998, p. 11). Through relaxed alertness the students can experience a sense of low threat but will still receive challenging information and experiences. There will be activities that will be designed to teach reading skills as well as writing skills. Reading, Math and Social Studies will be integrated to assist students in understanding the skills within daily activities that are needed to function within our society.

Daily writing activities will include an individual science journal in which students will write each day to reflect what they learned that day. They will answer two questions:

1. What did I learn today?
2. What would I like to know more about?

Math activities will include daily graphing of questions that relate to the activities being studied. Students will answer questions such as "Would you rather be a monkey or an anteater" and put an animal marker on

the graph. Discussions of the graph will include what they see and the relationship to their individual preferences. How this information can be used, and what can we learn from this activity will also be discussed.

Students will be grouped into five groups, which will be their learning activities group. Each group will choose a name such as Parrots, or Epiphytes etc. These groups will work together on many projects throughout the unit and they will receive a grade for both group and individual participation grade.

#### Purpose of the Study

The purpose of this unit is to design a Life Science unit that includes the Fontana Unified School district Science Standards and uses multiple intelligence instructional activities. The science standards state that second grade students will know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.

In order to address these standards students will create an environment like the rain forest within the classroom themselves. This unit will cover the diversity

and interaction of plants, and animals within this ecosystem as well as the importance of conservation for the future. The students will begin with a study of the plant organisms just as if the learner were visiting the rain forest 400 million years ago. Then they will discover the insect and reptiles, which lead into the birds and mammals of the region. As the unit progresses students will construct the different layers of the rain forest with the different plants and life forms added to each layer. They will participate in several multiple intelligences (MI) activities that represent different intelligences. This will allow them to construct different plant and animal forms while they are learning through discovery and immersion about those same organisms.

The major points that will be covered include the structure of the rain forest and the need for each organism within the system to function as a whole. The four layers of the forest will be identified as the emergent layer, the canopy layer, the understory and the forest floor.

Each layer has a distinct function within the ecosystem. The emergent layer has the tallest trees which

emerge above the system. There are many unknown insect species that live here and never have been seen by man. The canopy layer contains a large number of plants, animals, insects, and reptiles that live solely within these confines. Each organism depends on a very fragile system for its own survival. The understory also contains a set of organisms that depend on one another for their survival but the diversity of species is not as vast as the canopy layer. The forest floor primarily contains units of life that breakdown the litter from the upper layers and send the nutrients back into the system.

Students will discover that this system is very fragile because of the infringement of man and his desire to control the land. Just a few changes to this system by man can make a vast difference within the whole system. Students will understand why mankind needs to recognize how these individual organisms depend upon one another to survive. This could prove to be a metaphor for the existence of man and his own survival.

## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction and Historical Reviews

What is intelligence? How do we maximize the learning abilities of each individual in the classroom? These questions are important to the successful education of our students, but they are not easy questions to answer. The definition of intelligence is dependent upon cultural boundaries. Different cultures perceive intelligence in different ways. Asian cultures view intelligence levels through character behavior such as being benevolent and doing what is right. They put more merit on inter and intrapersonal relationships. Western cultures value a more "technological intelligence" with emphasis on practical problem solving and verbal ability (Sternberg and Kaufman, 1998, p. 2). African cultures perceive intelligence as being related to skills that support the social relationships of the family and the community. Sternberg (1998, p. 3) states that "in Zimbabwe, the word for intelligence, "ngware", actually means to be prudent and cautious, particularly in social relationships." Sternberg also relates that within the

United States, Asian families emphasize the importance of cognitive skills while Latino parents emphasize social-competence skills. So how do the educators, use this diverse spectrum of definitions of intelligence, in the classroom, to reach the individual students? Let's look at some of the different historical perspectives on intelligence. The Oxford American Dictionary defines intelligence as mental ability, the power of learning and understanding. It also defines intelligence quotient as a number that shows how a person's intelligence compares with that of an average person of the same age. Mental ability encompasses the ability to organize information within the mind or brain. Each definition is based upon what is considered to be a comparison of average individuals of the same age. What is an average individual? Who makes the decision as to the standards that are used to make this judgment? Are all individuals going to do the same things and think the same way at a given age? It does not appear that this is true. Just consider the individual cultural backgrounds within our cities and nations. Individuals in the United States are as diverse as the total world population.

Jean Piaget, a Swiss psychologist, was intrigued with the "development of thinking from infancy to adulthood" (Woolfolk, 1993, p. 27). His theory of cognitive development was derived from his early research in biology when he determined that all species inherit two basic tendencies. These tendencies are toward organization and adaptation of information into categories that can be used to survive on a "day to day" basis. Piaget theorized that all individuals strive to make sense of the world around them. His theory recognized that factors of maturation, activity, and equilibration are important in the development of changes in thinking. He organized his theory around four stages of cognitive development: the sensorimotor stage, the pre-operational stage, the concrete operations stage, and the formal operations stage. These stages were given age ranges where the child would develop specific tendencies during that time. This theory does recognize and identify specific tendencies that individuals use to build upon but it becomes very rigid within its age range limits. Each child is not limited only by their cognitive abilities; they are also influenced by their cultural heritage and other underlying influences such as socioeconomic factors.



Piaget's theories are important because he recognized that children develop in a somewhat predictable manner. The organization of information is important to the individual in order for them to predict what is needed to survive and function in their individual world. It is necessary for the individual to have information in place to build upon as they mature. This information comes through the individual stages that Piaget identified through his research.

The sensorimotor stage is the early infancy stage when children come to recognize that objects have permanence (if an object is hidden from view it still exists) and they begin to understand that they can physically act upon objects in their surroundings. The child develops means to assess how to physically play with or obtain toys within their surroundings. This ability to manipulate their surroundings becomes a precursor for the pre-operational stage where the child begins to develop language and symbolic thinking.

The pre-operational stage generally comes around the age of preschool and kindergarten when children are being introduced to the social aspects of life. This stage allows for the individual to be exposed to many different

activities. Verbal communication as well as visual and body symbolism are important at this stage. The child recognizes that although they are shown a picture of a doll or top and not the real thing that symbol is still a doll or top. This connects to the object permanence stage. Play becomes an imitation of daily life activities such as pretending to drink from cups or drive imaginary cars. During this stage children fail to recognize that other individuals do not have the same feelings as they do and although they seem to be interacting with one another they do not yet distinguish between the individual needs of others and themselves. The child's egocentric nature, according to Piaget, is shown through their "private speech" that they engage in while performing difficult tasks.

The concrete operations stage builds upon the experiences that were discovered during the pre-operational stage. Children begin to recognize that they can manipulate their surroundings and individual objects through organization. They begin to use concrete objects to understand their physical world. They begin to realize that things can be changed or transformed in some way, but still retain their general characteristics, such as when

the same amount of liquid is poured from a wide container into a narrow container the volume does not change but the liquid will seem to rise (conservation). The developmental level at this stage is dependent upon the previous experiences of the individual.

The formal operations stage becomes the abstract thinking stage when the individual extrapolates information from the known data or information to come up with possible answers or outcomes. This stage is heavily dependent upon the previous experiences of the individual during development. Many people do not successfully reach this stage in much of their lives but remain primarily within the concrete operations stage. The need to manipulate objects remains a constant for them.

Although Piaget's theory identifies several stages of development it is limiting because of the set age ranges. It does not address the child who exhibits abstract thinking at age 9 through his ability to make expert moves in chess while a 20 year old novice has a difficult time just making an appropriate opening move (Woolfolk, 1993). Individuals may exhibit areas where they show exceptional talents while still remaining within the given age limited developmental stage for everything else.

Piaget's theories primarily focus upon the need of the individual to organize information to make sense of the world around them. This theory seems to focus first and foremost on the individual's ability to manipulate their own surroundings. This does not allow for the influences presented within individual communities that surround the child. The Russian psychologist Lev Vygotsky (Woolfolk, 1993) presents the possibilities that a child's development is dependent upon the individuals present within their surrounding world. Social interactions and cultural surroundings become the main focus on an individual's cognitive development. Language also plays an important part in Vygotsky's theory. Whereas Piaget saw the child as being egocentric and using private speech as a means for self-centeredness, Vygotsky on the other hand viewed that same speech as a means of communicating. The child will use that "private speech" to help them to regulate their behavior and thinking. (Woolfolk, 1993)

Vygotsky believed that children require a means to help them develop cognitively. They need a way to find out what is going on around them. Language becomes that means of communication and the individuals that surround them become the supporters of the information pool.

Vygotsky believed that adults and cultural surroundings provide the structure, scaffold, which the child can use to support their developing understanding of their surroundings. Giving suggestions, ideas and support to the developing individual helps them to internalize their experiences. This theory allows for the teacher to become a facilitator who guides the students through experiences where they might not be able to explore alone. This level of learning allows the students to become more independent as they progress into higher levels of thinking and development.

#### Multiple Intelligences Theory

Although Piaget and Vygotsky attempted to define the cognitive development of thinking they did not address the individuals different ability levels. The theory of multiple intelligences, developed by Howard Gardner (1983), views each person as a unique individual possessing many different ability levels. In his reintroduction to his Frames of Mind book Gardner puts forth his definition of an intelligence as the ability to solve problems, or to create products, that are valued within one or more cultural settings (Gardner, 1983, p.

x). Notice that Gardner does not use mental ability in his definition but does include cultural aspects.

The theory of multiple intelligences was formulated from research instituted in 1979 by the Bernard Van Leer Foundation of the Hague which was investigating "The Nature and Realization of Human Potential". Howard Gardner was one of several people selected from the Graduate School of Education at Harvard to investigate this potential.

Gardner's original intent was to add perspective to his own investigations of children and brain-damaged adults. He was looking for a "broader and more comprehensive view of human thought" (Gardner, 1993). What eventually happened was a surprise to him. Gardner wrote about the existence of multiple intelligences in his book Frames of Mind (1983) with the original intent to present to developmental psychologists new ideas in test construction and measurement. But because of his inclusion of pages about possible educational implications of the theory his book was featured on several news programs. This coverage brought an invitation from the National Association of Independent Schools to provide an address at their annual meeting (Gardner, 1993).

Since that time Gardner has been working with his colleagues at Harvard Project Zero to explore the educational implications of his theory. Gardner found seven intelligences which are: linguistic, logical-mathematic, musical, spatial, bodily-kinesthetic, intrapersonal and interpersonal. Each intelligence does not work because of another modality of intelligence although it might work in conjunction with one or more of the other intelligences. Gardner points out that he is not limiting intelligences to only seven. He has identified one more intelligence since his original research, naturalist.

In order to understand what this theory presents we should know something about each intelligence and how a person functions within that confine. I will use the breakdown of the intelligences that are presented by Dr. Sue Teele, Director of Education, at the University of California Riverside (Teele, 1990).

Linguistic students have highly developed auditory skills, enjoy reading, writing, like to play word games and have a good memory for names, dates, places etc.

Logical-Mathematical students like to explore patterns and relationships and enjoy doing activities in a sequential order. They like mathematics, experiment to test things they don't understand,

enjoy opportunities to problem solve and reason logically and clearly.

Intrapersonal students prefer their own inner world, like to be alone and are aware of their own strengths, weaknesses, and inner feelings. They have a deep sense of self-confidence, independence and a strong will and motivate themselves to do well on independent study projects.

Spatial students enjoy art activities, read maps, charts, and diagrams and think in images and pictures. They are able to visualize clear images when thinking about things, enjoy doing jigsaw puzzles and solving artistic problems

Musical students are sensitive to the sounds in their environment, enjoy music, prefer listening to music when studying or reading. They appreciate pitch, rhythm and timbre and often sing songs to themselves.

Bodily-kinesthetic students process knowledge through bodily sensations and use their body in differentiated and skilled ways. They need opportunities to move and act things out. They respond best in a classroom that provides physical activities and hands-on-learning experiences.

Interpersonal students enjoy being around people, have many friends, social activities, and learn best by relating and participating in cooperative learning groups. These students express empathy for feelings of others and enjoy participating in group activities.

Naturalist students are sensitive to the natural world, notice relationships in nature, see connections and patterns within the plant and animal kingdoms, enjoy being outdoors, listens and hears sounds in the natural world, and categorizes and classifies flora and fauna. (Teele, 1998, p. 40)

Gardner used several different criterion to establish his list of intelligences.

Gardner examined the development of cognitive capacities in normal individuals; the existence of abilities in "special populations," such as prodigies, autistic individuals, idiots savants, and learning-disabled children: forms of intellect that



exists in different cultures; and two forms of psychological evidence--the results of factor analytic studies of transfer and generalization (Gardner, 1989, p. 5)

Using this data Gardner expressed concern for the limited application of assessment and methodologies used in schools today. Generally the schools have tended to specialize in teaching only to the linguistic, logical-mathematical, and intrapersonal intelligence students. This factor sometimes excludes a large portion of the student body. Assessment of students strengths in all of the intelligences becomes very important because, as a system, education should focus on developing ways of reaching those students who are not successful in linguistic, logical-mathematical and intrapersonal intelligence.

Early assessment of children helps to identify the strengths that each student possesses. The Project Spectrum form of assessment used at Harvard Project Spectrum allows the child to demonstrate his/her individual strengths. The Spectrum battery is composed of fifteen different tasks that span a wide range of activities that allows for assessment in the child's content.

First, Spectrum engages children through games that are meaningful and contextualized.

Second, Spectrum blurs the line between curriculum and assessment, thereby integrating assessment more effectively into the regular educational program.

Third, the Spectrum approach to assessment makes the measures "intelligence-fair" by using instruments that look directly at the intelligence in operation, instead of through a linguistic or logical-mathematical lens.

Fourth, Spectrum suggests how a child's strength may provide access to more forbidding areas (areas which the child shows less promise. (Gardner, 1993)

In 1985 Gardner met with a group of eight teachers who were interested in starting their own K-6 elementary school centered around the MI theory. It took two years of hard work but the Key School in Indianapolis, Indiana was formed because of this dedication.

The curriculum at the Key School centers around teaching through the different intelligences (Gardner, 1993). Each student must participate in activities relating to the student's own MI strength. The students participate in apprentice type pods where peers of different ages and a teacher meet to master a craft or discipline around their interest. These pods might be in architecture, gardening, cooking, or "making money", but they all center around "real life" skills which will enable the students to gain a clearer understanding of their surrounding world.

There are outside specialists who demonstrate different occupational or craft skills. These demonstrations center around a theme which is being studied. They might include police officers, rescue workers, bank tellers or leather workers. Along with the theme being studied there is a school project.

Each student is actively involved in the project. There are three projects per year, ten weeks in length. Each student must prepare a project around the theme. These projects are supervised by the teachers and other participating individuals (not the parent) although the input of parents is desired. The students are to complete the project themselves.

The students present the project to their classmates and describe the project's genesis, purpose, problems and future implications, answer questions raised by classmates and the teacher. Each presentation is video taped and becomes a record of the student's progress. This becomes a part of the student portfolio and assessment file. This method of teaching prepares students for the real world where they will be expected to complete projects in a timely matter rather than how to take tests which will never be used again once out of school (Gardner, 1993).

Gardner along with the co-authors Minday Kornhaber and Mara Krechevsky put forth the premise that,

Most theories of intelligence have attempted to answer the question "What?" to the extent that tests have been based on such theories, they have served more to label individuals than to promote their development. Instead, we have focused our search for new theory around the questions "When? Where? and How?" We believe that theory generated by these inquiries provides a constructive framework to advance both analysis and practical intervention (Gardner, 1993).

For the purpose of identifying the dominant intelligences of students, Dr. Sue Teele (Teele, 1992) developed the Teele Inventory of Multiple Intelligences (TIMI). It can be administered to students from the pre school level to those in college or even institutions of higher education.

The TIMI is a forced choice pictorial inventory of 56 numbered pictures of panda bears representing characteristics of each of the seven intelligences and provides students 28 opportunities to make their selection of two choices. . .There are no right or wrong answers. (Teele, 1995, p. 24)

When the test is scored, the inventory identifies the dominant intelligences. After determining the dominant intelligence of students, teachers can then determine which teaching, environmental, and assessments strategies would be most appropriate to integrate into the curriculum.

After extensive testing, Teele (Teele, 1995, p. 26-28) concluded that scores in linguistic intelligence appear to be strongest at grades kindergarten through fourth grades. Logical-mathematical intelligence was strongest from first through fourth. Spatial and bodily-kinesthetic intelligence remained as the two most dominant intelligences throughout elementary school. Intrapersonal was dominate in kindergarten. Interpersonal intelligence emerges in third grade, musical intelligence in fourth grade and continues throughout middle school.

By putting theory into practice the Renaissance Project conducted by the University of California, Riverside Extension in 1991 studied methods for integrating instructional strategies and assessment measures with the multiple intelligence theory. The premise was that students learning would be maximized and students would be better able to reach their maximum potential when teachers used methods emphasizing all seven intelligences and used authentic assessment measures as evaluations. The goal that students would become more engaged in learning, have greater motivation, achievement, and higher self-esteem was realized at the conclusion of the year. The first grade bilingual teacher and principal

of the California school being studied indicated that the students in this class did increase their engagement with learning and thus their potential for future success (Teele, 1992).

In 1994, Dr. Teele field-tested a project in an elementary school in California that provided instruction based on the theory of multiple intelligence and identified the relationship of multiple intelligence to the instructional process.

Teele (1995) explained that the physical setting, organizational factors, human aggregate, and social climate were the four domains used and that they interrelated with one another to facilitate the growth and development of the students. Each of the domains has five elements that contribute to creating a personalized learning environment for all students. She found that the social climate was the strongest factor in creating a child-centered education because it directly impacted the school. The physical environment conveyed commitment to multiple intelligences and reflected a positive atmosphere. The organizational factors included philosophy, curriculum, instruction, and assessment. The human aggregate included all students, teachers, parents

and the principal internally and community, school board, and district office externally. Dr. Teele proved that a common framework for establishing other schools where multiple intelligences and the philosophy that all children can and will learn is the foundational base. (1995).

In 1996 Gardner introduced a new intelligence into the mixture. Gardner had stated that he was only guessing at the possibility of only seven intelligences. He allowed for more to possibly surface in the future. The naturalist intelligence, defined by Dr. Teele from references to Gardner in her book Rainbows of Intelligence Exploring How Students Learn (Teele, 1999, p. 40) is:

one who is able to recognize, categorize, and classify flora and fauna; listens to and hears the sounds of the environment; enjoys being out doors; notices relationships in nature; sees connections and patterns with the plant and animal kingdom; and is in tune with and explores nature. The naturalist enjoys interacting with a variety of living creatures and can discern differences among plant and animal species. The naturalist explores the relationships between nature and civilization.

As a student of multiple intelligences I have begun to question this eighth intelligence because it seems to be a blending of several of the individual original seven intelligences. Gardner's definition seems to involve

musical when it relates to the sounds of nature, logical-mathematical in relation to the patterns of nature, categorizing and classifying, bodily-kinesthetic when exploring nature and enjoying being out doors and hunting, fishing etc.

Dr. Teele also finds problems with naturalist being a stand alone intelligence. In her Rainbows of Intelligence book she used the metaphor of the seven colors of the rainbow to explain the possibility of blending the intelligences to become proficient in specialized areas. This book relates the scientific basis of color and how a rainbow is formed. The blending of primary and secondary colors through refraction allows for the visible and invisible colors of the rainbow. Using this example, Dr. Teele develops the idea that each individual is a blend of the many intelligences which also might blend into secondary forms of intelligence.

Some people may see this controversy as a negation of Gardner's multiple intelligences theory. I don't see that at all. What I see is a reason to investigate them more extensively with the education of individuals in mind. Teachers need to continue to research ways to reach their students in the classroom.



## Emotional Intelligence

As an extension of Gardner's theory an examination of the impact that emotion plays on students in the classroom needs to be discussed. Daniel Goleman, Ph.D., is presently CEO of Emotional Intelligence Services in Sudbury, Massachusetts. He taught at Harvard and for twelve years covered the behavioral and brain sciences for the New York Times. In his book Emotional Intelligence (Goleman, 1997) he expounds on the impact of emotions on our every day life.

To better understand our emotional system and what happens when we feel emotions we need to have some understanding of the human brain. The human brain has evolved from the bottom up over millions of years. The logical reasoning brain is actually an elaboration of the primal or reptilian brain.

The primitive brain consisted primarily of the brain stem which was composed of a minimal nervous system which surrounded the top of the spinal cord. This structure is responsible for regulating our basic body functions, cycles, and defenses, including circulation, respiration, appetite, digestion, sexuality, and fight-or-flight behaviors (Sylwester, 1995). This structure was used to

ensure the survival of the species. The need to survive is very strong in any species and can be overpowering.

Over millions of years the limbic system developed surrounding the brain stem. According to Sylwester this system is "loaded with peptide receptors" and is "our brain's principal regulator of emotions" (Sylwester, 1995, p. 44). The key structures important to emotional regulation and memory within the limbic system are the amygdala, hippocampus, the thalamus and the hypothalamus. These structures regulate incoming and outgoing information necessary to our well-being. Sylwester quotes R. E. Thayer from a 1989 article saying that "because the limbic system plays important roles in processing both emotion and memory, emotion is an important ingredient in many memories. Memories formed during a specific emotional state tend to be easily recalled during events that provoke similar emotional states" (Sylwester, 1995, p. 44).

The newest part of the brain is the cerebral cortex. This is the largest portion of the brain and responsible for primary learning and thinking. This structure has been related to a storehouse for information. It consist of several hundred million neural networks which help it

to "(1) receive, categorize, and interpret sensory information, (2) make rational decisions, and (3) activates behavioral responses" (Sylwester, 1995, p. 45). This portion of the brain is the area where our educational system is most involved.

This development of the triune brain allows for a partnership of sorts. Each level performs a definite task. Sometimes these tasks are performed in unison but at other times there is a shutting down of the different levels and a recession to the reptilian brain. This is most noticeable when the fight or flight instinct takes over when we are faced with the unknown. This lends support to the influence of emotions on our daily life styles.

Emotions play a key role in each part of our brain. The reptilian brain supports the survival level. Our emotional needs encompass the urgency to either fight an enemy or run away from a dangerous foe. The limbic system allows for relationships of emotional sensation and memory to form. This system remembers both pain and pleasure and relates it to a time and place that can be retrieved at later dates. The cortex layer can retrieve emotional memories and use them to support other emotions or needs.

Goleman relates information from research done by Joseph LeDoux, a neuroscientist at the Center for Neural Science at New York University. He discusses the importance the amygdala plays in the emotional brain.

The conventional view in neuroscience had been that the eye, ear, and other sensory organs transmit signals to the thalamus, and from there to sensory processing areas of the neo-cortex, where the signals are sorted for meanings so that the brain recognizes what each object is and what its presence means. From the neo-cortex, the old, held, the signals are sent to the limbic brain and the rest of the body. That is the way it works much or most of the time--but LeDoux discovered a smaller bundle of the amygdala, in addition to those going through the larger path of neurons to the cortex. This smaller and shorter pathway--something like a neural back alley--allows the amygdala to receive some direct inputs from the senses and start a response before they are fully registered by the neo-cortex (Goleman, 1995, p. 17-18)

The amygdala is directly in contact with the neo-cortex layers of the brain. This association can either help or hinder the emotional responses to any situation. The prefrontal cortex of the brain is responsible for what is called the working memory. If the working memory receives signals that are happy, or pleasant the brain responds with pleasing emotions. An example of this comes when students enter into a state of flow. The individuals are so intent on what they are doing that they become oblivious to outside influences. Once the flow is locked

in it takes on a force of its own which offers relief from emotional turbulence and makes the task seem effortless (Goleman, 1995).

But in contrast if the brain receives strong signals of anxiety, or anger a sort of disconnection forms like the static on a radio. This emotional distress leads to upsets where the individual feels that they just cannot think straight. Sometimes the feeling of dread becomes very overpowering to the individual. This reaction helps us to understand why some situations in life allow for overwhelming emotional reactions. When the overwhelming fear of taking a test shuts down the pathways to the neo-cortex the process of retrieving information necessary to pass the test can become very difficult if not impossible.

When the process between the amygdala and the neo-cortex are working well together individuals have a vast quantity of connections to rely on to make informed decisions. When this connection is not working well individuals may become impulsive and disruptive. They have a difficult time making good decisions in many different situations. Many students who show great promise intellectually but are disruptive may be suffering from the ability to control their emotional feelings.

## Brain-Based Learning

As educators become more aware of brain research that relates to educating individuals we need to begin to use that research to develop new opportunities for students to learn. Brain-based learning presents a possibility to introduce materials in a way that piques the interests of the learner and allows for greater interest levels.

Renate Caine, Ph.D, Professor Emeritus of Education at California State University, San Bernardino, Geoffrey Caine, LL.M, educational and learning consultant, and Sam Crowell, Ed.D Associate Professor of Education at California State University, San Bernardino present many possibilities for teachers to redefine their ways of presenting the materials that they are teaching. Students of today live in a world where technology presents fast paced entertainment that results in students who no longer find the outdated presentation methods to be stimulating. According to the Caines and Crowell, in their book The Re-Enchantment of Learning (Crowell and Caines, 1998), there are three kinds of knowledge: surface knowledge, technical or scholastic knowledge, and dynamical knowledge.

Surface knowledge "is usually a sweeping coverage of facts and information, major terms and concepts, and broad

summaries of theories". This knowledge is "rarely connected to any other purpose other than 'you should know it' or 'you need it to graduate'. Students may be able to do very well in such courses and still have little or no understanding about the subject." Technical or scholastic knowledge "is more skill based and places a greater emphasis on depth and relationship." With this knowledge "we begin to understand the inner workings of the chosen discipline and we can see how the particular concepts and theories make use of the information and facts." This becomes disjointed information that "rarely goes outside its disciplinary boundaries, and a student often does not know how the subject relates to any other subject except in the most general way." The last and most important of the three is dynamical knowledge. This kind of knowledge "comes alive for us. We play with it, experiment with it, and participate voluntarily in learning more specifics and sharing our discoveries." This is the kind of knowledge that is found within our professional lives. We use this knowledge to become more successful in what we do within our professions (Crowell and Caines, 1998, p. 5-6).

The Caines and Crowell present twelve principles of learning "based on a synthesis of research from the fields

of neuroscience, physiology, optimal performance studies, neuropsychology, stress management, psychology, and more" in their book (1998). The following quotes their twelve principles:

1. The brain is a complex adaptive system. Perhaps the most potent feature of the brain is its capacity to function simultaneously on many levels and in many ways, which is one reason we have combined two principles (the brain is a parallel processor and learning engages the entire physiology). Thoughts, emotions, imagination, predispositions, and physiology operate interactively as the entire system interacts with and exchanges information with its environment. Moreover, there are emergent properties of the brain as a whole system that cannot be recognized nor understood when isolated parts are explored. Education must come to terms with the multifaceted nature of the human learner.

2. The brain is a social brain. We begin to be shaped as our immensely receptive brains/minds interact with our very early environment and within relationships. Vygotsky is partially responsible for noting the connection between social interaction and knowledge. Throughout our lives, our brains/minds change in response to their engagement with others-- so much so that individuals must always be seen to be integral parts of larger social systems. Indeed, part of our identity depends on establishing community and finding ways to belong. Learning, therefore, is profoundly influenced by the nature of social relationships.

3. The search for meaning is innate. "The search for meaning" refers generally to making sense of our experiences. This search is survival oriented and basic to the human brain/mind. While the ways in which we make sense of our experience change over time, the central drive to do so does not. At its core, the search for meaning is purpose and value driven. Maslow noted the extent of this human search. Included are such basic questions as "Who am



I?" and "Why am I here?" The search for meaning ranges from the need to eat and find safety through the development of relationships and a sense of identity to an exploration of our potential and the quest for transcendence.

4. The search for meaning occurs through patterning. Patterning includes innate and acquired schematic maps and categories. The brain/mind needs and automatically registers the familiar while searching for and responding to novel stimuli. Therefore, the brain/mind is both scientist and artist, discerning and understanding patterns as they occur and giving expression to unique and creative patterns of its own. It resists having meaninglessness imposed on it. By meaninglessness, we mean isolated pieces of information unrelated to what makes sense to a particular learner. Effective education must give learners an opportunity to formulate their own patterns of understanding.

5. Emotions are critical to patterning. What we learn is influenced and organized by emotions and mind-sets involving expectancy, personal biases, self-esteem, and the need for social interaction. Emotions and thoughts shape each other and cannot be separated. Emotions color meaning. The emotional impact of any lesson or life experience may continue to reverberate long after the specific event that triggers it. An appropriate emotional climate is indispensable to sound education.

6. Every brain simultaneously perceives and creates parts and wholes. Although there is some truth to the "left-brain/right-brain" distinction, it does not tell the whole story. In a healthy person, both hemispheres interact in every activity, from art and computing to sales and accounting. The two-brain doctrine is most useful for reminding us that the brain reduces information into parts while perceiving holistically. Good training and education recognize this phenomenon for example by introducing natural global projects and ideas from the beginning.

7. Learning involves focused attention and peripheral perception. The brain absorbs information of which it is directly aware, but it also directly absorbs information that lies beyond its immediate attention. In fact, it responds to the larger

sensory context in which teaching and communication occur. "Peripheral signals' are extremely potent. Even the unconscious signals that reveal our inner beliefs have powerful impact on students. Educators should pay extensive attention to all facets of the educational environment.

8. Learning always involves conscious and unconscious processes. One aspect of consciousness is awareness. Much of our learning is unconscious in that experience and sensory input is processed below the level of awareness, which means that much understanding may not occur during a class but hours, weeks, or months later. It also means that educators must organize what they do so as to facilitate that subsequent unconscious processing of experience by students. In practice, this organization includes proper design of the context, the incorporation of reflection and metacognitive activities, and the incorporation of methods to help learners creatively elaborate on the ideas, skills, and experiences. Teaching largely becomes a matter of helping learners make visible what is invisible.

9. We have at least two ways of organizing memory. Although there are many models of memory, one that provides an excellent platform for educators is the distinction made by O'Keefe and Nadel (1978) between taxon and locale memories. They suggest that we have a set of systems for recalling relatively unrelated information (taxon systems, from taxonomies). These systems are motivated by reward and punishment. They suggest that we also have a spatial and autobiographical memory that does not need rehearsal and allows for instant recall of experiences. This system registers the details of your meal last night. It is always engaged, inexhaustible, and motivated by novelty. Thus we are biologically supplied with the capacity to register complete experiences. It is through a combination of both approaches to memory that meaningful learning occurs. Thus meaningful and meaningless information are organized and stored differently.

10. Learning is developmental. Development occurs in several ways. In part, the brain is plastic, which means that much of its hard wiring is shaped by the experiences that people have. In part, there are

predetermined sequences of development in childhood, including windows of opportunity for laying down the basic hardware necessary for later learning. For this reason, new languages and the arts ought to be introduced to children very early in life. Finally, in many respects, there is no limit to growth and to the capacities of humans to learn more. Neurons continue to be capable of making new connections throughout life.

11. Complex learning is enhanced by challenge and inhibited by threat. The brain/mind learns optimally--that is, it makes maximum connections--when appropriately challenged in an environment that encourages taking risks. However, the brain/mind downshifts under perceived threat. It then becomes less flexible and reverts to primitive attitudes and procedures. We must create and maintain an atmosphere of relaxed alertness that involves low threat and high challenge. However, low threat is not synonymous with simply feeling good. The essential element of perceived threat is a feeling of helplessness or fatigue. Occasional stress and anxiety are inevitable in genuine learning because genuine learning involves changes that lead to a reorganization of the self. Such learning can be intrinsically stressful, irrespective of the skill of, and support offered by, a teacher.

12. Every brain is uniquely organized. We all have the same set of systems, yet we are all different. Some of this difference is a consequence of our genetic endowment; some of it is a consequence of different environments and experiences. The differences express themselves in terms of learning systems, differing talents and intelligences, and so on. An important corollary is both to appreciate that learners are different and need choices while ensuring that they are exposed to a multiplicity of inputs. Multiple intelligences and vast ranges of diversity are, therefore, characteristic of what it means to be human (Caines and Crowell, 1994, p. 17-27)

Once a teacher has the understanding of these principles they can begin to implement these principles

through the use of three areas of emphasis. Relaxed alertness, orchestrated immersion in complex experiences, and active processing.

Relaxed alertness refers to a state of mind that allows optimal performance and to the creation of an environment that supports this condition. These conditions require the absence of threat but the presence of challenge. . . a relaxed and ready state of mind is essential to achieve and maintain high levels of performance. . . The second emphasis in this model is orchestrated immersion in complex experiences. We learn best when we are immersed in multilayered experiences that allow us to recognize relevant patterns and see their connections. This immersion allows learners to see the connections between the big picture and the minute parts. . . A third and essential emphasis is called active processing. It refers to the ways we process or learn from our experience. Some of this processing we do naturally, but the frontier of learning and of realizing an expanded human potential lies, we believe, in the deepening quality of reflective processing. . . It is a focusing on who we are as much as what we know. (Crowell and Caines, 1998, p. 5-6)

The implication's of the research done on multiple intelligences and emotional intelligence has a great impact for our students. As a system educators have devoted their efforts to teaching only to linguistic, logical-mathematic and intrapersonal intelligence. As a result many of our students are failing miserably. Is this failure because of their IQ? I don't think so. On a daily basis we see students in our classrooms who are not able to perform well on tests but if you talk to them

about a given subject they have very sophisticated knowledge about the information. How can this be explained? Students exhibit different talents within the classroom. Musical students can sing any commercial jingle, or theme song at the drop of a hat but not be able to read a simple paragraph on a test. Bodily-kinesthetic students will excel at hand ball but fail double digit addition and subtraction problems with regrouping. Spatial students can draw the most elaborate moonscape but they can't write a simple paragraph. How do we tap into those talents to help them succeed?

The study of multiple intelligences seems to provide many avenues to help students achieve their own level of success in school at a much greater level of potential. Using this theory as a springboard to develop lesson plans, coupled with the principles of brain-based learning, can allow the teacher to gear the learning experiences to individual needs in a broader arena of learning experiences. It allows for more creative learning experiences to reach a broader spectrum of learning modalities.

CHAPTER THREE  
THEORETICAL FOUNDATIONS

How can a teacher use the theory of multiple intelligences to create an integrated unit based on the teaching standards? Gardner's theory presents a new way of looking at the classroom environment. Students are not all the same and each one brings a new focus into the classroom. Each teacher realizes that the dynamics of their individual classroom changes year by year due to the different learning styles of the classroom. A classrooms climate can change simply by adding or subtracting students as the year goes by. These changes can be frustrating to the teacher who has focused their curriculum primarily around a linguistic/logical-mathematic setting which is the current emphasis in most classrooms of today.

Each student can be serviced on a daily basis by using creative activities that touch on all seven (eight) intelligences. Thomas Armstrong presents suggestions in his book Multiple Intelligences In The Classroom (1994) that teachers can use to focus their planning. He suggests following a "seven-step procedure" to "create

lesson plans or curriculum units using MI theory as an organizing framework:" (using a web format)

1. Focus on a Specific Objective or Topic. You might want to develop curricula on a large scale. . .or create a program for reaching a specific instructional objective.
2. Ask Key MI Questions. These questions can help prime the creative pump for the next step.
3. Consider the Possibilities. Look over the questions. What specific strategies can I use for each intelligence?
4. Brainstorm. Use a new web and begin listing as many teaching approaches as possible for each intelligence. When listing approaches, be specific about the topic you want to address (e.g., "videotape of rain forest" rather than simply "videotape"). The rule of thumb for brainstorming is "list everything that comes to mind."
5. Select Appropriate Activities. From the ideas on your completed planning sheet, circle the approaches that seem most workable in your educational setting.
6. Set Up a Sequential Plan. Using the approaches you've selected, design a lesson plan or unit around the specific topic or objective chosen.
7. Implement the Plan. Gather the materials needed, select an appropriate time frame, and then carry out the lesson plan. Modify the lesson as needed to incorporate changes that occur during implementation. (Armstrong, 1994, p. 58-60)

These guide lines are very workable for any kind of lesson. As teachers become more adept at using this method of lesson planning they will become more focused on learning. Dr. Teele teaches a similar technique to implement lesson planning in her curriculum designing classes at U. C. Riverside. Teachers and students both can benefit by the use of these design elements. Teachers

can create lessons that are both creative and individualized. Students become more willing to participate and receive new understanding of content in ways that become more internalized and relevant to their own lives.

### Project Design

This project was designed to give students the opportunities to learn about life science through more interesting and relevant means. The use of multiple intelligence was integral to this project as well as the three elements of brain-based learning by creating a state of relaxed alertness in the students and the teacher, orchestrated immersion into the subject allowing the brain to make sense of experiences and active processing of experiences enabling students to get more meaning from those experiences.

This project is based on the National Standards and designed to follow the Fontana Unified School District Science Standards for the curriculum of Life Science in the second grade. These standards state that the students will know and understand the characteristics and structure of living things; the processes of life and how living



things interact with each other and their environment; and how they change over time.

In order to design this unit it was necessary to have a plan for the design. I used two different lesson templates to help me design the individual unit parts. One template is based upon integrating the different necessary elements of a curriculum with the multiple intelligences: big idea or theme, unit objectives, introduction, content covered in the unit, skills and knowledge acquisition, project activities, types of assessment, multiple intelligences used (APPENDIX C). The other is a theme planning form that allows for breaking down the objectives and elements even more (APPENDIX D).

Using these two templates I looked at the Fontana Unified School District Science requirements for the second grade (APPENDIX B). It was difficult to decide how to break down the standards and objectives into individual segments that could be taught within a relevant unit. My decision to use the rain forest as my springboard gave me many avenues to follow. I used the essential learning section of the standard as by big idea. The individual performance indicators became the unit objectives used

within each big idea (essential learning). By breaking these areas down it began to give me places to focus my lessons. This process was very time consuming but once I had a place to focus my attention then it became a matter of deciding how to teach each objective.

Using the "big idea template" first allowed me to break down each objective into mini parts and structure each individual lesson's components. I used one template per each objective consequently this allowed me to move the lessons around as I prepared the curricula. Each objective also required that I use the theme planning form to make sure that each lesson incorporated as many activities for each of the intelligences as possible. The opportunities for assessment of the lessons were made easier by using these templates. This may seem like a lot of work but it really did create focus and allowed me to be sure that all of the necessary components were included.

Because I wanted to use the principles of orchestrated immersion in my project design I decided that by having the students create a rain forest within the classroom itself they could truly begin to investigate life science on an intimate level. This presented me with

the focus that I needed for each of the lessons planned. It became apparent that if the students would be constructing the rain forest they would need to begin with the plant life giving me a strong beginning focus. Then the addition of insects, reptiles, and amphibians was dictated by the need for plant fertility and growth. Birds and mammals became the final entries into this unit that allowed for the full spectrum of diversity to be compared through this investigation.

The unit began to take on a life of its own as I began to collect information and resources to include in this project. I became excited with the anticipation of the presentation itself. The excitement led to anxiety as well as I once again began to wonder where the presentation of this information in these formats would eventually lead me. Finally the unit was ready to implement.

#### Reflections on Unit Study

We began the study with a discussion of what the students knew about the rain forest. Students were not quite sure about what a rain forest really is and talked about animals like lions living in the forest. They

watched the movie "Amazing Rain Forests" and there was a lot of chatter among the students. After seeing the movie the students talked about jungles and asked if a jungle was a rain forest. (Food for thought and discovery)

Time to make our KWL chart. Parrot papers were passed out and students decided that "What We Know" parrots should be blue, "What We Want to Know" should be orange, and "What We Learned" should be green. Each student had two papers one for what they knew sentence and one for what they wanted to learn. There was much talk and chatter among students. Some students were making multi color parrots despite the parameters set.

Learning the song became a fun activity with each student participating, some with some hesitance, but they did participate. I brought in many live plants to begin preparing the atmosphere. This really helped the classroom seem more friendly and less sterile. Do I sense changes in the student's attitude or is it just my own feelings?

The water cycle activity presented its own problems and realities. Students had a hard time picking up on what they needed to do to travel from one area to another. "Where do we go," and "what do we do," were the primary

learning experiences in the beginning. Very time consuming but finally they got it and began to become more independent. Much time was spent on copying down information for some groups. Perhaps I need to look at simplifying the directions (they did not seem to be very difficult when I saw them at first) in some way. We finally finished the activity and had a class discussion about what they learned. There were many "a-ha" experiences within some of the groups. Students asked many questions about our own climate and mountains. Stories of water/rain were still very limited but verbal discussion showed some understanding of the process. Many students were able to relate the water cycle to other cycles such as living/dying, day/night, year to year. Was this from prior knowledge?

Time to introduce plant observations. Groups chose their names: aves, reptiles, amphibians, mammals, and Epiphytes. The high intensity of activity was overwhelming. Students were interested in looking, touching, and experiencing the plants. Measuring activities became very in depth as I demonstrated the ruler and how we need to measure from one end to the other. Most groups were able to figure out ways for each

person to share in the responsibilities but some students struggled with the need to be the dominate person in the group. I finally had to assign jobs to one group. To my surprise two students, who generally have a hard time working together, were getting along quite well. Their interest levels were very deep and concentrated.

Our district superintendent visited our school. This was not an announced visit. She caught the students on the floor investigating their rain forest maps. I was also involved with the learning experience and busy working with students on designing leaves for our walls and vines (on the floor as well).

The terrarium activity was an experience in itself. Each group member was given individual jobs to do in the process and they worked together very well. Groups are excited to have their own plants and terrariums at their desks to take care of and observe. This also eliminates the sterile quality of the room and makes for a "more homey" atmosphere.

Daily journal writing about what we did today tended to be a problem because of time constraints. Students were interested and entries were sometimes reflective but they needed more time to formulate ideas. Continual

question I had was; will we have time for it all? We only have six weeks to do the unit. I began getting anxious about being able to do all of the activities.

Students were very interested in the flower activity. Being able to take apart each flower and examine all the parts was great. Feeling the pollen and seeing it on their skin was exciting for some but repulsive to others. The sticky feel of the sap also created excitement. Students wanted to know if it would be sweet to us if we tasted it. This created a discussion among some students but we decided not to try it because we did not know what might happen to us if we ate the sap. Students willingly began to draw their flowers and many artistic flames might have been sparked. The flower parts were correctly identified by most students.

Had a hard time finding ferns to show but we looked at pictures of the fern leaves and examined some mushrooms. The bromeliads were very well received some students had seen some of these plants at relatives homes but they did not realize that these plants came from the rain forest. The room was becoming more jungle like as students continued to observe their own plants and also bring in information from reading. I began to see less

discipline problems in the room as students were working together. Is this because of the new atmosphere? Is it because of the need to cooperate? Is it because of the new opportunities to learn in a relaxed way using their own dominant intelligences? What will happen when we end this unit and go back to our normal classroom style of learning?

During this unit it became time for student led conferences. Many students were excited to show their parents what they were learning in class. One student's parents told me that all their son could talk about were the bromeliads in the classroom. They told me that he was talking about the rain forest and looking for information in books while he read at home. Could this be spark of interest leading over into real life?

Time was passing quickly and we still had a lot to cover. Students were not aware of the time constraints but I was anxious and worried.

Insects and spiders lessons were interesting. More students were willing to talk about insects than spiders. Fear of spiders became apparent with more girls than boys. Brought in several larger than life models of insects: grasshopper, ladybug, preying mantis, beetle. Students



used these in centers to examine. Egg carton insects were interesting. Some students still did not make their insects with three body segments. Other students in the group point out these problems and try to help them fix their insect. Group work is still sometimes stilted. Is this due to the dominant intrapersonal intelligence being demonstrated?

The rain forest atmosphere was beginning to take shape. We added vines and leaves to the ceilings and walls. Students were working on maps and puzzles during center time and observations of plants were going well. We managed to take the district math test and language arts test during the unit but time still seemed to be pressing. Through interviews with students as I still conduct individual reading instruction, the students were showing a growth of understanding plants, insects, and spiders. This was encouraging because during these one-on-one sessions the students were not influenced by answers given by other students.

The tadpoles hatched and the excitement level in the classroom skyrocketed. Using the tapioca to simulate the frog eggs was a real experience for most students. Seeing the real eggs and feeling the fake eggs were fun for some

but repulsive to others. Visualizing activity was incorporated for students to imagine hatching out of the frog egg as a tadpole and growing into a frog. It was very interesting to watch each student as they began to formulate how to show the different stages. Of course there were those students who brought their own sense of humor to this activity.

The terrariums died. Why? What happened? Oops. Found out that we did not give them any air to breath. We needed holes in the caps to allow for circulation. This became a great opportunity for the class to discuss what plants need. Students return to the water cycle activity. A discussion about the air. Is this a cycle? Plants give off oxygen. Who/what needs oxygen? An opportunity to further discuss the needs of plants and animals. Several questions were raised as to the possibilities of this happening to our world? I love the way that this unit allows for students to verbalize their ideas. I don't feel that I have always had the opportunities for my students to use their higher level thinking skills during class. We don't often find spontaneous teaching situations like this one.

What a great segway into the lessons about how living things need other things to survive. This could not have happened this way if I had planned it. Food chain web was a little hectic but students liked the way that they felt the tugs on the rope. Students were beginning to use some of the information that they had gained to formulate new ideas.

Assembly time. Each classroom is assigned an assembly to do some type of performance. Luckily we were at our assigned time. Students performed the "Rain Forest Layers" song for all of the classes. There were four groups assigned to each layer. Students made costumes to represent their own layer. What a great chance for them as they performed. Each performance is taped and I have a living memory of this activity. What a great way to remember this experience.

Stress, stress, stress (for the teacher). Will we finish this unit on time? I was beginning to sweat. I was still finding things to add as the student's interest increase. I added feathers so students could feel how the feathers interlock. This was a question presented when we read about birds and their structure. I used dried chicken bone to see how bird bones have many hole in their

structure to be light weight so they can fly. I wish I would have had a steak bone to compare the weight and structure. Next time I will use this way to compare birds to mammals.

Finally we come to the day of the "Celebration of Learning". I was concerned about how many classes would visit our classroom. I was really surprised that all of the teachers from the school brought their classes. My students were assigned to two students and became the guides. The activity level was intense. Students and teachers milled about the room and enjoyed the atmosphere. Between the recesses and lunch breaks it took all day for them to guide the students through our classroom. What an exhausting experience. By the end of the day some tempers were beginning to surface as they became tired of the experience. Perhaps the next time we can spread this over more time.

I want to do this unit again but I see that it should be spread over the whole year and the students would be given more time to explore and investigate each aspect of the rain forest. I found many more activities that could be used within each lesson element but there was just not

enough time. What a fun time we had. I really liked this unit and the students seemed to also have a lot of fun.

### Metaphor

According to the Funk & Wagnall's Standard Desk Dictionary a metaphor is a figure of speech in which one object is likened to another by speaking of it as if it were that other. Metaphors are used in many walks of life to help people in understanding and internalizing information. The Caines and Crowell believe that teachers should find a metaphor to help them understand their own philosophies for teaching. Part of the brain-based learning philosophy espouses using metaphors during teaching to help establish a better understanding of the complex relationships of the brain/mind.

Sam Crowell, associate professor of education at California State University, San Bernardino and director of the Center for Research in Integrative Learning and Teaching, encourages his students to shift toward the theme of "teachers as artists". He believes that teachers are artists in their classrooms who need to gain insights into themselves so that they may better present their materials to others. Through meditation students are

invited to focus on their own philosophies and allow new insights to surface. Through this process we can begin to see life in many different ways.

As I meditated on my own metaphor for education the theory of multiple intelligences became an important part of my metaphor. My own dominant intelligence, musical, became apparent in my beliefs and feelings about education. My metaphor for education and learning comes in the form of a symphony orchestra. In a symphony orchestra the conductor (teacher) is charged with the creation of beautiful sounds through the blending of many different instruments. I see my vision of the teacher as one who, through subtle coaxing, brings together a cacophony of noise (the individual students) to create a rich blending of dynamic sounds (the on going learning).

The orchestra depends upon four different sections to create the single composition of music to be performed. Each section, to me, consists of one or two corresponding intelligences linked to the theory of multiple intelligences. The string section includes the intrapersonal and spatial intelligences. The brass section includes the interpersonal and linguistic intelligences. The winds section has the musical

intelligence. The percussion section includes the logical mathematic and bodily-kinesthetic intelligences. Just as each section brings its own individual sound to the music the individual intelligences also bring an intriguing blend to each classroom setting.

The strings bring an ethereal almost spiritual quality to the music. The quality of the dream like sounds help to relax and release a sense of peace and tranquility. This to me embodies the essence of the intrapersonal intelligence through the understanding of self and the comfort of knowing that you can be alone and be all right. The spatial intelligence is the ability to use visions that orient yourself to your surroundings. These qualities bring a sense of oneness with your surroundings and are very important in the classroom to bring a sense of balance.

The brass section represents the direction that the music is going. This section brings out the melody into the forefront of the composition. It leads the listener through the story being told with the music. This section to me represents the interpersonal and linguistic intelligences because of the needed rapport with the audience as well as the telling of the story. From the

whining sounds of the trumpet to the shrill piccolo chatter this section represents the energy in the classroom that is created each day through the exchange of ideas.

The winds help to solidify the melody. It brings a mixing of the ethereal with the direction. The wind section allows the flow of the music to become harmonic. The musical intelligence falls into this category. It brings a rhythm to the linguistic intelligence as well as the sequence to the logical mathematic intelligence. The addition of this intelligence to the classroom helps to solidify the mixture.

The percussion brings the addition of the solid beat. Without this section to keep time it becomes more difficult to maintain the flow of the idea of the music. The logical mathematic intelligence represents the solid cadence that is created through the beat. The need for order to understand is strong within this intelligence. The bodily-kinesthetic intelligence is represented here because of the compelling need to move that is created through this solid beat. The need for order and movement within the classroom to develop understanding is a critical factor in the learning process.



It is the teacher's job to tap into each of these instruments (intelligences) to create the enchanting sounds of learning. Just as the orchestra needs to blend with the ebb and flow of the music so does the classroom need to generate a place for learning. The teacher needs a subtle hand just like a conductor. With a large sweep of the hand the conductor creates a grand cacophony of sound but with a gentle wave she creates a simple tone. The teacher can also create a melodious sound through the gentle placement of ideas or the grand introduction of new concepts. Just as a conductor can lose their control of the orchestra with a gesture that is not related to the score so the teacher can create chaos with the need to control the outcome of the learning situation with activities unrelated to the intelligences represented in the classroom.

In conclusion I see the teacher as a person who is using the different intelligences represented in her classroom, which change each year, to mold and create an environment that fosters learning. She is responsible for guiding and leading but not forcing the learning. Forcing the outcome creates a stilted learning situation without the flow of self-generated exploration.

This unit design was a lot of fun to create. It was a wonderful learning experience for the students as well as the teacher. The endless possibilities are hard to imagine. When you begin to open up to all of the possibilities the excitement and anticipation begin to escalate. Big or small, the unceasing variety that is presented to the teacher to create exciting learning experiences for each student is overwhelming.

## CHAPTER FOUR

### EVALUATION

This project dictated that the evaluation be done qualitatively and the rationale for this is based on the following. Patton, a qualitative evaluation researcher, stated that, "Qualitative evaluation inquiry draws on both critical and creative thinking--both the science and the art of analysis" according to Strauss and Corbin (1998, p. 13). Analysts need to be aware of several behaviors that could promote creative thinking according to Patton.

These behaviors included:

- (a) being open to multiple possibilities;
- (b) generating a list of options;
- (c) exploring various possibilities before choosing any one;
- (d) making use of multiple avenues of expression such as art, music, and metaphors to stimulate thinking;
- (e) using nonlinear forms of thinking such as going back and forth and circumventing around a subject to get a fresh perspective;
- (f) diverging from one's usual ways of thinking and working, again to get a fresh perspective;
- (g) trusting the process and not holding back;
- (h) not taking shortcuts but rather putting energy and effort into the work;
- (i) and above all, having fun while doing it. (Strauss and Corbin, 1998, p. 13)

Strauss and Corbin went on to say that "Analysis is the interplay between researchers and data" (1998, p. 13)

The strengths for this type of evaluation can be found in the format of each lesson assessment section that details and describes the assessments to be considered for that lesson.

- Performance Assessment uses a 6 point rubric to evaluate students' performance and growth over time.
- Personal Communication Assessment is observations, interviews and anecdotal notes to evaluate student reasoning and identify dominate intelligences for each lesson.
- Open-ended Questions Assessment provides teacher with insight on how students are problem solving.
- Scientific Investigation Assessment measures the individual learning capabilities and strengths of students through hands-on experiments.
- Selected Response Assessment demonstrates certain types of student achievements with accuracy and efficiency.
- Matching and short answer fill in papers relating to many different lessons to measure the individual knowledge gained in each area will be used to evaluate each students progress and growth over time.

Activities for this project were designed to tap knowledge, mastery, and reasoning through individual participation. Dr. Sue Teele suggested, during the Institute for the Study of Multiple Intelligence Part 1 (1998), that multiple types of assessment can be used to engage students in challenges that are more realistic.

Many lessons contain a rubric for assessment ranging from 6, which dictates "full accomplishment", to 1 that dictates "little or no progress toward accomplishment." Before this project was presented, each student was given the TIMI (The Teele Inventory for Multiple Intelligences) to determine his or her dominant intelligences. This information was used to correlate different student intelligences, assessments, and analysis of the project.

The participants in the project were students in a second grade class at Date Elementary School in the Fontana Unified School District. Students were placed in this class according to age and date of enrollment by the principal and the school district. The students' ages range between six and eight. There were twenty students in the class. They were from White, African American, and Hispanic ethnic backgrounds. Their general state of mental and physical health was good according to the

Fontana Unified School District health standards. The study took place during regular class time at Date Elementary and lasted approximately twelve weeks.

It would appear that this is a valid and researchable project. It is descriptive in nature because the study took place in the classroom.

Possible categorical variables are: sex of students, parent involvement, working/non working parents, single parent in the home, cultural background (White, African American, Hispanic).

Possible continuous variables are: reading level, district language arts and math scores, attendance, socio-economic status of family (as defined by Fontana Unified School District's policy to qualify for a free lunch program), and "at risk students" (as defined by the school policy to qualify for Student Study Team intervention program and/or Healthy Start Program), and behavior, or speech problems.

The dependent variables could be, time constraints, students attendance, teacher illness, accessibility of materials, reading/math/content comprehension of student.

The independent variables would be the instructional method of using multiple intelligence strategies and brain-based learning principles to teach this unit.

The extraneous variables might be the amount of sleep and nourishment of the student prior to instruction and/or assessment, and health and emotional state of the student during instruction and/or assessment.

The confounding variables are, the behavior of students during instruction and/or assessment (on or off task), inappropriate level of instruction and assessments, and outcome of assessment changes due to method of presentation.

A TIMI test will be given to each student before the unit is presented to determine their scope on intelligences. The Performance Assessment checklist is used to record each student's participation and level of interest in each lesson. The Student Assessment form will be used to record rubric scores of each lesson to track growth. The Student Interview Form will be used to record student conferences on their feelings about each lesson answering the questions, "What I liked best" and "What I learned". This data could be linked to the student's dominant intelligence. Science journals are used for

student reflections on the observations they do and will be analyzed for the range of specific intelligences that were utilized by each student. The Portfolios and scientific investigation data from each student was analyzed to determine growth.



## CHAPTER FIVE

### CONCLUSIONS

Throughout my investigation the predominate question was the impact of using multiple intelligences and brain-based learning principles in the classroom to reach students through their dominant intelligences. The unit was designed to "immerse" the students into learning about the rain forest and the many different life forms that dwell within. The lessons in the unit were designed to utilize as many intelligences as possible so that all students would benefit.

An integral part of the analysis of the success of this unit began with the administration of the TIMI. By using this assessment I found that my students four dominant intelligences were: fourteen scoring high in Logical Mathematic, thirteen in Linguistic, thirteen were high in Spatial and eight were a combination of musical, bodily-kinesthetic and Intrapersonal. Dr. Teele in her research (Teele, 1999) has analyzed over 6,000 answer sheets for the TIMI and found that primary students tend to score high in the linguistic, logical mathematic, Sspatial, and bodily-kinesthetic areas. My classroom

tends to support this research. In her book The Multiple Intelligences School Dr. Teele stated that "second grade students were spatial, bodily-kinesthetic, logical-mathematic, and linguistic" (Teele, 1995, p. 25). She also stated that primary students tend to be more intrapersonal which seems to be supported by my classroom also.

The Personal Communication Assessment became a tool to help me organize anecdotal notes on each student. Through observation during activities and personal one-on-one interviews with the students I was able to evaluate the process each student was using to gain information. Over a period of time these notes showed individual growth in all of the students. This tool gave me insight into the individual intelligences each student was using during these different activities. Those students who had a difficult time expressing what they know through writing were given an opportunity to share the knowledge that they had gained in a different way. After evaluating the data I found that a majority of the students (thirteen) to have assimilated information through their dominant intelligences.

The Open-ended Question Assessments gave me an opportunity to observe the individual students as they processed information. It allowed me to record how the students used prior knowledge to gain new knowledge. Because of the design of the unit some of the information builds upon prior knowledge gained in previous lessons. The students were very animated during these times of discussion and shared many favorable insights into how they were using their intelligences.

The Performance Assessment as well as the Short Answer Assessments allowed for many different types of activities to be assessed. Students were required to write, draw, fill in the blanks, and draw pictures that showed a grasp of the knowledge being presented. Students who were not able to communicate what they had learned through writing could reveal that information in a different way. These opportunities for diverse presentations of information allow students to show what they know through their own intelligences. The students who were strong in spatial intelligence were able to draw and label pictures to show plant parts, insects, spiders, and other information relevant to the lessons being presented. As a whole the students were more successful

with the individual activities that were designed around their dominant intelligences. Even the three students who have a difficult time expressing themselves through writing were able to share their knowledge by drawings, one of their dominate intelligences.

The Scientific Investigation Assessment gave insight into the student's ability to investigate, and present their own evaluation of what they were observing during the plant observations. Each investigation presented different problems to be observed. By giving the students an opportunity to draw pictures as well as write in these journals each individual was given the freedom to relate what they had learned. Students strong in linguistic intelligences did well in relating what they observed. They showed a growth over time in their individual writing ability as well as the ability to share what they had observed. Students who were stronger in spatial intelligence were able to draw what they were seeing and thus, along with the Open-ended Question Assessment, showed an understanding of what they were observing.

The culminating activity gave me the greatest opportunity for observing how well the students had internalized the knowledge that they had gained. Each

student became a tour guide for students from the various classrooms that were invited to tour our rain forest. My students were to show the students around the room and give information about the projects and what they had learned. They were the resident experts to the visiting students. As we began this Celebration of Learning there was a sense of anticipation from some students and dread from others. As each class arrived the students began to share their knowledge there was a feeling of controlled chaos.

Tour guides were sharing what they had learned with quite a bit of enthusiasm and visitors were eager to see all that they could in this rain forest. Students who were strong in linguistic ability as well as intrapersonal were eager to share what they had learned. Even those students who were not very comfortable sharing their knowledge became adequate tour guides and shared in a more limited way. I was able to identify the dominant intelligences of my students as they shared what they had learned. After this experience we shared with each other how we felt about the experience. All of the students showed a great deal of enthusiasm for the experience,

although many said they were really tired from being a tour guide.

Later that week we received several letters from different classrooms sharing their own ideas about the experience. These are some of the comments from teachers as well as students from those various letters;

Fifth Grade Teacher:

I was extremely impressed with how well the guides handled the classroom tour. The students were able to explain what each display was as well as the significance of each. They also were able to answer questions my students had about the displays and the Rain Forest.

My students were impressed with the displays as well as the tour. They found it informative and interesting. I was impressed with several aspects of the experience. I thought Mrs. Stover and her class did an excellent job designing the Rain Forest and teaching it to other students. I was also impressed with how the unit was thematic, touching upon the areas of Science, Social Studies, Language Arts, Music, Art and Math."

Fourth Grade Teacher:

"My students really enjoyed the tour of the rain forest. They commented on how well your students did on their projects. They really liked the paper and real plants.

Your students seemed very informed about the rain forest. My students also liked having a 'tour guide' to show them around. . .My students won't/Can't stop talking about their tour."

Fourth Grade Student:

"Thank you for the tour of your rain forest. It was really fun and interesting. We really liked the monkeys, frogs, trees, and bugs."

Third Grade Student:

"Thank you for walking us around the rain forest. I like that you were showing the book that it has trees and animals and little bugs. It was cool."

Third Grade Student:

"Thank you for showing us your things about the rain forest. You are smart."

Second Grade Student:

"I like your rain forest and your frogs and the trees to and the birds."

This project has successfully shown me that using multiple intelligences and brain-based learning principles to present relevant materials to students in a way that is fun and exciting is very possible. The experience that I had creating this unit was a learning experience for me and the implementation of this unit became a great adventure for my students. The impact on my students as well as the other students and teachers who shared our experience through the Celebration of Learning activity is supported by the comments made by the individuals in their thank you letters.

### Implications

The implications for education that this project presents are to use the knowledge that we are gaining through research about the brain and how students learn to

come up with more relevant ways of presenting the materials that we teach. The way in which educators present the materials today are out dated for the fast paced society that we have become. We are boring our students to death with the slow pace and lack of interesting presentations. Our students need to be immersed in new learning experiences just as they become immersed in their video game experiences. They need to become part of the experience not passive receptors of the experience. Giving them the opportunity to use their dominant intelligences in the learning experiences allows them to become more focused, excited to learn, and receptive to new experiences. What a benefit to society in the future this could be if we were to more readily adopt these experiences into our classrooms.



APPENDIX A  
RAIN FOREST PROJECT

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## Lesson 1

### Objectives:

Students will discover the similarities and differences between the needs of plants and animals in the rain forest.

### KWL Chart:

Students work together as a class group to find out what they know about rain forests, and what they want to learn about rain forest.

\*\*they will add to the chart as they discover things about the rain forest

Amazing Rain Forests

This is a 40 minute video that introduces the evolution of rain forests over 400 million years to the present

(Linguistic/Logical-Mathematic/Spatial/Musical/  
Intrapersonal)

### Teacher Read:

Rain Forest Secrets by Arthur Dorros

This book introduces the different layers of the rain

forest with many of the plants and animals of each  
layer

\*\*discuss the layers as we go along

\*\*investigate the pictures

Learn:

### Tropical Rain Forest Layers Song

by Mary Anne Stover

(sing to Frere Jaque)

In the Rain Forest  
The tropical Rain Forest  
It has four layers  
It has four layers  
First is the Emergent Layer  
Next is the Canopy Layer  
Then the Understory  
Last the Forest Floor

In the Emergent Layer  
It has the tallest trees  
But just a few  
Just a few  
They get lots of sunlight  
Lots and lots of sunlight  
But they have shallow roots  
But they have shallow roots

In the Canopy Layer  
In the Canopy Layer  
Live lots of animals  
Live lots of animals  
Insects hum and nibble  
Reptiles slither along the limbs  
Monkeys chatter and swing  
Colorful birds fly among the leaves

In the Understory  
It is getting darker  
Trees grow more slowly

Waiting for more sunshine  
Some plants have big leaves  
To capture more sunlight  
Woody vines hang on the trees  
To hitch a ride up to the skies

On the Forest Floor  
The darkest part of the Rain Forest  
The air is still and moist  
The air is still and moist  
This is where the ferns grow  
Dead leaves cover the ground  
Fungi, termites, and earth worms  
Help recycle the nutrients

\*\*as the students learn the song have them use body movements to show the different layers and animals

\*\*students may add verses to the song as they learn things about the rain forest inhabitants

(Linguistic/Logical-Mathematical/Spatial/Bodily-Kinesthetic/Musical/Interpersonal/Intrapersonal)

Assessment:

Personal Communication Assessment: Student observations, anecdotal notes to evaluate processing in individual dominant intelligence.

Performance Assessment: Student participation, verbal responses during each activity.

Open-ended Questions: Listen to responses and encourage students to process information on their own.

## What is a Cycle Activity:

What is a cycle?--(A sequence of recurring events)

\*\*Talk about different types of cycles--(growth, seasons, days, weeks, months, etc.)

\*\*ask students if they have heard about a water cycle

\*\*group write down what they think a water cycle is

\*\*talk about the water cycle using the terms:

evaporation, transpiration, ground water and

condensation (these are necessary for the rain forest plants to survive)

\*\*the water cycle activity has seven stations to represent clouds, mountains, ground water, ocean, animal, stream, and plants

\*\*each station has strips of paper that represent different sets of actions a water molecule might take on its journey through the water cycle

\*\*each draw will represent an action with many different variable actions that can happen to each molecule

\*\*divide students into seven groups

\*\*each group goes to one of the stations and draws a slip of paper

\*\*they write down the action on their record sheet and then follow the action to the designated station when the teacher says cycle (ex. You fall as rain onto a mountain. Go to Mountain, or you soak into the ground and get absorbed by a plant's roots. Go to Plant)

\*\*repeat these cycles 10 times with students writing down their action each time

\*\*after the 10 cycles discuss what the students discovered about cycle

\*\*have groups write a story about what their water molecule went through on their own cycle

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Assessment:

Personal Communication Assessment: observation of the groups and each individuals participation within the group.

Scientific Investigation: Group participation in the activity. Group story of their water molecule.

Rubric for assignment

6: All cycles are included within the story with logical conclusions to the cycle.

5: All cycles are included within the story with an attempt at telling how the cycles happen.

4: At least 5 cycles are included within the story and the sequence is correct.

3: Some of the cycles are included within the story and at least the first cycle is correct.

2: A story was attempted with cycles included.

1: No story or cycles papers.

Teacher Read:

Natures Green Umbrella by Gail Gibbons

This book continues the students investigation of the diversity within the rain forest

Activity:

Students will make a layers flip book (black master) to help them see more closely what the layers are along with definitions of each layer

(Linguistic/Logical-Mathematical/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Group and Individual Activities

During Entire Unit

Build a Terrarium Activity:

Each group will build their own terrarium to observe



\*\*each group will use a clear large jar with a lid, gravel, charcoal, potting soil, small plants and water

\*\*cover with charcoal and then potting soil

\*\*add the plants and mist with water

\*\*put on the lid and keep in a sunny location but not direct sunlight in

\*\*group will use these terrariums for observations during the unit

\*\*keep observations in a science journal

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

#### Assessment:

Personal Communication Assessment: observation of the groups and each individuals participation within the group.

Scientific Investigation: Students keep an observation journal on their group terrarium. List things that they observe. What happened and why they think it happened.

#### Rubric for Journals

6: Entries for each week are complete with logical observations by all group members

5: Entries for each week are somewhat complete with observations attempted and all group participation.

4: Most entries are included with an attempt to answer the questions most group members participation.

3: Many entries included with an attempt made to answer the questions, some group members participate.

2: An attempt was made to answer questions with one member participating.

1: No attempts to do the activity.

#### Green Scene Activity:

Each group will be in charge of a different type of philodendron plant during the unit to observe.

\*\*they must keep it watered and record the growth in a growth journal

\*\*the plants will include shade plants, full sun plants, and some sun plants.

\*\*students will answer a set of questions each week about their plant in their journal during their center time activities

\*\*they will first note which type of plant they have and the sun requirement for their plant

\*\*they will note how many shoots are on their plant and how many leaves it has

\*\*they will measure the leaves and measure the trailers or stems of the plant and record this information in their journal

\*\*they will draw a picture of the plant

\*\*each week they will answer these questions and draw a new picture of their plant in their journal

How many shoots are there from the base? How many new shoots do you see from the last observation?

How many leaves are on the plant? Are there any new leaves since the last observation? How many? How long are the leaves? Are they the same or different from the last observation? How long are the trailers/stems? Are they the same or different from the last observation?

\*\*at the end of the unit the students will tell how their plants grew and changed over time

(Linguistic/Logical-Mathematical/Spatial/  
Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Assessment:

Personal Communication Assessment: observation of the groups and each individuals participation within the group

Scientific Investigation: groups will keep a plant growth journal during the unit making the required journal entries each week. Students will be graded on their participation with their groups and their individual input into the journal entries.

Rubric for Journals

- 6: Entries from each week are complete with logical observations by all group members.
- 5: Entries for each week are somewhat complete with observations attempted and all group participation.
- 4: Most entries are included with an attempt to answer the questions, most group members participation.
- 3: Many entries included with an attempt made to answer the questions, some group members participate.
- 2: An attempt was made to answer questions with one member participating.

1: No attempts to do the activity.

How does water make a difference?

Each group will compare how two fern plants grow under two different conditions

\*\*one fern will only be watered by misting and the other will be watered only at the stem area with a watering can.

\*\*the group will see if there is any difference in growth between the two plants because of the watering conditions.

\*\*they will draw the two plants each week and write up a group observation of what is happening to each plant.

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Assessment:

Personal Communication Assessment: observation of the groups and each individuals participation within the group.

Scientific Investigation: groups keep journal entries each week of what they see happening.

Rubric for Journal

- 6: Entries for each week are complete with logical observations by all group members.
- 5: Entries for each week are somewhat complete with observations attempted and all group participation.
- 4: Most entries are included with an attempt to answer the questions, most group members participation.
- 3: Many entries included with an attempt to answer the questions, some group members participate.
- 2: An attempt was made to answer questions with, one member participating.
- 1: No attempts to do the activity.

Rain Forest Canopy Layers Observation: (Whole Group)

The class will observe a center grouping of several similar plants

\*\*the plants will be grouped so that the taller plants will be together near sunlight and shorter plants will be behind the taller plants to block the available sunlight

\*\*plants will be watered the same to simulate the canopy/emergent layers of the rain forest

\*\*as a class have each group make predictions of what will happen to the plants

\*\*each week observe the plants and see what happened

\*\*predict what will happen over the next week

\*\*individual students will write their own

observations in their science journals

(Linguistic/Logical-Mathematic/Spatial/Intrapersonal/Interpersonal)

Assessment:

Performance Assessment: journal entries of observations and predictions.

Observations should show a growth of understanding the relationships of sunlight and shade to the growth of plants within the rain forest layers.

Sunlight and Shade Activity: (Whole group)

Students will observe how two similar plants grow in two different environments of sun and shade.

\*\*one plant is placed in direct sunlight while the other is placed away from sunlight.

\*\*they are both watered the same.

\*\*students will observe each plant every day to see what is happening.

\*\*they will draw pictures to show what happens each day to the plants.

\*\*use a split paper for each observation with sunlight/shade and the date

\*\*each week the class will come together to write a group entry of their observation and what might be happening

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Assessment:

Performance Assessment: journal entries that include the observation of the plants over time as well as participation in the group writing activity

Teacher Read:

The Magic School Bus in the Tropical Rain Forest by Joanna Cole

This book reinforces the observations students have made so far about the rain forest and its diversity—this book will help the students to begin to more readily understand how plants and animals are dependent upon one another for their existence.

Finding Tropical Rain Forests Activity: (Whole Group)



Tropical rain forests of the world map for each student and finding tropical rain forests questions.

\*\*as a group look at the map and find the areas on the world map in the room.

\*\*identify where the rain forests are and identify the continents.

\*\*as a group answer questions about the rain forest on the blackline master.

(Linguistic/Spatial/Bodily-Kinesthetic/Interpersonal)

Center Activities:

Mapping the Amazon blackline master

\*\*students use a map of South America to find the answers on the blackline master

\*\*they will identify the countries of Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Surinam, and Venezuela

\*\*they will answer related questions about the location of the Amazon within various countries

\*\*this may be done as an individual or as a group activity

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Assessment:

Performance Assessment: students will complete the Mapping the Amazon activity master. There is a possible score of 15.

## LESSON 2 A

### Objective:

Students will observe, describe and record the function of plant parts.

### Video:

What is a Plant?

This is a 6 minute video that introduces the students to plants and the different parts of a plant--it also discusses the need for insects in reproduction of the plants

### Intro Book:

Science with Plants by Mike Unwin

This is an Usborne Science Activities book--students will be able to use this book during the unit to discover many aspects of plants and how they grow and what they need to live.

### Starting to Grow Activity:

This is the first activity in the Science with Plants book

\*\*students look at different types of dried beans (if possible use beans that come from the rain forest)

\*\*what do they see, find the scar where the bean was attached to the plant, what do they feel like, how are they different, do they recognize any of them as food that their mothers might prepare?

\*\*these are actually seeds as well as food to eat

\*\*have beans that have been soaking in some water to soften the outside shell

\*\*cut one to examine the inside

\*\*find the tiny baby plant on the inside of the seed

\*\*what could the rest of the materials be inside the shell? (stored food for baby plant)

\*\*using clear plastic cups give each study group one cup with one paper towel

\*\*students wet the paper towel and put it inside the cup

\*\*each group gets 4 moistened beans to put inside the cup between the paper towel and the clear outside edge of the cup so that they can observe what happens

\*\*put a small amount of water in each cup

\*\*what do you think will happen

\*\*students observe their groups beans and record what

they see in their plant journals  
(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Intrapersonal/Interpersonal)

Different Kinds of Seeds:

bring different fruit to observe (apple, orange,  
peach, pear, banana)

\*\*take a count of students who have eaten each type  
of fruit

\*\*did they find the seeds in each fruit

\*\*talk about what kinds of seeds might be in the  
fruit (how many, how big)

\*\*cut up fruit and find all the seeds in each one

\*\*were any of the students surprised by the seeds  
(bananas could be a surprise)

\*\*where did the fruit come from (the flower)

\*\*do you think all plants need to grow from seeds

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/  
Intrapersonal)

Assessment:

Open-ended Questions: observation of students  
participation during discussion. Encourage discussion  
of observations during activity

## LESSON 2 B

### Objective:

Students will compare the life cycles of different types of plants.

### Read:

The Reason for Flowers by Ruth Heller

This book looks at different types of flowers and some insects--it shows the parts of the flower--pollen, anther, stamen, stigma, styles--it also introduces different types of plants that grow in different climates

### Flower Activity:

Use different flowers to show the structure and to compare them (tulip, rose, daisy)

\*\*look at the different flowers

\*\*observe how they are different/same

\*\*take each apart and find the parts

\*\*sepals--look like leaves at the bottom of the flower

\*\*petals--colorful part of the flower

\*\*pistil--the single stalk in the center

\*\*stamens--the stalks around the pistil

\*\*pollen--yellowish dust made by the stamens

\*\*ovary--pouch at the bottom of the pistil where  
the seeds form

\*\*did all the flowers have all the parts

\*\*draw pictures to show what the flowers look like

\*\*as a whole flower

\*\*each part of the flower

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Interpersonal/Intrapersonal)

Center Activity:

Draw an imaginary flower to go into our rain forest--  
include all the parts of a flower

Assessment:

Personal Communication Assessment: observation of  
students during activities.

Open-ended Questions: listen to discussion of  
students during the activity. Encourage discovery  
learning through investigation.

Performance Assessment: student drawing of the plants  
includes information gained during this activity

Read:

Plants That Never Ever Bloom by Ruth Heller

This book introduces plants like fungi, ferns and

seaweed--these plants don't have flowers so they  
don't make seeds--they make spores

Activity:

Have eatable mushrooms of different kinds for the  
students to take apart and examine. Also have fern  
leaves to examine

\*\*show mushrooms in store containers and talk about  
the differences between eatable store bought  
mushrooms and poisonous mushrooms that grow in the  
garden (this is a very important fact that needs to  
be stressed)

\*\*what do they mushrooms look like

\*\*how are they different from other plants

\*\*where could the spores be living (in the frilled  
parts)

\*\*look at the fern leaves and examine them

\*\*do they look like regular plants that students have  
seen

\*\*where are the spores

\*\*draw and describe what a mushroom looks like

\*\*draw and describe a fern leaf

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Interpersonal/Intrapersonal)

Assessment:

Personal Communication Assessment: observation of students during the activity.

Performance assessment: student drawings of plants and how they describe each plant.

Re-visit:

Science with Plants

- \*\*talk about how their bean plants are growing
- \*\*look at other ways plants can grow
- \*\*have carrot tops, beet tops, and a pineapple top
- \*\*put each in a dish with some water to see if they will grow
- \*\*predict what will happen
- \*\*write prediction and draw picture of plants (use paper folded in half)
- \*\*put them in sunny place (these plants take several weeks to grow)
- \*\*observe over time

(Linguistic/Logical-Mathematic/Spatial/Interpersonal.

Intrapersonal)

Assessment:

Personal Communication Assessment: observe students during activity



Scientific Investigation: a prediction with a drawing at the beginning. What happened over time with a drawing.

Amaryllis bulb observation:

\*\*have an amaryllis bulb and a narrow necked jar filled with water

\*\*put the amaryllis bulb in the neck of the jar so that it touches the water

\*\*do you think that the bulb will grow without soil

\*\*students watch over time and record results in their science journals

(Linguistic/Logical-Mathematic/Interpersonal)

Assessment:

Personal Communication Assessment: observation of students during activity.

Scientific Investigation: a prediction with a drawing at the beginning/what happened over time with a drawing

Rain Forest Plant Activity:

Bring together classroom bromeliads, air plants, orchid, and ferns

\*\*these are some plants that are found in the rain forest

\*\*what do the students observe (flowers different, colorful centers, have bowl like centers, on tree bark)

\*\*these plants called Epiphytes, they live in the upper part of the rain forest in the Canopy Layer

\*\*is there soil in the Canopy Layer (no)

\*\*how do you think they grow (accept all predictions)

\*\*they attach themselves to trees and grow on the plants

\*\*they do not take nutrients from them, they just use the trees to have a place to hold on to in the air

\*\*the debris rich soil that they create causes tree roots to emerge from the trees (they trick the tree into thinking it is real soil)

\*\*the bowl like areas trap pools of rain water which they use to get their own water and animals use them as an oasis to drink and live in

\*\*compare leaves on plants, look at the size and shape

\*\*point to plants that have drip leaves, those whose leaves funnel water into the plant

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/  
Intrapersonal)

Center Activity:

Students will make their own bromeliads, orchids, and leaves to add to the classroom rain forest environment. During this time the students will continue to observe and care for the plants in the room and make entries in their journals.

LESSON 3 A

Objective:

Students will observe, describe, and record the functions of animal parts.

Video:

Insects

This 35 minute video talks about what an insect is and the different kinds of insects in the world--it gives an overview of the relationship between plants and insects

Read:

Insects by John Grassy

This book talks about many different types of insects--it will introduce the insects into the rain forest to help pollinate the plants.

Insect Discussion Activity:

Show clear plastic model of ant--insect posters

- \*\*insects don't have any backbones, their shells protect their insides
- \*\*all insects have six legs
- \*\*all insects have three body parts
  - \*\*head
  - \*\*thorax--middle part of the body
  - \*\*abdomen
- \*\*insects have antenna
- \*\*have jaws and teeth
- \*\*insects can develop in three different ways
  - \*\*simple change--insects like silverfish
    - \*\*egg
    - \*\*small insect looks like adult insect only small
  - \*\*incomplete change--insect like grasshoppers
    - \*\*egg
    - \*\*small insect looks like adult but has no wings
    - \*\*adult insect develops wings
  - \*\*complete change--metamorphic insects like butterflies
    - \*\*egg

\*\*larva

\*\*pupa

\*\*adult

\*\*insects pollinate flowers by touching them as they fly around

\*\*some insects are good for plants but some insects are also bad because they eat the plants, such as grasshoppers

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/Intrapersonal)

Read:

I Can Read About Spiders by Deborah Merrians

This book looks at spiders and tells about different kinds of spiders

Spider Discussion:

\*\*is a spider an insect? Why/why not?

\*\*some insects have six legs and three body parts

\*\*spiders have eight legs and two body parts

\*\*head and chest

\*\*abdomen

\*\*spiders have special parts called spinnerets that spin silk to make webs

\*\*spiders don't have wings

**\*\*spiders don't have a backbone--their shell body protects their insides**

**\*\*have fangs**

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/  
Intrapersonal)

Venn Diagram:

**\*\*use venn diagram to compare spiders and insects**

<b>spider</b>	<b>both</b>	<b>insect</b>
eight legs		six legs
two body parts	hard outer cover	three body parts
fangs		jaws and teeth
no wings	no backbone	wings (usually)
spinnerets		

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/  
Intrapersonal)

Center Activity:

Students will use egg cartons and other art materials to create an insect to be added to the rain forest-- must include the three parts of an insect and six legs.

Students will use egg cartons and other art materials to create a spider to be added to the rain forest-- must include the two parts of a spider and eight legs

(Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Interpersonal/Intrapersonal)

Assessment:

Personal Communication Assessment: observation of students during activities. Anecdotal notes of thinking processes, how do they use the knowledge that they have gained so far.

Open-ended Questions: observe discussion during activities, encourage problem solving during creation of own insects.

Performance Assessment: students created insect and spider with the appropriate body parts for each.

LESSON 3 B

Objective:

Students will compare the life cycles of different types of animals.

Video:

Reptiles

35 minute video shows many different types of reptiles and describes their many habitats.

Read:

All About Alligators by Jim Arnosky

This book tells about the habits of alligators-- although alligators do not live in rain forests and crocodiles do this book tells the difference between an alligator and a crocodile which allows the students to see how a crocodile also lives.

Live cycle activity:

Talk about different types of reptiles

\*\*snakes

\*\*lizards

\*\*crocodiles

\*\*what do they have in common

    \*\*cold blooded

    \*\*lay eggs

\*\*recall the water cycle--what does it do?

\*\*what is a life cycle

\*\*begin a life cycle chart of animals to be added to during the unit

    \*\*name of animal

    \*\*how born

    \*\*kind of young (like parents or different)

    \*\*adult

\*\*crocodile lays eggs--looks like small adult--grows to adult size



\*\*snakes lay eggs--looks like small snake--grows to adult size

\*\*lizards lay eggs--looks like a small lizard--grows to adult size

(Linguistic/Logical-Mathematic/Spatial/Interpersonal)

Read:

From Tadpole to Frog by Wendy Pfeffer

This book shows the transformation of frogs from their eggs to tadpoles to frogs

Class discussion:

Review pictures and transformation

\*\*eggs

\*\*tadpole

\*\*change by growing back legs then front legs

\*\*tail shrinks and frog goes out of water for first time

\*\*lives on land

Activity:

Using book make a list of each stage a frog goes through from egg to tadpole to frog. Fold white paper into six squares. Students write sentence about, draw picture of example for the six stages

\*\*egg

\*\*tadpole

\*\*grows hind legs

\*\*grows front legs

\*\*tail shrinks and frog goes out of water for first  
time

\*\*frog lives on land

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Interpersonal/Intrapersonal)

Center Activity;

Use cooked pearl tapioca to represent the eggs of the  
frogs--models of frog that goes through metamorphosis  
from tadpole to frog with legs

Students touch and feel eggs, tadpole, frog models.

Write sentences to tell what they feel like/look  
like.

Draw pictures of each.

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Intrapersonal)

Assessment:

Personal Communication Assessment: observation of  
students during the activities, anecdotal notes and  
observation of new knowledge processes.

Open-ended Questions: observe students during

discussion. How are they using and processing information.

Performance Assessment: students show all six stages included with a reasonable sentence to describe the stage.

#### Rubric for Assessment

6: All 6 stages included with correct spelling for each stage.

5: At least 5 stages with reasonable spelling for each stage.

4: At least 4 stages with attempted spelling for each stage.

3: At least 3 stages with attempted spelling for each stage.

2: 1 or more stages with an attempt at spelling.

1: Drawings are attempted with or without spelling attempts.

#### Read:

Frogs by Gail Gibbons

This book includes vocabulary about frogs and their habitats

#### Class discussion:

Introduce vocabulary

\*\*hibernate--embryo--amphibian--algae--spawn--gills--

herpetologist--vegetarian

\*\*discuss each word and clap out a spelling pattern

for each word

\*\*make up a simple song or chant about the vocabulary

words with appropriate definition of each word

\*\*black line master book about frogs--draw tadpole

and frog

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/

Interpersonal/Intrapersonal/Musical)

Center Work:

Students will draw a picture to represent each word

from the new vocabulary list. Write the correct

spelling of the word at least five times on the

picture.

(Linguistic/Interpersonal/Spatial)

Re-read:

Frogs

Class Discussion:

Book makes comparison of frogs and toads

\*\*what are the differences

\*\*why are frogs called amphibians

\*\*are toads amphibians too

\*\*make a venn diagram to compare frogs and toads

<b>frogs</b>	<b>same</b>	<b>toad</b>
smooth, moist skin		thick, dry bumpy skin
can have bright colors		dark colors, warts
long back legs	cold blooded	short back legs
long leaps	no tails	short leaps
narrow body	amphibians	plump bodies
ridges down back	start as tadpole	ridges on head
large round ear	hatch from eggs	small ear
membranes		membranes
small teeth in upper jaw		no teeth
clumps of eggs		strings of eggs in water
most live in or near water		lives on land

Activity:

Students draw a picture of a frog and write three sentences to tell about characteristics of frog. Draw a picture of a toad and write three sentences to tell about characteristics of toad.

Assessment:

Personal Communication Assessment: observations of students during the activities, anecdotal notes to assess grasp of concepts.

Open-ended Questions: observation of students during discussion. How are the students formulating their own reasoning process.

Performance Assessment: students drawing and sentences about frog and toad.

Rubric for activity

6: pictures and sentences are correct

5: pictures and at least two sentences correct for both

4: pictures correct with some of the characteristics correct

3: 1 or both pictures correct with good attempt of characteristics

2: some information correct

1: no attempt at activity

Read:

Discovering Reptiles and Amphibians by Stephen

Caitlin

This book describes different reptiles and amphibians

Class Discussion:

How do frogs compare to other amphibians

\*\*what is the difference between amphibians and reptiles

\*\*what are some of the most famous reptiles we like to study about (dinosaurs)

\*\*blackline master book about different amphibians to read during free time

(Linguistic/Spatial/Bodily-Kinesthetic/Intrapersonal)

Read:

Frogs, Frogs, Everywhere by D. M. Souza

This book discusses the many different species of frogs.

Many of the frogs in this book are residents of the rain forest.

Class discussion:

Where are rain forests located?

\*\*what are differences of the frogs and amphibians we have learned about

\*\*listen to rain forest sounds tape to hear all the sounds--what did we hear (water, frogs, insects, birds, other possible animal sounds)

Activity:

Students listen to tape and write a story about a day in the life of a rain forest frog.

(Linguistic/Interpersonal/Intrapersonal/Spatial/Musical)

Assessment:

Personal Communication Assessment: observation of students and anecdotal notes of participation and processing of information.

Open-ended Questions: observation of students during discussion, encouragement of learning process of each student through questions.

Performance Assessment: student's story of the frogs day

Other Activities to go along with these lessons:

Live tadpoles will be observed by the students as they hatch and go through the different stages of metamorphosis to large frogs.

Students will write observations in their science journals as the frogs change and draw pictures of what they see.

Floor puzzle of the life cycle of a frog.

Different models of frogs and the books that we have read during class.

Read:



Flashy Fantastic Rain Forest Frogs by Dorothy Hinshaw

Patent

This book gives an overview of the different types of frogs that are found in the rain forest

Class Discussion:

Are frogs reptiles? (no, they are amphibians)

\*\*what makes them different than reptiles?

\*\*what kind of life cycle do frogs have?

    \*\*lay eggs--grow into tadpoles--morph into

    frogs--adult frog

\*\*are there any other animals that have this type of life cycle

\*\*add life cycle to chart

(Linguistic/Logical-Mathematic/Spatial/Interpersonal)

Read:

Cardinals, Robins, and Other Birds by George Ficter

This book tells about many different types of birds-- it talks about the structure of those birds and tells the functions of the different bills and other information--although this book does not include any rain forest birds the information in the book can be used to investigate the birds of the rain forest by their individual characteristics

Class Discussion:

Talk about the different shapes and uses for the different bird's bills

\*\*do all the birds have similar characteristics?

\*\*make a list of the different uses of the bills

(keep in the room for reference for rain forest birds)

\*\*what is the life cycle of a bird

    \*\*lays eggs

    \*\*young have same shape as adult but feathers are different

    \*\*adult

    \*\*add to life cycle chart

(Linguistic/Logical-Mathematic/Spatial/Interpersonal)

LESSON 3 C

Objective:

Students will compare and contrast how living things depend on each other.

Read:

The Great Kapock Tree by Lynne Cherry

This is a story that tells about the importance of one tree to many animals

## Jungle Animal ID Cards:

Introduce the students to the jungle animal ID cards  
\*\*these cards have different animals on them with a  
set of facts about that animal

    \*\*where they live

    \*\*type of animal(reptile, mammal, amphibian,  
etc,)

    \*\*special information about the animal(poison  
arrow frog used for poison, etc.)

\*\*discuss cards with students

\*\*cards will be used in many different activities  
including writing activities

\*\*students can make their own cards to tell about  
animal facts

\*\*as we go over the cards add information to the life  
cycle chart

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/  
Intrapersonal)

## Read:

One Day in the Tropical Rain Forest by Jean Craighead  
George

This book tells a story about a boy named Tapui who

helps look for a never before seen butterfly to save his home--this book will be used to see the way different plants and animals depend upon one another in the rain forest--this will take several days to complete

Daily reading activity:

As I read along through the book we will stop and talk about the different things that happen in the book

\*\*using a chart--record the actions that happen (butterfly breaks out of chrysalis, termite protects his nest by shooting out chemical from opening of nest

\*\*discuss the relationships of the different plants/ animals/insects

\*\*work on comprehension skills of the students

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/ Intrapersonal)

Daily book activity:

Students will draw a picture each day showing something that happened in the book that day and they will write a sentence or two to tell about their drawing

(Linguistic/Spatial/Intrapersonal)

Assessment:

Personal Communication Assessment: observation of students during activities.

Open-ended Questions: observation of students as they discuss book.

Anecdotal notes about participation and acquisition of knowledge.

Performance assessment: students interpretation of the daily readings.

LESSON 3 D

Objectives:

Students will describe how living things use resources from their environment to meet basic needs.

Class discussion:

Talk about what all things need to grow and survive

\*\*water

\*\*food

\*\*air

\*\*water comes from the sky, lakes, rivers, ocean

\*\*air is all around us with the help of plants

\*\*where do we get food

\*\*review water cycle, life cycle, add food cycle  
(chain)

\*\*what do we eat--plants, animals, fish

\*\*who eats who/

\*\*show food chain cards

\*\*talk about how each animal or insect depends  
on the other for their own life

Web of life activity:

Using food chain cards ten students sit in circle  
(make two circles so that all students can  
participate)

\*\*hand out food chain cards at random (one to each  
student in each circle)

\*\*give a ball of string to person holding card number  
one who wraps it around their hand one time

\*\*card number one passes the string to person holding  
card number two who then wraps it around their hand  
one time in this same manner each consecutive card  
holder get the string

\*\*make sure that the people are sitting in a random  
order to create a web affect with the string

\*\*starting with card number one have them give a tug on the string (not a yank) when card number two feels the tug they also give a tug

\*\*after all people have joined in and felt the tug stop and discuss what they observed

\*\*talk about what would happen if one person were to drop out (possible extinction) of the chain--who would be affected

\*\*try it with one card in the middle dropping out

\*\*what happened?

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Activity:

Students draw a simple food chain (plant, cow, human) and tell what happens in the chain

Assessment:

Personal Communication Assessment: observation of students during the activity. Anecdotal notes about participation and acquisition of knowledge.

Open-ended Questions: observation of students. How are they using prior knowledge with the activities.

Performance Assessment: students show an understanding of the food chain.

Rubric for activity

- 6: pictures show all components of chain with complete telling of how it works
- 5: pictures show all components of chain with some understanding of the process
- 4: pictures show chain with an attempt to write about it
- 3: pictures have missing element with an attempt to write
- 2: pictures have missing element with no attempt to write
- 1: no attempt made

LESSON 3 E

Objective:

Students identify characteristics of plants and animals that allow them to live in specific environments

Re-read:

Flashy Fantastic Rain Forest Frogs

Frogs

These books were read during the frog study lessons

Class discussion:



compare the information in both books

**\*\*what** are some of the differences between pond frogs  
and rain forest frogs

**\*\*colors**

**\*\*legs**

**\*\*where they live**

**\*\*what** are some of the things that are the same

**\*\*live cycle**

**\*\*general body shape**

**\*\*what they eat**

**\*\*make a venn diagram to compare the frogs**

<b>pond frog</b>	<b>same</b>	<b>rain forest frogs</b>
green color	eggs	many bright colors
legs for jumping	tadpole	legs more for climbing
feet webbed	eat insects	sticky toes to hold on
live on ground	start in water	live in trees

(Linguistic/Logical-Mathematic/Spatial/Interpersonal)

Re-read

The Reason for Flowers

Plants That Never Ever Bloom

Class discussion:

Compare information in the books

**\*\*what characteristics do the class notice**

**\*\*where do the plants that have flowers grow in the rain forest? Why?**

**\*\*in the canopy layer**

**\*\*need more sun to grow**

**\*\*insects to pollinate**

**\*\*where do the plants without flowers grow in the rain forest? Why?**

**\*\*understory and forest floor**

**\*\*live on the decaying leaves, trunks of trees**

**\*\*grow in darker areas**

**\*\*need moist environment to live**

**\*\*look at plants in the classroom and discuss where these plants might grow in the rain forest and why they think that**

**\*\*bromiliads**

**\*\*in the canopy**

**\*\*need more sunlight**

**\*\*center leaf similar to flower**

**\*\*orchid**

**\*\*in the canopy**

**\*\*need more sunlight**

\*\*flowers grow

\*\*green leafy plants

\*\*possible canopy or understory

\*\*depends on amount of sunlight needed

\*\*air plants

\*\*all layers

\*\*needs moisture from the air

(Linguistic/Logical-Mathematic/Spatial/Interpersonal/  
Intrapersonal)

Activity:

Students choose two different plants to draw

\*\*draw picture of plants in correct part of rain  
forest

\*\*write at least two sentences to tell about each  
plant

(Linguistic/Logical-Mathematic/Bodily-Kinesthetic/  
Spatial)

Assessment:

Personal Communication Assessment: observation of  
students during the activity. Anecdotal notes about  
participation and acquisition of knowledge.

Open-ended Questions: observation of students. How  
are they using prior knowledge with the activities.

Performance assessment: students displays and understanding of where the plants grow in the rain forest and why.

#### Jungle Journal Activity:

Each student will create their own jungle journal  
\*\*using the animal ID cards students will glue a picture to the upper right hand corner of the page  
\*\*the student will write a sentence about what they know about that animal  
\*\*the student will draw a picture about the sentence  
\*\*students will follow this format for all the animals

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Intrapersonal)

#### Assessment:

Personal Communication Assessment: observation of students during the activity. Anecdotal notes about participation and acquisition of knowledge.

Open-ended Questions: observation of students. How are they using prior knowledge with the activities.

Performance assessment: students show an understanding of each animal on the ID cards and they can tell about them.

## LESSON 3 F

### Objective:

Students will classify organisms based on characteristics.

### Center Activity:

Students will use the Jungle Animals ID cards to sort the animals by different characteristics

\*\*sort by warm blooded and cold blooded

\*\*sort by vertebrate and invertebrate

\*\*sort by amphibian, reptile, bird, and mammal

\*\*sort by layers that they live in of the rain forest

\*\*sort by any other characteristics students choose

\*\*record each on a list to show which animals were placed in which file

(Linguistic/Logical-Mathematic/Bodily-Kinesthetic/Spatial/  
Intrapersonal/Interpersonal)

### Assessment:

Personal Communication Assessment: observation of students during the activity. Anecdotal notes about participation and acquisition of knowledge.

Open-ended Questions: observation of students. How are they using prior knowledge with the activity.

Performance assessment: how well the student classifies the different animals.

Center Activity:

Forest Dominoes--Using the forest dominoes students play by sorting by the type of animal (amphibian, reptile, bird, and mammal)

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/Interpersonal/Intrapersonal)

Assessment:

Performance assessment: how well the student sorts the animals.

CULMINATING ACTIVITY

Individual:

Students will write a report about one of the animals that they learned about and give an oral presentation.

Assessment:

Personal Communication Assessment: observation of students during the activity. Anecdotal notes about participation and acquisition of knowledge.

Open-ended Questions: observation of students. How are they using prior knowledge with the activities.

Performance assessment: report includes information about the animals type of food, where they live, type of animal (bird, mammal, etc.)

Group Activity:

Groups will work together on a chosen activity;

- \*\*group chant, poem, or song about the rain forest
- \*\*play about the rain forest
- \*\*collaborative picture about the rain forest
- \*\*poster about the rain forest or an animal in the rain forest
- \*\*any reasonable activity that the group suggests about the rain forest

Assessment:

Personal Communication Assessment: observation of students during the activity. Anecdotal notes about participation and acquisition of knowledge.

Open-ended Questions: observation of students. How are they using prior knowledge with the activities.

Performance assessment: representation of the information.

Whole Group:

Students will work together to create a rain forest environment. They will invite other classes to join in on a "Celebration of Learning" day with individuals and groups presenting information of what they learned about the rain forest.

ADDITIONAL ACTIVITIES

TO BE USED IN THIS UNIT

Read:

A Story A Story by Gail E. Haley

Why Mosquitoes Buzz in People's Ears by Verna Aardema

These books will be used for different language arts activities which will include book knowledge, story telling, chants, and writing activities.

(Linguistic/Logical-Mathematic/Spatial/Bodily-Kinesthetic/  
Musical/Interpersonal/Intrapersonal)

Tapes:

A Tropical Rain Forest Tape will be played during many of the activities including writing and center times to enhance the musical intelligence. Crocodile Smile--this tape has some fun songs about endangered species the students will sing and do body movements



during slow times or over stimulating times during the unit.

Visualization:

Also during the unit I will use visualization exercise for the students to experience the feelings of the rain forest. Using the rain forest tape I will have the students visualize:

- \*\*the different layers of the rain forest
- \*\*individual animals or insects in the rain forest
- \*\*through whole group participation make up different sounds of the animals, insects, and birds--perform a students created orchestration of the sounds (teacher lead and student lead)
- \*\*orally lead the students to create a physical representation of a tropical rain storm
  - \*\*start with soft rubbing of palms on knees--keep a slow rhythm
  - \*\*visualize a lizard in the rain forest
  - \*\*rubbing palms become soft tap on knees still slow rhythm
  - \*\*rain starting to fall
  - \*\*slightly faster rhythm

\*\*soft clap and pat on knee

\*\*lizard looks for shelter under a drip  
leaf

\*\*faster clap, pat as rain comes faster

\*\*begin to get softer

\*\*softer and slower

\*\*slower

\*\*back to knee tap only

\*\*softer and slower drip---drip---drip

Center activities:

Maps of different Continents to discover the rain forest areas.

Maps of the world to discover where the continents are in the world.

Rain Forest Puzzle with two interactive layers.

Student books to read on the rain forest which include reference information books.

Art Center to create papier-mâché animals to go into the rain forest environment as well as creating their own stain glass look butterflies.

Color of the Rain Forest Sentence Strip and Listening Center.

Writing center activities with shape book templates  
to create own stories.

Many different little books to make--these will be  
about the different parts of the rain forest from the  
plants to the different animals and insects.

APPENDIX B  
SCIENCE STANDARDS

**SECOND GRADE  
STANDARD 1  
LIFE SCIENCE**

<p><b>NATIONAL STANDARDS</b> (Major Topics and Program Goals) Students demonstrate Their knowledge of Basic skills, Conceptual Understanding, And problem solving as They relate to:</p>	<p><b>ESSENTIAL LEARNINGS</b> (Things Students Must Learn)</p>	<p><b>PERFORMANCE INDICATORS</b> (Things We Measure and Test)</p>	<p><b>ASSESSMENT</b> <u>Mandatory:</u></p> <p><u>Recommended:</u></p>
<p><u><b>LIFE SCIENCE</b></u> The student knows and Understands the characteristics and structure of living things, the processes of life and how living things interact with each other and their environment.</p>	<p>* Living things have structure and related functions.</p>	<p>* classify organisms based on characteristics (i.e. vertebrate, warm blooded, methods of reproduction) * observe, describe, and record the functions of plant Parts * observe, describe, and record the functions of animal parts.</p>	
	<p>* Living things grow and change.</p>	<p>* compare the life cycles of different types of plants * compare the life cycles of different types of animals * sequence and describe the stages of growth for an animal or plant * identify requirements for healthy human growth and development (i.e. nutrition, exercise)</p>	

<p><b>NATIONAL STANDARDS</b> (Major Topics and Program Goals) Students demonstrate Their knowledge of Basic skills, Conceptual Understanding, And problem solving as They relate to:</p>	<p><b>ESSENTIAL LEARNINGS</b> (Things Students Must Learn)</p>	<p><b>PERFORMANCE INDICATORS</b> (Things We Measure and Test)</p>	<p><b>ASSESSMENT</b> <u>Mandatory:</u></p> <p><u>Recommended:</u></p>
	<p>* Living things interact with each other and their environment.</p>	<p>* describe the similarities and differences Between the needs of plants and animals</p> <p>* compare and contrast how living things depend on each other for basic needs (i.e. food chain)</p> <p>* describe how living things use resources from their environment to meet basic needs</p> <p>* identify characteristics of plants and animals that allow them to live in specific environments</p>	

APPENDIX C  
BIG IDEA TEMPLATE

Unit Name: \_\_\_\_\_

Title: \_\_\_\_\_

Big Idea: \_\_\_\_\_

Unit objectives	Introduction	Content Covered in Unit	Skills and Knowledge Acquisition	Project Activities	Type of Assess.	Multiple Intelligences Used When or Which?



APPENDIX D  
THEMATIC PLANNING TEMPLATE

Lesson Planning To Enable All Students To Succeed

Multiple Intelligences Planning Sheet	
Objective:	
Assessment:	
Linguistic	Bodily-Kinesthetic
Logical-Mathematical	Intrapersonal
Spatial	Interpersonal
Musical	Combinations of the Intelligences

APPENDIX E  
STUDENT INTERVIEW FORM

Student Interview Form Lesson # Date

Student	What I liked best	What I learned
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

APPENDIX F  
MULTIPLE INTELLIGENCES  
QUESTIONS/ACTIVITIES

## MULTIPLE INTELLIGENCES

### QUESTIONS/ACTIVITIES

Ask Key MI Questions.

LOGICAL-MATHEMATICAL: How can I bring in numbers, calculations, logic, classifications, or critical thinking skills?

LINGUISTIC: How can I use the spoken or written word?

SPATIAL: How can I use visual aids, visualization, color, art, or metaphor?

MUSICAL: How can I bring in music or environmental sounds, or set key points in a rhythmic or melodic framework?

BODILY-KINESTHETIC: How can I involve the whole body or use hands-on experiences?

INTERPERSONAL: How can I engage students in peer sharing, cooperative learning, or large-group simulation?

INTRAPERSONAL: How can I evoke personal feelings or memories, or give students choices?

What specific strategies can I use for each intelligence?

LINGUISTIC: lectures, large-and small-group discussions, books, worksheets, manuals, brainstorming, writing activities, word games, sharing time, students speeches, storytelling, talking books and cassettes, extemporaneous speaking, debates, journal keeping, choral reading, individualized reading, reading to the class, memorizing linguistic facts, tape recording one's words, using word processors, publishing (e.g., creating class newspapers)

LOGICAL-MATHEMATICAL: mathematical problems on the board Socratic questioning, scientific demonstrations, logical problem-solving exercises, classifications and categorizations, creating codes, logic puzzles and games, quantifications and calculations, computer programming languages, science thinking, logical-sequential presentations of subject matter, Piagetian cognitive stretching exercises, Heuristics.

SPATIAL: charts, graphs, diagrams, and maps,

visualization, photography, videos, slides, and movies, visual puzzles and mazes, 3-d construction kits, art appreciation, imaginative storytelling, picture metaphors, creative daydreaming, painting, collage, and other visual arts, idea sketching, visual thinking exercises, graphic symbols, using mind-maps and other visual organizers, computer graphics software, visual pattern seeking, optical illusions, color cues, telescopes, microscopes, and binoculars, visual awareness activities, draw-and-paint/computer assisted-design software, picture literacy exercises.

**BODILY-KINESTHETIC:** creative movement, hands-on thinking, field trips, mime, the classroom theater, competitive and cooperative games, physical awareness exercises, hands-on activities of all kinds, crafts, body maps, use of kinesthetic imagery, cooking, gardening, and other "messy" activities, manipulatives, virtual reality software, kinesthetic concepts, physical education activities, using body language/hand signals to communicate, tactile materials and experiences, physical relaxation exercises, body answers.

**MUSICAL:** musical concepts, singing, humming, or whistling, playing recorded music, playing live music on piano, guitar, or other instruments, group singing, mood music, music appreciation, playing percussion instruments, rhythms, songs, raps, and chants, using background music, linking old tunes with concepts, listening to inner musical imagery, music software, supermemory music.

**INTERPERSONAL:** cooperative groups, interpersonal interaction, conflict mediation, peer teaching board games, cross-age tutoring, group brainstorming sessions, peer sharing, community involvement, apprenticeships, simulations, academic clubs, interactive software, parties or social gatherings as context for learning, people sculpting.

**INTRAPERSONAL:** independent study, feeling-toned moments, self-paced instruction, individualized projects and games, private spaces for study, one-minute reflection periods, interest center, personal connections, options for homework, choice time, self-teaching programmed instruction, exposure to

inspirational/motivational curricula, self-esteem activities, journal keeping, goal-setting sessions.



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