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A GUIDE TO A BRAIN-BASED APPROACH TO THEMATIC,
INTERDISCIPLINARY TEACHING

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

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

by
Deborah Marie Ferguson

June 2001

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INTERDISCIPLINARY TEACHING

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June 2001

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TABLE OF CONTENTS

ABSTRACT	iii
ACKNOWLEDGMENTS	iv
LIST OF FIGURES	vi
CHAPTER ONE: INTRODUCTION	1
CHAPTER TWO: LITERATURE REVIEW	4
How Thematic, Interdisciplinary Teaching is Important to Education	5
Brain-Based Research in Support of Thematic, Interdisciplinary Teaching	12
Suggestions and Guidelines for Planning a Thematic, Interdisciplinary, Brain-Based Unit	19
CHAPTER THREE: METHODOLOGY AND DESIGN	33
CHAPTER FOUR: EVALUATION	37
CHAPTER FIVE: CONCLUSIONS AND IMPLICATIONS	46
APPENDIX A: TEACHER'S CHECKLIST FOR PLANNING A BRAIN-BASED, INTERDISCIPLINARY UNIT	49
APPENDIX B: BRAIN-BASED, INTERDISCIPLINARY CURRICULUM PLANNING / UNIT OUTLINE	64
APPENDIX C: MASTER'S PROJECT EVALUATION FORMS: DATA COLLECTION	86
REFERENCES	99

LIST OF FIGURES

Figure 1. Masters Project Evaluation Form 35

CHAPTER ONE

INTRODUCTION

Through my teaching encounters, I have observed how today's instruction often reflects the textbook-driven practices of years ago, disregarding individual learning styles and scientific findings of how to optimize learning. Brain-based research in education provides clear guidelines for how to improve teaching practices and enhance learning. Specifically, thematic instruction through an interdisciplinary approach is an instructional practice conducive to the findings from brain-based research and learning. Defined, thematic, interdisciplinary teaching theories suggest linking the disciplines to a specific topic, concept, or theme in which students find commonalities among the subjects through in-depth investigations. As teachers better understand the scientific findings from brain-based research, they are more likely to revise instruction moving toward a student centered, brain-compatible curriculum. The shift from linear teaching practices to multi-directional, brain-based strategies is certain to elevate the quality of learning experiences. These changes are necessary, for our world is

in a state of continual change and growth, particularly as we cross the threshold of a new century. The understanding from scientific findings of brain-based learning challenges schools and teachers to revise ineffective teaching methods as an attempt to remain on the cutting-edge of change. Schools must prepare children for the comprehensive changes that have occurred and for those rapidly approaching. The understanding and implementation of brain-compatible instructional strategies meets this challenge.

The foundation of this project, chapters two through five, reflects research of current literature; thesis design and methodology; and evaluations of the project targeting a practical and understandable plan for curriculum development. The project for this thesis consists of a checklist of questions accompanied by a brain-based, interdisciplinary unit outline. The checklist serves as a prompt for teachers to employ brain-based theories into classroom instruction. The unit outline is a guide that provides direction for interdisciplinary curriculum planning.

Chapter two, the review of literature, will examine findings from current literature in support of methods for effective instruction. The literature review is sectioned

into three parts significant to instructional applications: How Thematic, Interdisciplinary Teaching is Important to Education; Brain-Based Research in Support of Thematic, Interdisciplinary Teaching; and Suggestions and Guidelines for Planning a Thematic, Interdisciplinary, Brain-Based Unit. The three sections target brain-based learning theories and are tied specifically to thematic, interdisciplinary curriculum.

Chapter three, Methodology and Design, will discuss how research of the literature directed the final project and arranged the process of evaluation.

Chapter four, Evaluation, provides feedback and suggestions from the project evaluation. Three classroom teachers reviewed the project and responded to a prepared evaluation. The evaluation rates the project according to practicality and understandability and provides opportunity for comments and suggestions.

Chapter five, Conclusions and Implications, discusses the responses from the evaluation regarding the project's implications for education.

CHAPTER TWO

LITERATURE REVIEW

As we merge into a new century, we enter an era of educational reform. Educational practices of yesterday are being challenged through scientific findings on how the brain learns. This review of literature is to help educators understand the need to revise traditional teaching methods to reflect the new brain-based theories that promote learning and cognition. This review consists of three main sections, each focusing on the effectiveness of thematic, interdisciplinary teaching. The first part, *How Thematic, Interdisciplinary Teaching is Important to Education*, discusses the importance of thematic teaching to educational practices; the middle part, *Brain-Based Research in Support of Thematic, Interdisciplinary Teaching*, covers brain-based research that supports the integration of thematic, interdisciplinary teaching; and the third part, *Suggestions and Guidelines for Planning a Thematic, Interdisciplinary, Brain-Based Unit*, provides guidelines for planning a brain-based, thematic curriculum.

How Thematic, Interdisciplinary Teaching is Important to Education

The education profession is now approaching a crossroads in its journey to better understand how learning occurs. Research findings on how the brain learns indicate the teacher directed, textbook driven methodology of instruction typically used in public education is incompatible with how the brain functions and retains information. Ironically, how the brain learns is the business of education and should be understood first and foremost by educators, but this is rarely the case. "Our brain has always defined the education profession, yet educators haven't really understood it or paid much attention to it" (Sylwester, 1995, p. 1). Granted, yesterday's children have grown to become today's scientists and world leaders. Educational practices were not bad, in fact these practices have been successful in shaping today's professionals. However, technological or global advancements require an educational system that encourages new understandings while enhancing our capability to learn.

We need to move beyond just a methodological fix.

"Educators do not need another method or approach or model

guaranteed to 'save' education... What is needed is a framework for a more complex form of learning..." (Caine & Caine, 1994). Educators need to move from mediocrity to more effective teaching methods. Van Tessel (2000) states, the job of educators is not finished "until [new] information is processed, labeled, stored, and cross referenced with other memory in storage" (p. 2). This cycle of brain development is what defines the processes of our memory.

Thematic teaching provides a framework for effective instruction. Defined, thematic teaching means that "...a concept or topic is explored as an interdisciplinary spider web...We learn with themes, favorite subjects, issues, key points, questions, trial and error, and application" (Jensen, 1996). Thematic teaching strategically frames curriculum around a topic or idea and connects the disciplines through an interdisciplinary approach to in-depth understanding of the topic studied.

Interdisciplinary teaching through the use of thematics can be an efficient and effective method to cover any grade-level curriculum and deepen student understanding.

An integrative approach is more efficient in addressing the interrelationships among the various areas and in making evident commonalities. Focusing

on any one of these areas in the absence of others often does not lead to lasting changes [in learning]. The situation is analogous to focusing on the trees and not seeing the forest. (Jesunathadas, 1995)

Mason and Mathison (1989) affirm that students will discover fascinating and compelling relationships between disciplines and add meaning and relevancy to learning through an interdisciplinary approach to curriculum. "New perspectives are developed [through thematic teaching] which help students construct a more integrated web of knowledge" (p. 3). The processes of thematic teaching makes learning new information more memorable than the traditional methods of isolated subjects.

Thematics allow educators and students to cover a wide area around a topic. Students are likely to become personally involved in the learning and tie-in a level of personal relevance to what is being studied. "Because our lives require us to integrate... teaching children through merged disciplines better prepares them for applying new knowledge and understandings" (Vogt, 2000). Additionally, when students view their learning as having personal relevance, they put more effort into their schoolwork and achievement.

Memories are linked to experiences when they are meaningful, when patterns are found, when connections to prior knowledge are made, and when emotions are associated with the experience. Patterning is a natural, re-occurring function of our brain. "The brain creates patterns... connected [to] larger patterns of related information. This is referred to as a pattern-seeking device... and is exemplified in the use of thematic teaching" (Fogarty, 1997). Through thematic teaching, the curriculum is organized into interconnected patterns and the disciplines are merged allowing the student to relate what is being learned. Caine & Caine (1997) assert that cognition is set, in part, by one's capacity to perceive relationships and connectedness. "The bigger the picture teachers have of... interconnectedness, the more they can relate subjects and skills to other domains and to a student's personal interests" (p. 127). It is the teacher's duty to understand the whole educational picture and to help the students find patterns that give reason for the learning. This understanding answer the all-too-common question students ponder, why are we learning this. "Cross-curricular thematic instruction allows students to contemplate problems and situations that reflect the world

as they know it" (Vogt, 2000). Hence, their question is addressed.

Traditional teaching practices separate the disciplines into tidy, sequential subjects that prove to benefit the teacher, not the learner. These divided disciplines are only parts to a whole learning experience. When the subjects are separated, it is difficult to see how the learning is part of a larger experience. Thematic teaching values the whole learning experience by bringing the disciplines together, rather than emphasizing unrelated parts or subjects. Crowell, Caine, and Caine (1998) emphasize that school subjects are only part of a larger, more impressive "whole" and the separation of subjects is futile:

There is also some sense that every subject is somehow embedded in every other subject, and that beyond all subjects is the reality that subjects themselves are merely arbitrary separations of a world and universe that is essentially whole. (p. 60)

The idea of the whole versus the parts in reference to educational practices suggests that educational institutions should structure curriculum in a connected framework giving the learner a complete and realistic idea of what needs to be learned.

Thought-provoking questions posed by the teacher along with opportunities for inquiry are a large part of thematic, interdisciplinary teaching. The goal of thematics is to delve deeply into a topic, not limiting the learning to one discipline but finding commonalities among all the disciplines to create a well-rounded, meaningful curriculum. Short, Harste, & Burke (1996) state when students begin to form topic-related inquiry questions, they go beyond what they already know, examine the topic as broadly as possible from many different perspectives, and develop deeper understandings (p. 266). Thematic teaching invites students to wander through and wonder about the learning. This wandering may feel chaotic, even detached. As educators, we need to appreciate chaos and know it will lead to organization. "Though chaos appears to be the opposite of wholeness.. wholeness lay to its heart" (Briggs & Peat, 1999).

It is difficult to accept theories of chaos without first understanding the term "flow". As defined,

Flow is the period in the creative process when self-consciousness disappears, time vanishes or becomes full, and there is total absorption in the activity. There is an intense clarity about the moment and a sense of clear movement, and there is little or no concern for failure. (Briggs & Peat, 1999, p. 27)

Chaos provides opportunity for creativity, immersing the student in flowing thought and exploration in an attempt to self-organize and find meaning. The students' natural tendencies for creativity will emerge as the result of a chaotic, investigative curriculum. Frank Smith (1997), an expert in the field of reading instruction, embraces theories of chaos, "Chaos theory demonstrates that even in the most turbulent... conditions there can be small stable systems of order and self-regulation" (p. 147). The idea of self-regulation is imperative for the student's growth and development not only in reading instruction, but also across the disciplines and in real life situations. As students learn to govern themselves, they become independent and responsible. These are qualities that lead to success later in life.

Self-government and personal freedom defines our society. In real life, or life outside of the classroom, students make personal decisions constantly. Educational practices traditionally strip away decision-making from students leaving it to administration and teachers, which results in passivity and a lack of autonomy. For students to get the most of their education, the system must make the necessary changes that allow students to make

executive-type decisions as they already do in their personal lives. These changes, which can be found through thematic, interdisciplinary teaching methods, will help students grow in self-government and find relevance to their school experiences.

Thematic teaching, through its integrative rationale, promotes independence among students and encourages them to move away from the obvious, search the varying disciplines and then circle around to make connections to the main topic of study. It is the process of investigation that may develop into chaos. This chaos makes it possible to organize and connect the relations among the many separate parts. An analogy by Briggs and Peat (1999) states, "Chaos theory, like the image of our incredible planet in space, offers us a perception... of an interconnected world—a world organic, seamless, fluid: whole" (p. 145).

Brain-Based Research in Support of Thematic, Interdisciplinary Teaching

The curriculum we teach in our classrooms will, with hope, be meaningful to our students. Through the interconnectedness of thematic teaching, we provide the brain opportunities to do what it does best, create

meaningful experiences. As we look at the disciplines as a larger picture, we find meaning and relevance in our experiences and, "...by understanding the world in all its many aspects—reductionist and holist, mathematical and poetical... we will come to understand ourselves and the meaning behind this universe" (Davies, 1983).

The brain has certain necessities for creating memory. Finding meaning is exceedingly important for our experiences to be memorable. The environment, our emotions, opportunities for creativity, reduced stress, and risk-taking allowances promote learning and are important elements to consider in our teaching and planning. Robin Fogarty (1997) suggests memory is linked to three things: attention, meaning, and relevance.

After the brain has paid attention to [an] idea, the learner tries to make sense or meaning of the input and attach personal relevance to it. In this way, the learner finds a pattern or another way of 'chunking' the input so it can be connected through the neural pathways to other ideas in the brain. That is how the new input becomes part of the long-term memory system. (p. 36)

Attention, relevance, and meaning are intertwined and occur simultaneously. Personal relevance is key to grabbing one's attention so connections to prior knowledge may occur and the information may become meaningful to the

individual. Personal relevance means the information has a sense of purpose, which opens the door for a meaningful experience. "Learning becomes personal when we allow it to have meaning for individual students and when we relate that meaning to a sense of purpose and connectedness" (Crowell, Caine, & Caine, 1998).

Thematic teaching connects the disciplines similarly to how the brain links new information to knowledge it already finds meaningful.

The brain creates patterns, or neural pathways, that are linked and connected in larger patterns (sets and subsets) of related information. This is referred to as a pattern-seeking device in the brain and is exemplified in the use of thematic teaching... (Fogarty, 1997)

Patterns are formed through connections to prior knowledge. One must keep in mind prior knowledge consists of teaching experiences coupled with an accumulation of outside world interactions, thus, it is wise to connect classroom experiences to real-life experiences. "The human brain is not a vault in which the fruits of instruction are deposited... the human brain is an intricately organized and internally consistent model of the world..." (Smith, 1997).

The most undervalued factor in educational practice has been the role of the emotions in learning. "When

learning promises positive experiences or pleasure, reward and/or novelty, then the new information tends to move quickly into the cortex" (Caine, 1995). Exciting curriculum that allows inquiry, exploration, and decision-making involves students on an emotional level. Thematic teaching requires students to become personally involved in the topic through deep exploration and by making decisions on how to conduct their explorations and present their findings. Sylwester (1995) describes the important role of emotions in creating memory:

A memory is a neural representation of an object or event that occurs in a specific context, and emotionally important contexts can create powerful memories. When objects and events are registered by several senses (e.g., seeing, hearing, touching, tasting), they can be stored in several interrelated memory networks. (p. 96)

In order for students to brave their inquiries, they must first feel safe and relaxed in their classroom environment. Creating a classroom conducive to learning means the environment should be relaxed, organized, appealing to the senses, print-rich, social, and intellectually stimulating. Caine & Caine (1997) suggest, "...An optimal state of mind exists for meaningful learning. We describe it as relaxed alertness, a combination of low threat and high challenge" (p. 33). Relaxed alertness

happens when students are engaged in what was described earlier as "flow". Students are relaxed, engrossed in their work, mentally alert, and learning. Thematic instruction provides the climate for deep interest in a topic, which paves the way for relaxed alertness and flow to occur.

The key to creating an environment where students are free to learn is to reduce as much stress as possible. Often, stress in the classroom creates barriers and inhibits student's learning. "If the barriers to their learning were reduced, then students will, of their own intrinsic nature, want to learn. The role of the teacher is to facilitate and help remove those barriers" (Van Tessel, 2000). Teachers who create a warm, encouraging, and inviting classroom environment reduce the possibility of students downshifting. "Downshifting is a psychophysiological response to the experience of threat related to a sense of helplessness or fatigue" (Crowell, Caine, & Caine, 1998). Physiologically, the brain reacts harshly to menacing situations. Renate Caine (1995) states when threat affects the thalamus endorphins are released into the system. These endorphins both anesthetize the outer glands and restrict information from going into the

neocortex. This same process holds for learners who are bored or overly fatigued (p. 115).

The inability to create may also result from stressful instances that occur in the classroom. Creativity is essential to effectively implement thematic teaching. Students need to think creatively to learn in a global fashion. "The positive effective outcomes from interdisciplinary education can positively affect creativity..." (Van Tessel, 2000).

A large part of brain-based research in education revolves around the Caines' twelve principles of brain-based learning (Caine & Caine, 1994). If teachers are to implement brain-based methods, they must first examine these twelve principles. These principles will provide us with a framework for learning and teaching that moves us irrevocably away from the methods and models that have dominated education for more than a century.

1. The brain is a parallel processor: Thoughts, emotions, imagination operate simultaneously.
2. Learning engages the entire physiology: Learning is as natural as breathing, but it can be either inhibited or facilitated depending on the environment.

3. The search for meaning is innate: The search for meaning is survival oriented and basic to human needs.
4. The search for meaning occurs through patterning: The brain is designed to perceive and generate patterns, and it resists meaningless patterns.
5. Emotions are critical to patterning: Emotions facilitate the storage and recall into and from memory.
6. The brain processes parts and wholes simultaneously: There are two separate but simultaneous tendencies in the brain for organizing information. One tendency is to reduce information, the other is to perceive and work with it as a whole.
7. Learning involves both focused attention and peripheral perception: The brain absorbs information of which it is directly aware. It also absorbs information that lies beyond the field of attention.
8. Learning always involves conscious and unconscious processes: We learn much more than we are ever capable of consciously understanding.
9. We have at least two different types of memory-A spatial memory system and a set of systems for rote learning; Spatial memory requires no rehearsal and allows for instant memory; rote learning systems require rehearsal and deals with facts in isolation.

10. We understand and remember best when facts and skills are embedded in natural, spatial memory: Specific items are given meaning when embedded in ordinary experiences. That is the most important element that brain-based theories of learning have in common.
11. Learning is enhanced by challenge and inhibited by threat: The brain downshifts under perceived threat and learns optimally when properly challenged.
12. Each Brain is Unique: The more we experience and learn, the more unique we become. (p. 88-95)

Suggestions and Guidelines for
Planning a Thematic,
Interdisciplinary,
Brain-Based Unit

Research indicates thematic and interdisciplinary instruction is an effective educational practice. Planning a brain-based, thematic unit requires an understanding of new brain-based theories along with guidance by experts in the field of thematic planning. When preparing your unit, keep in mind that we need a way of selecting a methodology that will maximize learning and make teaching more effective and fulfilling. "The first task is to reconceptualize learning outcomes to deal with the primary importance of meaningfulness..." (Caine & Caine, 1994). Capitalizing on experience and prior knowledge are

important for creating meaningful learning. Eric Jensen (1996) affirms brain-based instruction must connect with many other subjects; be based in reality - the learner's everyday life; be generated by the learner; and have sufficient time to truly explore topics in-depth (p. 311). Thematic, interdisciplinary teaching clearly encompasses these understandings, hence, raising the quality of instruction and learning.

The remainder of this section considers four general areas when planning instruction: optimal climate; utilization of the multiple intelligences; inquiry learning; and specific steps and strategies for planning a thematic, interdisciplinary, brain-based unit. Each section will assume integration of thematic instruction, therefore, there will be minimal reference to thematics.

Mentioned previously, the environment is an important consideration when maximizing learning. Reducing stressful occurrences and creating opportunities for "flow" is vital to brain functioning and how the brain stores information into memory. Jensen (1996) adds practicality to this idea with a plan for the optimal learning environment. He claims that the optimal environment is one in which learners are at different times partners, teammates,

individuals, and presenters. This diversity of roles provides for greater contextual, real-life immersion learning and better ensures that the learning is integrated (p. 153). For students to participate in optimal learning experiences the classroom practices must contribute.

Jensen provides four suggestions for an optimal, brain-friendly learning environment:

- 1) The environment must be consistent with an individual's personal goals.
- 2) The environment must be congruent with the learner's bio-social and cognitive styles.
- 3) The environment must offer the learner the resources needed such as materials, advice, tools, transportation and supplies as well as time and affordability.
- 4) The environment must provide an emotionally supportive and positive climate where trust, warmth, safety and peer acceptance are crucial (p. 108).

When the best possible climate and attitude have been established, motivating the learner now becomes the focal point. Research provides many types of stimuli that help

put learners into a motivated state of learning. Jensen (1996) provides some common motivational practices:

- Activities: alternate from one to another, intensify or modify, go from individual to group work, change locations and do role-play.
- Environment: change lighting, use aromas, music ionizers, provide fresh air, change the temperature of the room, change seating.
- Multi-media: change to video, computers, overheads, music, slides.
- People: change presenters, have a guest speaker, learner as teacher, switch rooms.
- Tone: change theme, time allowed, goals, resources, rules, and opinions.
- Focusing: breathing exercises (inhale & exhale slowly, nostril breathing, use of visualization, key imagery).
- Student input: learners become motivated to learn when they have control over their learning, creative input, frequency of feedback, positive social bonding, good nutrition, proper learning styles and safety (p. 121).

The integration of music into the classroom may be another option to motivate students. Music adds a fun approach to learning as well as assessment. Working with musical activities encourages communication, cooperation, teamwork, leadership, and consideration for others. "[Music integration] not only develops good motor skills, hearing skills and thinking skills, it also develops human skills for healthy and happy living" (Leng, 1999).

Motivating students leads teachers to consider Howard Gardener's theories of multiple intelligences, first introduced in 1983. Listed briefly, the theories include: linguistic intelligence; logical-mathematical intelligence; spatial intelligence; musical intelligence; bodily-kinesthetic intelligence; interpersonal intelligence; intrapersonal intelligence. Robin Fogarty (1997) ties the theories of multiple intelligences to brain-compatible teaching.

Armed with this theory of multiple intelligences, the brain-compatible classroom becomes a laboratory for experimenting with the many ways of knowing and expressing what one knows. The goal is not to teach a lesson in several different ways... but to design learning in authentic ways that naturally tap into the various intelligences. By utilizing the multiple intelligences, the profile [of an individual's intelligence] becomes strengthened and more balanced. (p. 170)

As an example of how one might integrate the intelligences into instructional planning, Nunley (2000) suggests that teachers make certain they have enough assignments for non-readers to achieve success. In addition, include hands-on activities for the tactile learners, video and art projects for the visual learners, and optional lectures for the auditory learners. Textbook assignments should be available for students who prefer this method of learning. However, these should include the arts and should require cross-discipline involvement (p. 2). Fogarty (2000) recommends the use of graphic organizers, which are defined as visual representations or links of ideas, as a tool to reach those with a visual preference (p. 146). Some common graphic organizers used in classrooms include the web, the Venn diagram, and the flow chart. Graphic organizers make interaction with new information become visual to the many different types of learners.

It is important to implement ideas for integration of technology. "In the ever expanding, often exploding field of technology, it is imperative that today's students be technologically literate..." (Fogarty, 1997). Technology can be used to complement any type of learning style. Nunley (2000) suggests, "Technology should be used whenever

possible. Computer programs make wonderful assignment options especially for the limited English proficiency student because concepts are graphically represented" (p. 3 & 4).

Fleming (1999) states that inquiry can be another way to enhance learning in an integrated classroom. "Inquiry learning... consists of a classroom environment and student activities in which students are encouraged to pursue answers to the questions they have raised" (p.1). Often students work with peers, but can progress independently if desired. Students progress through a cycle of thoughtful investigations in which they question, explore, explain, interpret and then revise their initial thinking. According to Fleming, the process of inquiry learning includes five steps:

- 1) Students identify a focus based on something that matters to them.
- 2) Students select research methods with guidance from the teacher.
- 3) Students interact with others, experts, community, and teachers to collect data.

- 4) Students alter, shift, or revise their views as they test their hypothesis and further their investigation.
- 5) Students form conclusions based on their inquiries (p. 3).

Short, Harste, & Burke (1996), experts in the field of reading instruction, reflect on the use of inquiry learning when planning a unit:

There is no way that I can simply look back at my lesson plans and bring out my 'gorilla unit.' The unit belongs to the children who helped to create it at that time and place. For me to plan each unit of study or inquiry project before the year even begins seems ludicrous now that I realize the importance of student input. What a teacher doesn't do in his or her classroom may be just as important as what the teacher does do". (p. 69)

Allowing students freedom to choose and make decisions about their learning puts their agendas in the forefront. This is important to remember when planning a thematic, interdisciplinary unit.

There are numerous guidelines and suggestions available for creating thematic or interdisciplinary units. To simplify, this next part is divided into two sections. The first section, Guidelines, presents steps from two literature references that have been merged into one thematic, interdisciplinary guide to planning. The second

section, *Brain-Based Ideas*, will present suggestions from brain-based research that supports meaningful learning in the classroom.

Guidelines

Gianelli (1992) and Mason & Mathison (1989) give specific guidelines for thematic, interdisciplinary planning. Commonalities were found and merged to offer six steps to consider when creating a thematic, interdisciplinary unit:

1. Begin by selecting the theme, or primary content base that will serve as the catalyst for instruction. Make lists of possible themes. What are the primary pieces of information that you want students to understand?
2. Identify the most important content area concepts. Identify events, discoveries, and writings within other disciplines that relate to the primary content base in a meaningful way. Divide and develop subtopics.
3. Formulate instructional objectives. Objectives serve as the springboard for the development of the instructional strategies and activities you will

use. Identify the skills to be emphasized and the key points of intersection between the disciplines.

4. Identify teaching strategies that will compel students to use their knowledge in one discipline to better understand another. Make certain strategies are appropriate for grade/age level, content, language and cognitive development, and cultural and ethnic background.
5. Carefully consider the prerequisite skills students must have before they can successfully accomplish the objectives you have set forth. Then, gather your materials from a wide range of resources.
6. Share. Write model lesson plans for teachers to refer to. Include goals of interdisciplinary lessons that involve helping students understand how the knowledge they possess can be combined to accomplish a task, discover a solution, or explain a situation.

Assessment is an important part of any instructional plan. There are many ways to integrate authenticity with assessment. One method commonly used in the classroom is portfolios. There is no one single way to develop portfolio programs however, in all of them students are

expected to collect their work, select the most impressive pieces, and reflect on their progress and successes. Portfolios are prized as an assessment tool because, as representations of classroom-based performance, they can be fully integrated into the curriculum. Unlike separate tests, they supplement rather than take time away from instruction. "Many educators and researchers believe that portfolio assessments are more effective than 'old-style' tests for measuring academic skills and informing instructional decisions" (Sweet, 1993). It may take much time for schools to accept authentic assessment as a replacement for traditional tests. Until then, teachers can enrich their programs with authentic assessment options such as student-centered portfolios.

Brain-Based Ideas

When planning your unit, it is essential to include the findings from brain-based research that prove to increase meaning and understanding. Jensen (1996) states once resources for gathering information are available, students will still need to process the information internally. Jensen claims some of the best brain-based strategies for increasing understanding are:

1. Spiral learning. The opposite of linear learning, spiral learning re-visits the learning four or five times. This is often called layered learning.
2. Storytelling. Information can be woven into a story, rewritten and retold, or turned into one by the participants.
3. Peer presenting. Students teach their peers.
4. Model making. In some cases, participants can build a scaled-down model of the material.
5. Performance. Some material lends itself to being performed.
6. Music. Most material can be set to music, written about music, and performed.
7. Reflection. Many kinds of material can be better understood if participants simply have time to think about it.
8. Myths. Myths can bring knowledge to life and instill it at a profound level.
9. Thematics. The more angles from which a topic is studied, the more thorough the understanding.
10. Expert/reporter interviews. This is a simple role-play activity. The expert spends time preparing

for the interview, while the reporter spends time preparing quality questions to ask the expert.

11. Drawing. Let participants express what the learning means to them.
12. Journals. A journal or learning log will provide reflective time.
13. Sculpture. Some learning can be represented as a physical object or a sculpture.
14. Debates. Pick a partner and make the best case you can for why your topic is important.
15. Personal quests/personal life. Sometimes this form of exploration goes into family history, hobbies or personal growth.
16. Presentations. Provide choice in the topic selection and a low-risk peer support environment.
17. Mind-mapping. Use graphic organizers for understanding relationships, themes and associations of ideas.
18. Game design. Re-design a known game.
19. Montage/collage. Assembling thoughts in art.
20. Open discussion. In a low-risk learning environment, where it's safe to say risky things and safe to be wrong or unpopular, a simple

discussion can provide a great vehicle for understanding.

21. Physical activities. A simple game can bring an idea to fruition and create that feeling of "Aha".
22. Multi-status. Great ways to help your learners is to get tutoring, pairing, coaching or listening from another grade level, an adult, or play a new role where they teach and learn.
23. Apprenticeships. A more long-term approach is to provide an expert or tutor for your students. (p. 187-190)

Interdisciplinary, thematic instruction adds meaning and relevancy to learning as students discover fascinating relationships between the disciplines. The integrated, brain-based rationale in a classroom makes learning fun while transferring new information in meaningful ways. "The greater the number of associations that your brain elicits, the more firmly the information is woven in neurologically" (Jensen, 1996). This powerful knowledge structure facilitates the absorption of new information and increases students' understanding of and appreciation for the wealth of information and ideas they already possess.

CHAPTER THREE

METHODOLOGY AND DESIGN

The design of this project consists mainly of research and evaluation. The research targets topic-related literature, which includes several literary and Internet resources. The synthesis of the research resulted in the culmination of the final project: a Teacher's Checklist For Planning A Brain-Based Interdisciplinary Unit; and a Brain-based Interdisciplinary Curriculum Planning/Unit Outline. During the review of literature ideas for the final project were noted in a personal journal, re-visited, and eventually revised until a practical, informative proposal for a project emerged.

Evaluative feedback for my project resulted from a checklist of questions I developed for teachers interested in implementing brain-based theories into classroom instruction. To accompany the checklist I developed an outline for planning a brain-based, interdisciplinary unit. My intention was to develop a project that presented a practical and purposeful tool for planning integrative, brain-based curriculum. The checklist and unit outline seemed promising.

To test the project's resourcefulness, I developed a questionnaire to gather data regarding the practicality and understandability of the checklist and unit outline. I will elicit evaluations from three elementary school teachers. To obtain feedback that encompasses perspectives from different levels of teaching expertise, I selected two experienced teachers who may provide a proficient evaluation of the project. The third teacher selected has two years of teaching experience and may provide the feedback of a beginning teacher. These teachers will read through the checklist and unit outline and then answer the related questions on the evaluation form. The feedback and implications for education will be considered in Chapters Four, Evaluation, and in Chapter Five, Conclusions and Implications. Below is a reproduction of the evaluation form that accompanies the project (see Figure 1, page 32).

Figure 1. Masters Project Evaluation Form

Masters Project Evaluation Form
California State University, San Bernardino

Dear Participating Teacher,

This evaluation form is to assess the attached master's project, which includes a Teacher's Checklist of Questions and a Brain-Based, Interdisciplinary Unit Outline. Please respond to all questions according to your professional expertise. Your suggestions are very important and greatly appreciated.

Thank you for your assistance with this project.

Deborah Ferguson
CSUSB Graduate Student

Directions: Please indicate the extent to which you agree with the following statements. A space is provided after each statement for your comments and suggestions. (Please attach additional paper, if needed.)

1=Strongly Agree 2=Agree 3=Disagree 4=Strongly Disagree

Regarding the Teacher's Checklist section only

1. The information from the checklist is understandable.

1 2 3 4

Comments _____

2. The information from the checklist is practical. I could easily implement the suggestions into my teaching practices.

1 2 3 4

Comments _____

Regarding the Brain-Based Unit Outline section only

3. The information from the unit outline is understandable.

1 2 3 4

Comments _____

4. The information from the unit outline is practical. I could easily implement the suggestions into my teaching practices.

1 2 3 4

Comments _____

Regarding the Teacher's Checklist and Brain-Based Unit Outline as a combined document

5. The combined document provides me with new information about how learning occurs and offers effective brain-compatible teaching strategies.

1 2 3 4

Comments _____

6. The combined document promotes creativity in teaching and learning.

1 2 3 4

Comments _____

7. The combined document clearly offers the means for a connected curriculum.

1 2 3 4

Comments _____

Additional Information

8. The most helpful part of the combined document is...because

9. If I could add to any part of the checklist or unit outline, I would add...because

CHAPTER FOUR

EVALUATION

This chapter reflects and reviews the feedback from the evaluations of the final project consisting of the teacher's checklist and unit outline. The evaluation sheet targets understandability, clarity, and practicality from a teacher's perspective regarding implementation of the suggested theory and instruction found in the project. The evaluators provide teaching perspectives ranging from novice to expert.

I elicited assistance from Mrs. Doreen Pavlov, Mrs. Heidi Cherry, and Mrs. Kendra Zoulko. Mrs. Pavlov has several years experience teaching at the elementary level and some experience at the high school level. Mrs. Cherry is an experienced elementary teacher who has completed a masters degree in Elementary Education. I selected these two teachers because they have the teaching expertise and broad viewpoint to objectively evaluate the theoretical strategies of the project. Mrs. Kendra Zoulko has been teaching first grade for two years. She will provide the valuable response from a beginning, primary-level teacher

necessary to target the project's clarity, understandability, and ability to be grade-level modified.

Each evaluator was instructed to complete a formal evaluation sheet, which accompanied the final project. Evaluators were to rate each statement from a range of 1 to 4: 1 indicates they "strongly agree" with the statement; 2 indicates they "agree" with the statement; 3 indicates they "disagree"; and 4 indicates they "strongly disagree" with the statement. The statements of the evaluation are organized into four sections: first, statements 1 and 2 relate to the checklist as a separate document; second, statements 3 and 4 relate to the unit outline also as a separate document; third, statements 5, 6, and 7 relate to the checklist and unit outline as a combined document; and fourth, space is provided for additional information.

The evaluations are reviewed according to each of the nine statements and to each teacher's response.

(Statements 1 and 2 reflect the feedback referring to the checklist only.)

- Statement 1: The information from the checklist is understandable.

- Pavlov: "1 - The [checklist] questions are not only understandable, but serve as reminders in

checking for curriculum integration and in keeping the curriculum learner-centered".

- Cherry: "1". No comment included.

- Zoulko: "1 - The combination of statement, questions, and example made the concept clear to the reader".

- Statement 2: The information from the checklist is practical. I could easily implement the suggestions into my teaching practices.

- Pavlov: "1 - I especially appreciated the brain-based rationale supporting each checklist question.

- Cherry: "2 - [I] feel mandated by state standards sometimes, though standards don't always reflect creative expression".

- Zoulko: "1 - The checklist kind of motivates the reader to try/implement the suggestions given".

(Statements 3 and 4 reflect the feedback referring to the unit outline only.)

- Statement 3: The information from the unit outline is understandable.

- Pavlov: "1 - The examples interjected under specific headings helps to concretize the concept".

- Cherry: "1". No comment included.

- Zoulko: "2 - More specific examples would have made this section more clear to me. Ex: 'Council gatherings'... you mention issues of importance...like what? And, 'datelines'... I can't picture what these 'datelines' would look like. What might be discussed"?

- Statement 4: The information from the unit outline is practical. I could easily implement the suggestions into my teaching practices.

- Pavlov: "1 - I appreciated how it was sequentially designed so that it could be easily implemented".

- Cherry: "2 - [Same response as in Statement 2] I feel mandated by state standards sometimes, though standards don't always reflect creative expression".

- Zoulko: "2 - As a 1st grade teacher, I can't implement your suggestions directly, but I can use them to spark my own ideas".

(Statements 5, 6, and 7 reflect the feedback referring to the checklist and unit outline as a combined document.)

- Statement 5: The combined document provides me with new information about how learning occurs and offers effective brain-compatible teaching strategies.

- Pavlov: "1 - This is especially true because of the brain-based rationale you included in the checklist".

- Cherry: "1". No comment indicated.

- Zoulko: "1 - I especially enjoyed the checklist, and found it motivating to try more of the brain-based teaching. I love teaching thematic units".

- Statement 6: The combined document promotes creativity in teaching and learning.

- Pavlov: "1 - This is especially so because it moves the curriculum away from teacher-centered concepts/themes".

- Cherry: "1". No comment included.

- Zoulko: "1 - Giving the students choices in planning what is learned would stimulate and keep their interest. Allowing personal choice in how students demonstrate their learning also

encourages students to express themselves in ways that are meaningful to them: [poetry], play, art, etc., according to the multiple intelligences”.

- Statement 7: The combined document clearly offers the means for a connected curriculum.

- Pavlov: “1 - This would be even more pronounced if part of the set up, as well as the assessment rubrics, included the integration of the theme being studied to a minimum number of other areas in the curriculum”.

- Cherry: “1”. No comment included.

- Zoulko: “2 - The idea of thematic units is fun and exciting. It allows for art, music, and movement to accommodate the multiple intelligences. It makes learning fun.

(Statements 8 and 9 provide space for additional information.)

- Statement 8: The most helpful part of the combined document is...because

- Pavlov: “...the brain-based rationale behind each checklist question because brain-based research is entirely new to me”.

- Cherry: "...the suggested activities because we often get caught up in teaching in preparation for testing".

- Zoulko: "...the checklist. It is universal, can be used across grade levels, and educates/motivates brain-based learning".

• Statement 9: If I could add to any part of the checklist or unit outline, I would add..because

- Pavlov: "I would bring in the theme of JOURNEYS once again in the section entitled 'Interdisciplinary integration/re-visit all standards'. With the JOURNEYS theme, I would give an example of how it might connect to another discipline, as well as how it might connect to a particular grade level standard".

- Cherry: "Possibly a daily, weekly, or monthly planned-out activity/unit".

- Zoulko: "What a unit might look like in a lower-primary setting. I got the image of students doing a lot of independent work (without the teacher), which is great, but it doesn't seem so practical in a lower-primary classroom. First

grade would require a lot more direct involvement of the teacher".

Upon reviewing the evaluations, specific adjustments become necessary to improve the overall quality and resourcefulness of the project.

- ✓ Specifically address the effects of state mandated testing and how it affects creativity.
- ✓ Offer suggestions for how to avoid channeling teaching to meet grade level standards. Give examples for how teachers encourage risk-taking and still meet standards.
- ✓ Provide more concrete examples of interdisciplinary integration of specific grade level standards.
- ✓ Provide specific examples of daily/weekly/monthly activities for a unit.
- ✓ Revise datelines to reflect the possibility of difficulties with time and scheduling. Give specific examples.
- ✓ Include suggestions for how to make certain all students participate.
- ✓ Address the difficulties of group grading and provide possible solutions.

- ✓ Include frequent suggestions for flexibility and modifications depending on student's needs and grade level.

Remarks from the evaluations are included in Chapter Five, Conclusions and Implications, which will reflect on how the project may be useful to a larger audience of educators.

CHAPTER FIVE

CONCLUSIONS AND IMPLICATIONS

This chapter will discuss the conclusions taken from the evaluations of the final project and will address the implications of the entire research project in regard to the teaching profession.

The final project consisting of the teacher's checklist and the brain-based unit outline is intended to promote analysis of instructional practices in the elementary classroom, inspire creativity, and prompt ingenuity. The project provides a practical, yet theoretical approach to thematic teaching while focusing on brain-based strategies. Chapter four discusses the responses suggested to make the project more resourceful. This chapter, taking the feedback one step further, examines how the implied theories and strategies realistically affect teaching.

The teacher's checklist is supported and validated by the brain-based rationale. This validation is extended into the unit outline, which offers brain-based suggestions and interdisciplinary activities. Doreen Pavlov, an evaluator, comments on the effectiveness of the checklist

stating that the questions are not only understandable, but serve as reminders in checking for curriculum integration and in keeping the curriculum learner-centered. The brain-based rationale integrated throughout the project is supportive of ideas that are new to teachers, as stated by Heidi Cherry, a second evaluator. The sequentially formatted unit outline is easily implemented and helpful for teachers planning thematic instruction. Cherry also comments that the activities throughout the project take teaching away from test preparation and back to teaching for learning and pleasure. Kendra Zoulko, a third evaluator, affirms that by allowing personal choice in how students demonstrate their learning encourages students to express themselves in ways that are meaningful to them.

The principal implications of the research and project ask teachers to re-evaluate their instructional practices, put learning before the required testing, and implement effective research-proven teaching strategies to the best of their ability. This project encourages educators to welcome creativity and ingenuity into classroom practices and invite students to make decisions about their learning. Undoubtedly, each teaching situation will be different, for every brain is unique. With hope, teachers will further

their research of brain-based theories. As a brain-based teacher, it becomes understood that learning becomes an expansion of cognitive processes. High-quality teaching and student learning soon become a priority.

APPENDIX A:

TEACHER'S CHECKLIST FOR PLANNING
A BRAIN-BASED, INTERDISCIPLINARY
UNIT

TEACHER'S CHECKLIST FOR PLANNING
A BRAIN-BASED, INTERDISCIPLINARY
UNIT

The beauty of brain-based instruction is that each teaching and learning experience is as unique as the individuals involved. Please do not limit your teaching to the few suggestions provided in this checklist. Be creative, take risks, and have fun with your curriculum and your students.

1. Did the students and I review our grade-level standards to select a broad and interesting topic, concept, or theme in which to plan our unit?
- Do students have a voice in making important decisions?
 - Are the students and I collaborating on a variety of curriculum ideas?
 - Are students personally involved in planning the unit?

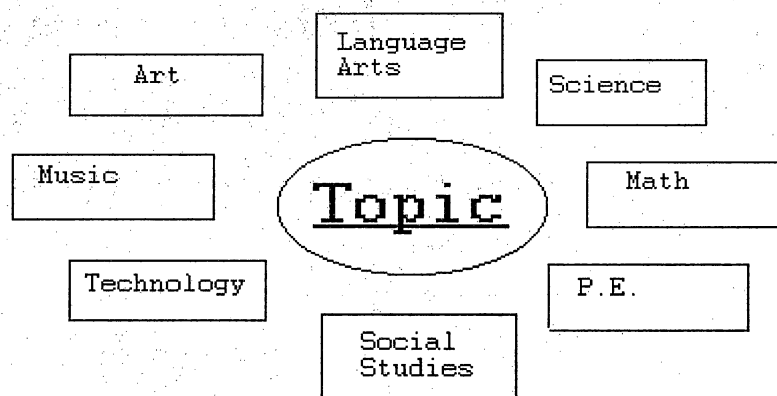
Example: Students and the teacher review grade-level standards for science or social studies and choose a broad topic that is easily integrated with music and art or hands-on projects and connects to all other disciplines.

The study of Native Americans is a wonderful topic to

integrate music, art, science, literature, health, math, and much more. A concept might include teamwork, journeys, or cycles. Potential themes are found at every grade level.

* Brain-based teaching involves students at many levels of planning and learning. When students are given opportunities to make decisions, they become involved personally and learning becomes meaningful. Brain-based teachers know the search for meaning is an innate, basic function of the brain.

2. Is our unit thematic and interdisciplinary, connecting all the disciplines?



- Have we made clear connections with our topic to all the disciplines?

- Have we made connections to previous learning and prior knowledge?
- Are predictions valued and apparent as the students study the topic?

Example: Connect the theme to:

- Math
 - Create timelines
 - Mapping (Relief maps as art projects; maps showing animal habitats or agricultural resources)
- Literature
 - Journaling (What might a person from the time period write in their journal; role play)
 - Creative writing (Relate the learning to today's way of life)
 - Related reading (Poetry; non-fiction, fiction, fairytales...)
 - Use graphic organizers to show sequence of events
- P.E.
 - Invent a game or sport related to the theme; modify a game

- ♦ Science
 - Tie together animals/habitat/geography/survival
 - Discuss how the environment influenced survival or migration
- ♦ Social Sciences
 - Research traditions/cultural influences
 - Relate human survival strategies/hierarchies/power struggles to the animal kingdom
- ♦ Arts
 - Integrate music of the period to your learning
 - Reproduce artwork of the period studied
 - Compare/contrast today's art styles to art of the time period studied
 - Interpret art, music, and poetry

* Brain-based teachers know information becomes meaningful as patterns are found and connections are made to prior knowledge. Interdisciplinary teaching provides an outline for the topic and opens avenues for deeper understanding. It helps students make connections throughout the disciplines and finds

patterns in the learning. Brain-based teachers know teaching a subject in isolation produces meaningless, disconnected learning. The brain resists the imposition of meaningless patterns.

3. Is the classroom environment conducive for optimal learning?

- Is the lighting adequate and natural? Is the room temperature comfortable?
- Have the students displayed their work throughout the classroom?
- Are learning opportunities appropriately challenging for all learners and levels?
- Are students encouraged to express their thoughts and ideas, or take risks during their explorations?
- Are individual differences valued and respected?
- Are stressful situations, such as competitive grading or pop-quizzes, eliminated or at a minimal?

Example: Create an atmosphere that reflects the theme, such as a rain forest. Allow students to decorate and build the

classroom atmosphere. Add subtle scents of potpourri for relaxation. Add a lamp to reading area and teacher's desk. Lessen the use of florescent lights using natural and lamp lighting frequently. Invite students to plan tests. Respond respectfully to student's suggestions.

* Brain-based classrooms reduce stressful situations that may cause the brain to downshift and inhibit learning. An appropriately challenging and stimulating environment provides the brain with opportunities to function at a high level. Brain-based teachers encourage risk-taking and support exploration.

4. Have I provided the students with a variety of assignment and criteria choices with consideration for:

- Howard Gardener's Multiple Intelligences
- Independent and/or group-oriented workers

Example: Ask students to perform the learning in a skit or puppet show; or, invite students to integrate technology into assessments by creating a Hyper Studio stack.

Students may write a rap song about a period of time or culture. Assignment and criteria choices are limitless.

* Brain-based teaching recognizes the uniqueness of each brain and the individuality of each student. Prior experiences shape the brain and influence how it best learns. Brain-based teachers acknowledge learning differences by providing a variety of assignments and allowing students to make choices about how to organize their curriculum according to learning preferences.

5. Are a variety of resources available for the students as they explore a topic?

Suggestions:

- Computer technology, including access to Internet and multi-media software
- Educational journals/textbooks/various related literature
- Reference materials, such as dictionaries and encyclopedias
- Field trips/outings
- Community members, programs, and organizations
- Family members

Example: Know the skills and culture of your student's families. Invite family members to the class to share their knowledge or cultural understanding that relates to the theme studied. Ask them to bring artifacts or visual aids. Refer to reputable publications, such as National Geographic, for related articles. Learn in-depth about a topic or concept for greater understanding and retention.

* The physical environment in a brain-based classroom is resource rich. Tangible resources, such as related literature and encyclopedias are available whenever students need reference. Guest speakers who are knowledgeable about the topic are invited to the classroom to share valuable information. They are available for students to question or interview. Brain-based teachers realize multiple resources are required to deeply explore a topic. Students become emotionally involved when they plan the inclusion of real-life sources into classroom learning. Brain-based teachers understand the brain remembers best when facts and skills are embedded in natural, spatial memory occurring from ordinary experiences.

6. Have I integrated the arts - music, art, poetry, and movement - into classroom experiences?

- Have my lesson introductions to new material integrated the arts or story telling?
- Have I required students to include the arts as part of their criteria for learning?
- Have I required students to include the arts as an assessment option?

Example: Begin a lesson by telling a story taken from a textbook or storybook in narrative form. Expand the story using visual aids, related music, artifacts, and more. Be creative. Use different textiles or materials to paint with or arrange on canvas or paper.

* Brain-based teachers know physiological changes occur in the brain as students learn and make new connections. The inclusion of movement and the stimulation of the five senses engage the brain on multiple levels. Thoughts, emotions, imagination and predispositions operate simultaneously and are stimulated by integration of the arts and story telling. The more the brain and the body are engaged

through multi-sensory input, the more significant the experience.

7. Am I keeping goals and objectives in sight for my students throughout our unit?

Suggestions:

- Spiral learning: frequently expanding out and spiraling back to the main goals
- Re-visitation: reviewing previous learning, then making connections to new ideas
- Layered learning: adding depth to the learning
- Scaffolding: building upon prior knowledge and learning

Example: As students connect the disciplines to a theme and deeply explore a topic, frequently re-visit to the objectives. Review previous learning and make predictions about possible connections, such as how the learning might be applied in a mathematical sense. Connect learning to student's personal life.

- * Brain-based teachings will frequently re-visit goals, bridging the gaps that occur between learning and goals. Re-visiting goals helps students solidify connections made to real life or to other

disciplines. Brain-based teachers know the brain processes parts and wholes simultaneously as its organizing factor. Students will remain involved with their work when they see a purpose for their efforts and have an understanding of the whole learning experience.

8. Are students given opportunities and ample time to reflect on their learning?

Suggestions:

- Learning logs
- Journaling
- Maintenance of portfolios
- Whole class oral reflections
- Review of new skills

Example: Allow students time to keep a learning journal and/or adjust their portfolios. Invite students to display their idea of exceptional work such as a well-written story, artwork they are particularly proud of, or share journal entries. In addition, ask students to critique your unit upon its completion. Ask "why" they have these opinions.

- * Brain-based teaching recognizes reflective practices as a technique for the brain to re-examine what has

been learned. Learning is optimal through direct application, trial-and-error, or other interactive methods. Brain-based teachers know learning involves conscious and unconscious processes. Additional learning results when the brain reflects on something tried, and then re-applies what has been learned. Allowing time to reflect on thoughts or processes provides an opportunity for the brain to retrieve and re-store information. This process often secures the information in long-term memory.

9. Am I using a variety of assessment options to check for understanding or assign grades?

- Are students included in planning criteria and scheduling assessments for their work?
- Are students clear on the requirements and expectations to obtain specific grades?
- Are a number of assessment options authentic or performance based?
- Have I eliminated as much stress as possible from the assessments?

Example: Provide students with materials, such as folders and calendars, to organize their criteria and due dates.

Schedule and post assessment dates in advance and allow the students to help decide what will be assessed, and when. This will eliminate the stress from the unknown and prepare your students for success. Allow students choices in performance or authentic assessments such as skits, puppet shows, visual displays, and more. Be creative.

* Brain-based classrooms recognize each brain as unique to the individual, therefore, a variety of assessments are used to ensure an accurate measure of student understanding. Assessments are neither threatening nor single dimensional. They include opportunities for students to demonstrate what has been learned. Brain-based teachers realize when students are allowed to make decisions about their learning they will invest a level of interest that goes beyond requirements. Students take ownership of their decisions and become responsible for their learning when they are included in the planning.

10. Have I reflected on my instruction?

- Have I noted my errors?
- Have I noted possible suggestions for future instruction?

- Have I noted my successes?)
- Have I shared my successes and mistakes with colleagues?

Example: Invite colleagues to your classroom to view student's displays. Offer ideas that have strengthened your teaching and share your creative moments. Encourage others to take risks. Share the student's critiques of your unit.

* Brain-based teachers value reflective practices.

Every brain, being unique to its experiences, learns from application and reflection. As the mind proceeds to identify with new information, it simultaneously continues to process already learned information. Brain-based teachers understand recalling ideas and thoughts develop new connections where new understandings are applied.

APPENDIX B:

BRAIN-BASED, INTERDISCIPLINARY
CURRICULUM PLANNING / UNIT
OUTLINE

BRAIN-BASED, INTERDISCIPLINARY
CURRICULUM PLANNING / UNIT
OUTLINE

Before arranging your curriculum, consider these clarifying questions.

- ? What do I want this unit to look like upon its completion? Visualize the end picture of your unit and the accomplishments by your students.
- ? What skills are needed to develop your vision of the unit? Modify or supplement your instruction to ensure students are prepared with necessary skills.
- ? How much time do I need or have to implement the learning? Modify your time or your unit to meet your needs. Be realistic.
- * This unit outline is formatted sequentially for purposes of clarity, however, it is intended to be implemented as an interwoven system with all five parts interchangeable. The anticipated chaos will lead events to surface at will. Your planning will become uniquely yours. This project is simply to provide a guideline. Your challenge is to go beyond these suggestions and explore your ingenuity. Keep in mind the uniqueness of your students' brains, as

well as your own individuality. Tap curiosities and encourage creativity through authentic experiences. Remember to display as much work as possible and take time for celebrations. These simple practices will enhance your program and promote cognition.

Part I: Getting Started

Start with the end picture of your unit and prepare your curriculum to lead to this point. This section includes: 1) Prepare for chaos 2) Choose a theme/topic/concept 3) Prepare the classroom both physically and mentally.

1) Prepare for chaos

Student centered, brain-based curriculum planning is not tidy. Often the chaos may bring one to abandon their plans. Remember, chaos theory suggests out of every moment of disorder, order is waiting to emerge. Allow time for the organization to present itself.

2) Choose a theme/topic/concept

A. Know your grade-level standards well enough to help students find broad themes or topics that will easily connect to all other disciplines.

*Recommendation: Focus on broad disciplines

such as science or social studies in which to choose topics; or choose larger, more abstract concepts such as journeys or cycles.

- B. Share the standards with your students
- C. Prepare a brief, working list of the main standards for the chosen discipline; i.e., science or social studies standards.
- D. Students, as a whole group, brainstorm with the teacher choosing from the standards a list of broad topics to plan thematically; or select a concept.
- E. Students and teacher select a concept or topic and theme in which to arrange the curriculum in an interdisciplinary manner.

3) Prepare the classroom environment both physically and mentally.

- A. Work on attitudes for students and teacher
 - a. To optimize learning, it is important the students know the teacher allows risk-taking and encourages exploration. Depending on varying personalities, this may take extra time to accomplish. Students should feel uninhibited and want

to try new things. They must understand everyone has a voice and what they might say will matter.

- b. Mutual respect is vital for successful group work. Procedures and consequences are clearly understood. Criticism and teasing are intolerable. Individual differences are accepted and valued as a resource. Classroom attitude reflects support.

B. Select groups

- a. Every class situation differs. Keep in mind those students who prefer to work independently and provide them opportunities for independence. All students should work in a group, however, individual assignments may remain an option. Teacher and students decide how groups will be selected:

- Random selection (Research indicates this type of selection results in equal amounts of success as planned grouping)

- Homogenous selection; according to ability, gender, race
- Heterogeneous selection - students who differ in many ways are purposely selected to work together
- Number per group: two to five students per group works best

b. Discuss cooperative group procedures.

- Listen attentively; take turns talking
- Stay on task/jobs
- Support and encourage all ideas
- Be open-minded and non-judgmental
- Ask clarifying questions to clear up confusions
- Make sure everyone participates

c. Establish study partners/support groups

- a. Groups pair up with another group to process the learning through sharing and giving suggestions.
- b. Groups schedule time for when they will meet and the topic for discussion.

- c. Groups organize how their meetings will proceed following the cooperative group procedures (see 3, B, b).
- D. Establish class routines/ arrangement of time
- a. Predictable routines and schedules are important in every classroom and at every grade level. Allow students enough time to explore their topics, yet keep them from procrastinating or wasting time as they proceed with their studies. Class routines are determined by the individual needs of the teacher and by the personality of the group of students.
 - b. Time arrangements are also determined by classroom circumstances and personalities. However, scheduled datelines are recommended. Datelines are scheduled appointments when teacher and small groups, or teacher and the whole class gather for discussion of progress and to answer questions, for support, or for reflection. Datelines are scheduled according to group or class needs.

*Recommendation: Schedule datelines daily.
Post a schedule. Make it interactive and flexible.

E. Prepare the required classroom resources

- a. Provide students access to many resources such as dictionaries, thesauruses, encyclopedias, atlases, textbooks, the Internet, computers and software programs, related literature and videos, etc. Make sure the necessary equipment is available for students to utilize these resources.
- b. Additional resources should become available as the students further study their topics. Suggestions include: community resources, family members, and administration or teachers.

F. Prepare work and research areas

- a. Designate specific areas or tables in the classroom for messy work such as experiments, artwork, editing.
- b. Designate specific areas in the classroom for research such as the classroom library, or reference tables. Make

available in these areas the required classroom resources mentioned above in item 3,E.

- c. Brainstorm and post procedures for using these work areas.

G. Plan council gatherings

- a. Council meetings should be reserved for issues of importance. This is different than scheduled datelines for these issues require guidance and intervention.

- b. Council meetings may be held for individual small groups or whole class group.

- c. Format suggestion:

Establish procedures and consequences for proper council behavior.

- Form a circle of chairs where everyone has a seat. The teacher should lead the meetings until students are familiar with the process and prove to be cooperative, then select or have students vote for

two responsible students who may lead instead of you.

- Begin with a relaxation or visualization exercise or a moment of silence to focus thoughts.
- Use a "talking piece". This may be any tangible item, such as a stick or an art piece. The one who holds the talking piece is the one who speaks. Everyone else listens without responding. The piece is passed along as students feel the need to speak.
- When all views have been expressed, move to finding solutions.
- Council may be continued for processing and reflection, if desired.
- Establish a routine for ending a council meeting, such as reciting a phrase, or a simultaneous clap.

Part II: Establish Assignments

Allow students to make decisions about where they will take their explorations. Help them make predictions and interdisciplinary connections, and to see the end picture as you have already done. This section includes: 1) The process of Brainstorm>Select>Divide 2) Datelines.

- 1) The process of Brainstorm > Select > Divide
 - A. >Brainstorm broad ideas around the chosen theme.
 - B. >Select from your list of ideas the most important areas to explore. List more ideas than there are groups to ensure a choice.
 - C. >Divide ideas among groups/students. Students, within their groups, decide what areas will be studied closely.

For example: If the class theme is Journeys, students brainstorm ideas of how to connect Journeys across the disciplines. Within their groups students decide which areas to explore, such as the journeys taken by animals migrating, or the journey of an artist or poet while creating the artwork, or the journey of understanding mathematical patterns and applications. A word of caution,

do not limit students to one discipline. Help them find connections among many disciplines through the in-depth study of one area.

2) Datelines are interactive and flexible. Due dates are final and unchanging. Datelines of some type should be scheduled daily.

- A. Establish datelines *for the whole class* to gather and share their progress/learning as a group.
- B. Establish datelines with individual groups to check progress, answer questions, or provide suggestions.
- C. Establish datelines for final, whole-class due dates. Due dates are finalized approximately halfway through the unit and are according to whole group needs.
- D. Small groups establish datelines with study/support partner groups (see Part I, 3, C).
- E. Implement council when necessary. Schedule this as needed, or make it a routine for reflection or to address issues that arise.

Part III: Create the Curriculum

This section begins the process of investigation and discovery of the selected theme and topics/concepts. The curriculum should be interdisciplinary and, more important, should deeply examine a topic or concept for complete understanding. Allow students to take part in creating the curriculum. This section includes:

1) Brainstorm > Select > Divide and Collaboration; 2) Datelines; 3) Resources; 4) Interdisciplinary integration/re-visit all standards.

1) Brainstorm > Select > Divide and Collaboration:

Individual groups collaborate to design a working curriculum.

A. Individual groups brainstorm specific ideas they will explore from their selected areas or disciplines (see Part II, section 1) taking a more in-depth look at their topic. Select and narrow from their list the most important areas to study. Then, students divide the work among the members of their group, either individually or in pairs. During this process, cooperative

group procedures are self-organized within each small group.

For example: If the overall class theme is Journeys and students have decided to explore animal migration from a specific geographical area, they will then decide who will study why the animals migrated, where the animals migrated to and from, risks of migration and survival, weather patterns influencing or preventing the migration, cycles of birth and death.

B. Groups create an outline of the areas of research for teacher approval. A dateline is scheduled and students give a brief, organized presentation of where they will take their explorations. Students understand that the teacher will give suggestions or make requests/changes. The students and the teacher will conclude the meeting with specific criteria to be included as part of their research. This is one area where integration of the arts may be implemented as criteria.

*Note: The established criteria are only part of the research. Students are encouraged and expected to go beyond simply meeting what is

required. This may be enforced as part of the rubric (discussed in Part IV: Collaborating Assessment Requirements).

c. Group progress journals or group learning journals are required for students to maintain and monitor their progress, or record their next step. The teacher checks this frequently. It is important for students to keep their journals orderly for it will be a presentation of their progress during scheduled meetings with the teacher.

2) Datelines

A. Individual groups schedule meetings frequently with the teacher for questions, suggestions and to review their progress. Teacher checks group journals at this time.

B. Groups maintain occasional datelines with support groups to share their progress or give suggestions.

c. Whole class datelines are scheduled specifically to check progress, address needs, or give interdisciplinary suggestions.

3) Resources

A. Required classroom resources for research are used as needed while students explore their topics. Additional resources are planned according to their research. The inclusion of additional resources may be discussed at dateline meetings. Additional resources should be considered part of their criteria and discussed during dateline meetings. Some suggestions for additional resources include, but are not limited to:

- Community program/organization information and guest speakers
- Family members
- Other teachers or students who can offer expertise
- Equipment or materials to enhance visits such as projector, chart paper, video camera, VCR, photography camera, or other equipment necessary.
- Fieldtrips

4) Interdisciplinary integration/re-visit all standards

- A. Teachers re-visit and share the grade-level standards with the students in a whole class setting as they make connections among the disciplines regarding students' research.
- *Visiting the standards should be frequent and practiced early in the unit. Students are encouraged to explore other disciplines and make connections as they research their topics.
- B. Teachers are encouraged to re-visit the standards as part of their classroom routine. This may be set up as bi-weekly or weekly datelines, a daily routine, or whatever works best for all involved.

Part IV: Collaborating Assessment Requirements

How will students demonstrate their learning?

Creativity is key to helping students synthesize their learning and transfer it to long-term memory. This section includes: 1) Criteria 2) Demonstration choices.

1) Criteria

- A. Teacher and groups/individual student create a rubric for grading based on contracts related to their assignments (see Part III, 1, B).

*Individual datelines may be scheduled to design student contracts based upon group criteria.

B. Two types of grades are suggested: Group and individual.

- Group grades are based on a rubric for meeting the criteria. The rubric is formatted around the agreed-upon criteria, for example:

- ★ Excellent (A) = exceeds all facets of criteria

- ★ Above average (B) = criteria met at an exceptional level

- ★ Average (C) = criteria met at a satisfactory level

- ★ Below average (D) = criteria not met, or criteria met at an unacceptable level

- ★ Fail (F) = no criteria has been accomplished

- Individual grades are based on criteria agreed upon by the teacher

and student. This criterion is formatted around the student's contribution and participation to the group's research, as well as individual learning needs.

Individual journals or contract records are encouraged to show work and progress toward meeting individual goals. These contracts may be shared with parents.

2) Demonstration choices

- A. Whole class or individual groups may demonstrate their work.
- B. Teacher may list possible demonstration choices, or students may invent their own demonstration to reflect their learning.

Suggestions:

- Reporting
- Problem solving
- Performance assessment
- Multi-media projects
- Mini-conferences
- Students write test

- Models or artwork
- Interview with the teacher
- Newspaper articles, debates, commercials

C. Groups select demonstration and schedule a dateline to meet with the teacher for questions, suggestions, approval, and final due dates.

D. Demonstrations may or may not be graded.

Whether you choose to grade the demonstrations or not should be consistent with the whole class.

Part V: Reflections > Selections > Evaluations

Students and teacher reflect on the learning from the unit; select work for portfolios and displays (classroom and school wide); and evaluate and critique the unit. This section includes: 1) The teacher and student reflect 2) Making selections 3) Evaluations of the unit.

1) The teacher and the students reflect

A. Teacher reflections are encouraged to note successes and future changes. How reflections are recorded is a personal decision.

Reflections may be noted throughout the planning of the unit.

B. Student reflections may be kept in personal journals throughout the unit as well, or at the end of the unit as an assignment. Take this lightly and be creative.

2) Making selections from their unit or personal contracts as entries into their portfolios that reflect their best work. This sample should demonstrate individual mastery of the learning.

Students and teacher select work for display. Work should be displayed upon completion throughout the unit.

3) Evaluations of the unit are designed as part of the reflection process. Students re-visit the learning events stating what they liked or did not like about the unit. This critique of the learning assists the teacher with future planning. The assignment should be simple and used with the whole class.

For example: Teachers section butcher paper into three parts to organize student's opinions.

☺ First part was what they liked and why.

⊖ Middle part was what they thought was okay and why.

⊖ Third part was what they did not like and why.

Remember to share your unit with colleagues. They may be inspired by your creativity and ingenuity.

Summary. Common practices found within Parts I-V include:

- Datelines scheduled regularly to support communication and provide individualized instruction
- Cooperative grouping to promote teamwork and develop social skills
- Interdisciplinary curriculum planning
- Allowing students to make important decisions
- Integration of the arts and providing opportunities for creativity and authentic learning
- Reducing stressful situations

APPENDIX C

MASTER'S PROJECT EVALUATION
FORMS: DATA COLLECTION

Masters Project Evaluation Form
California State University, San Bernardino

Dear Participating Teacher,

This evaluation form is to assess the attached master's project, which includes a *Teacher's Checklist of Questions* and a *Brain-Based, Interdisciplinary Unit Outline*. Please respond to all questions according to your professional expertise. Your suggestions are very important and greatly appreciated.

Thank you for your assistance with this project.

Deborah Ferguson
CSUSB Graduate Student

Directions: Please indicate the extent to which you agree with the following statements. A space is provided after each statement for your comments and suggestions. (Please attach additional paper, if needed.)

1=Strongly Agree 2=Agree 3=Disagree 4=Strongly Disagree

Regarding the Teacher's Checklist section only

1. The information from the checklist is understandable.

① 2 3 4

Comments *The questions are not only understandable, but serve as reminders in checking for curriculum integration and in keeping the curriculum learner-centered.*

2. The information from the checklist is practical. I could easily implement the suggestions into my teaching practices.

① 2 3 4

Comments I especially appreciated the brain-based rationale supporting each checklist question.

Regarding the Brain-Based Unit Outline section only

3. The information from the unit outline is understandable.

① 2 3 4

Comments The examples interjected under specific headings helps to concretize the concept.

4. The information from the unit outline is practical. I could easily implement the suggestions into my teaching practices.

① 2 3 4

Comments I appreciated how it was sequentially designed so that it could be easily implemented.

Regarding the Teacher's Checklist and Brain-Based Unit Outline as a combined document

5. The combined document provides me with new information about how learning occurs and offers effective brain-compatible teaching strategies.

(1) 2 3 4

Comments This is especially true because of the brain-based rationale you included in the Checklist.

6. The combined document promotes creativity in teaching and learning.

(1) 2 3 4

Comments This is especially so because it moves the curriculum away from teacher-centered concepts/themes.

7. The combined document clearly offers the means for a connected curriculum.

(1) 2 3 4

Comments This would be even more pronounced if part of the set up, as well as the assessment rubrics, included the integration of the theme being studied to a minimum number of other areas in the curriculum.

Additional Information

8. The most helpful part of the combined document is...because

... the brain-based rationale behind each checklist answers because brain-based research is entirely new to me.

9. If I could add to any part of the checklist or unit outline, I would add...because

I would bring in the theme of JOURNEY 5 once again in the section entitled "Interdisciplinary integration (re-visit all standards)." With the JOURNEY 5 theme, I would give an example of how it might connect to another discipline, as well as how it might connect to a particular grade level standard.

Thank you for completing and returning this evaluation!

Masters Project Evaluation Form
California State University, San Bernardino

Dear Participating Teacher,

This evaluation form is to assess the attached master's project, which includes a *Teacher's Checklist of Questions* and a *Brain-Based, Interdisciplinary Unit Outline*. Please respond to all questions according to your professional expertise. Your suggestions are very important and greatly appreciated.

Thank you for your assistance with this project.

Deborah Ferguson
CSUSB Graduate Student

Directions: Please indicate the extent to which you agree with the following statements. A space is provided after each statement for your comments and suggestions. (Please attach additional paper, if needed.)

1=Strongly Agree 2=Agree 3=Disagree 4=Strongly Disagree

Regarding the Teacher's Checklist section only

1. The information from the checklist is understandable.

(1) 2 3 4

Comments _____

2. The information from the checklist is practical. I could easily implement the suggestions into my teaching practices.

1 (2) 3 4

Comments Feel mandated by state standards sometimes, though standards don't always reflect creative expression.

Regarding the Brain-Based Unit Outline section only

3. The information from the unit outline is understandable.

(1) 2 3 4

Comments _____

4. The information from the unit outline is practical. I could easily implement the suggestions into my teaching practices.

1 (2) 3 4

Comments Same

Regarding the Teacher's Checklist and Brain-Based Unit
Outline as a combined document

5. The *combined document* provides me with new information about how learning occurs and offers effective brain-compatible teaching strategies.

1 2 3 4

Comments _____

6. The *combined document* promotes creativity in teaching and learning.

1 2 3 4

Comments _____

7. The *combined document* clearly offers the means for a connected curriculum.

1 2 3 4

Comments _____

Additional Information

8. The most helpful parts of the combined document
are
is...because

the suggested activities because we often
get caught up in teaching in preparation for
testing.

9. If I could add to any part of the checklist or unit
outline, I would add...because

Possibly a daily, weekly, or monthly
planned out activity/unit.

Overall - great job!

Thank you for completing and returning this evaluation!

Masters Project Evaluation Form
California State University, San Bernardino

Dear Participating Teacher,

This evaluation form is to assess the attached master's project, which includes a *Teacher's Checklist of Questions* and a *Brain-Based, Interdisciplinary Unit Outline*. Please respond to all questions according to your professional expertise. Your suggestions are very important and greatly appreciated.

Thank you for your assistance with this project.

Deborah Ferguson
CSUSB Graduate Student

Directions: Please indicate the extent to which you agree with the following statements. A space is provided after each statement for your comments and suggestions. (Please attach additional paper, if needed.)

1=Strongly Agree 2=Agree 3=Disagree 4=Strongly Disagree

Regarding the Teacher's Checklist section only

1. The information from the checklist is understandable.

Comments 1 2 3 4
The combination of statement, questions, and example made the concept clear to the reader.

2. The information from the checklist is practical. I could easily implement the suggestions into my teaching practices.

Comments ^{1 2 3 4} The checklist kind of motivates the reader to try/ implement the suggestions given.

Regarding the Brain-Based Unit Outline section only

3. The information from the unit outline is understandable.

Comments ^{1 2 3 4} More specific examples would have made this section more clear to me. Ex: "Council gatherings" you mention issues of importance like what? And "datelines" I can't picture what these "datelines" would look like. What might be discussed?

4. The information from the unit outline is practical. I could easily implement the suggestions into my teaching practices.

Comments ^{1 2 3 4} As a 1st grade teacher, I can't implement your suggestions directly, but I can use them to spark my own ideas.

Regarding the Teacher's Checklist and Brain-Based Unit Outline as a combined document

5. The combined document provides me with new information about how learning occurs and offers effective brain-compatible teaching strategies.

Comments ^{1 2 3 4} I especially enjoyed the checklist, and found it motivating to try more of the brain-based teaching. I love teaching thematic units.

6. The combined document promotes creativity in teaching and learning.

Comments ^{1 2 3 4} Giving the students choices in planning what is learned would stimulate and keep their interest. Allowing personal choice in how students

7. The combined document clearly offers the means for a connected curriculum. demonstrate their learning also encourages -

Comments ^{1 2 3 4} The idea of thematic units is fun and exciting. It allows for art, music, & movement to accommodate the 'multiple' intelligences. It makes learning fun.

students to express themselves in ways that are meaningful to them: poem, play, writing, art, etc, according to the multiple intelligences

Additional Information

8. The most helpful part of the combined document

is...because

the checklist. It is universal, can be used across grade levels and educates/motivates brain-based learning.

9. If I could add to any part of the checklist or unit

outline, I would add...because

What a unit might look like in a lower-primary setting. I got the image of students doing a lot of independent work (without the teacher) which is great, but it doesn't seem so practical in a lower-primary classroom. First grade would require a lot more direct involvement of the teacher. ☺

Thank you for completing and returning this evaluation!

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