THE EFFICACY OF ART AS A MEDIUM FOR TEACHING CONCEPTS TO FIFTH GRADERS

by

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(ABSTRACT)

This quasi-experimental study investigated the hypothesis that specially designed art lessons can be used as a vehicle to enhance the learning of specific concepts. The concepts selected were ones traditionally taught in an elementary art program coinciding with those measured on standardized tests. The selected concepts were area, volume, perimeter, congruency, pattern, and sequence.

Elementary school art lessons designed to teach specific concepts and taught by an art specialist to a treatment group of students were found, as a whole, to enhance the learning of concepts significantly over that of the comparison group of students taught in a traditional manner. All teachers provided a multimodal approach to teaching, but the treatment teacher was found to use more visual and kinesthetic modes of instruction than the comparison teachers. Students' dominant learning modalities appeared to have no influence on the amount of knowledge gained from the type of instruction received. Students who were taught by the

treatment method learned more regardless of their dominant learning modalities. Students taught by the treatment teacher who exhibited a positive "feeling tone" in her classroom learned more than students taught by teachers who exhibited a negative or neutral feeling tone. As a whole, concepts transferred from the teaching situation to the testing context. The students in the treatment group were found to have scored significantly higher on the posttest than those students in the comparison group.

No significant difference was found in creativity of the artwork produced by the two groups of students. In addition, no significant relationship was found between dominant learning modality and developed ability level, race, or gender. Race and gender had no significant relationship to the amount of knowledge gained.

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CHAPTER 1

THE PROBLEM

Background

The researcher, while participating in staff meetings as a central office supervisor in an urban school division, became aware through the discussion of test score results that some concepts measured on standardized tests were also taught in the art curriculum. Under the leadership of a new superintendent and his administration, the goals and objectives for the school division included "everyone helps" with basic skills education of all students. Each curriculum area was asked to design instructional lessons that could be used to assist students in their learning. The researcher reviewed standardized tests looking for concepts taught in traditional academic areas (language arts, mathematics, science, and social studies) that coincided with concepts taught in the art program. Many similar concepts were found. During the 1983-84 school term, several art specialists worked with the supervisor to redesign already existing lessons from the elementary art curriculum that taught selected concepts measured on standardized tests. The newly designed lessons were taught by art teachers to see if the

retention of specific concepts covered in traditional subjects could be enhanced through the integration of art activities. The art specialists were not shown the tests so the lessons were not designed to teach to specific items on the tests.

The initial lessons were revamped to assist in teaching concepts of area and volume to sixth-grade students. In order to integrate the art and mathematics curriculum areas more fully, mathematical formulas were incorporated into the art lessons. The focus of the lessons was slightly altered to place additional emphasis on the selected concepts. The process of creating art in the lessons was unchanged. The art specialists felt that by adding mathematical formulas to existing art lessons, rather than designing art lessons around math, the integrity of the art experience was not compromised.

All elementary art specialists employed by the school system taught the newly-designed lessons to their students. Gain scores on standardized tests in 1985 for three questions on area and perimeter increased over scores for these students from the previous year. Administrators indicated that this increase exceeded gains in previous years. No statistical analysis was done on these results.

The researcher left the school division in 1986, but continued to question why children apparently were able to

comprehend and retain concepts more easily when art was used as a vehicle to teach them.

The acquisition of cognitive skills and their relationship to the arts has not been deeply probed and is still an area needing further inquiry and research (Madeja, 1978).

Research Questions, Expected Findings, and Review of the Literature

The format of the following section includes research questions followed by the expected findings and a review of related literature.

1. Can the making of art enhance the learning of specific concepts?

Making art can enhance learning of specific concepts because it can link or connect content areas. The specific amount of enhancement is unknown. This study demonstrates the extent to which enhancement occurs.

A review of the literature revealed that integrating or linking disciplines to enhance learning within the curriculum has been suggested by various educational philosophers, art educators, and psychologists (Bassett, 1969; Bruner, 1961;

Dewey, 1931; Eaton, 1985; Field, 1970; Lowenfeld & Brittain, 1987; McFee, 1961; Perkins & Salomon, 1988; Read, 1945). Perkins and Salomon (1988) discussed the "enormous overlap and interrelations" (p. 30) between disciplines, but they lament boundaries between subjects caused by school organization. Teachers need to make opportunities for integrating and connecting subject areas to take advantage of the synergistic effect of combining skills and information from various disciplines.

Lowenfeld and Brittain (1987) wrote of the fragmentation of learning processes because experiences are separated into blocks of time. As an attempt to remedy this problem, they report that art is sometimes used to connect subjects, but only with superficial results. They state further that while it is possible for integrated learning experiences to develop in a school situation, the student must become totally involved in learning for integration to take place. "Integrated learning does not happen by merely shuffling subject matter around--such integration can take place only within the child" (p. 174).

Read (1945) said, "I believe that what is wrong with our educational system is precisely our habit of establishing separate territories and inviolable frontiers" (p. 11). He wrote further of the "value of art as [an] educative medium" (p. 14) and stated that it should be the "fundamental basis of education" (p. 71), for art is a natural mode of

integration for children. Field (1970) elaborated on Read's work saying that it "makes a case for art as a total means of education" which has not been "taken so seriously as perhaps it deserves" (p. 55). McFee (1961) reported her belief that art is the basis for most of the other learnings which occur during elementary school because it is an integral part of many other disciplines. Also, art involves learners mentally and physically and encourages retention of information.

Eaton (1985) discussed the idea of the separation of curriculum into "cellular components" when courses are taught in independent units or class periods. Teachers often fail to assist students in seeing connections between the things they study. This, she believes, creates difficulties for learners. She further stated that art can be used as a vehicle for carrying content to be learned. For example, she related that musical and visual symbols can help "fix" information in learners' minds. By attaching information to be learned to a pattern, visual or musical, the learner is often able to remember sequences and content in a pleasant way. She stated that learning can be reinforced and easily recalled by using art as a link or connection between disciplines.

Einstein, Galileo, Schweitzer, Leonardo, and others have reported that participation in their art helped them to see connections and to make cognitive leaps. Einstein stated

that many of his ideas came to him in the form of images in his mind (Eaton, 1985).

The notion that art might serve as a link or connection between subjects was also suggested decades ago by Froebel (1912):

> For all ideas are interrelated. . . . Therefore, art, on one side touches the understanding through mathematics; on another it connects with the reason through language; on a third, though it expresses ideas, it is one with the representation of nature . . . . (p. 152)

Art experiences allow learners the opportunity to make connections within themselves through the involvement of all areas of intellectual, physical, emotional, and aesthetic development according to Pfeuffer (1982). She wrote of the many non-art curricular areas which have natural connections to art. Measurement, balance, volume, patterns, color, detailed observation, invention, discovery, and decision-making are examples she cited.

Steger (1988) stated:

> The study of the arts is compelling because it enables us to sort and select, to analyze and interpret sense data that structure experience in ways that educate us as rational thinkers and moral actors . . . The arts help us to 'see' new relationships . . . . (p. 2)

Silver (1978) found that language and hearing-impaired children were able to acquire concepts of order (sequence), grouping, and spatial relationships by participating in a series of specially designed art classes for a period of four months. Posttest performance for the experimental group

showed significant improvement over pretest scores, while scores of the control group showed a net decline. A similar study was also conducted by Silver with children who were diagnosed as having learning disabilities. Again, significant improvement was found in the ability of the children to order sequentially, to form groups, and to organize spatial relationships as a result of structured art lessons. "The time may . . . be right for serious consideration of the role of art in developing cognitive skills" (Silver, 1978, p. 119).

The results of a study by Greene and Hasselbring (1981) of young children who were prelinguistically and profoundly hearing impaired strongly suggest that linking visual art activities that combine visual, linguistic, and tactile modes to target language concepts results in greater concept attainment than teaching the same concepts without art activities. They concluded that art should become an integral part of the curriculum for hearing-impaired children, and they suggest more empirical support for "whether art can serve as a successful and generalized teaching mechanism for the hearing impaired" and for others (Greene & Hasselbring, 1981, p. 36).

Children often have a conceptual understanding that is greater than they can express either verbally or in writing. By incorporating or integrating art as a link or mode to expression, children can often "say" what they know in a

non-verbal way. In a study conducted by the researcher (Willett, 1987), a teacher reported the following incident which had occurred in her class:

> A few years ago I had a student who was in special classes and could not read, and really could not do anything written that we did . . . . We were studying Virginia history and I asked my class to draw something that they were interested in and then tell me about it. The student drew a very detailed picture. I think he had almost everything that we'd covered on Virginia history on a large poster, and I was amazed that he had taken in that much and was able to put it out on paper. Not written, but in an art form (p. 31).

By combining art and social studies, the child was able to demonstrate his conceptual understanding in a less traditional way than is normally used in school. If his teacher had not encouraged or allowed the child to express what he knew in a non-written mode, she would not have realized the depth of his comprehension. In this case, a student learned a concept through listening in class and was able to express his knowledge through art. As Silver (1978) stated, "particularly for the child deficient in language skills, drawing and painting pictures about experiences can serve to integrate new information and demonstrate what has been learned" (p. 19). This leads us back to the research question. How much does making art enhance the learning of specific concepts?

2. **What differences are there between the teaching modalities used by the art teacher and those used by the classroom teachers, and**

3. **Do students with a particular dominant or combination of learning modalities learn concepts more easily through art?**

The researcher expected to find that teachers who teach lessons in modes addressing the dominant learning modality(ies) of each student would enable each learner to grasp and retain information more efficiently.

The researcher believes that art is a multimodal approach to teaching and addresses the learning modalities of each student. While classroom teachers and art teachers present much information through verbal means, a teacher of elementary art incorporates combinations of visual and kinesthetic/tactile modes of instruction into lessons more often than a traditional classroom teacher.

Students identified as kinesthetic learners, who are taught the designated concepts through the multimodal (auditory, visual, and kinesthetic/tactile) approach used in the art lessons, will show greater gain in knowledge of those concepts as measured by test scores than will kinesthetic learners who are taught the concepts through a traditional manner. Creating art involves learners in kinesthetic/

tactile activities so that they are able to grasp information in their preferred modality. In addition, during the lesson the learner hears and sees information that helps to strengthen auditory and visual modes. Conversely, the traditional manner of teaching consists primarily of oral presentations with some visual elements. There is very little kinesthetic/tactile activity. Students who are identified as kinesthetic learners will have difficulty learning concepts taught in the traditional manner that rarely addresses their preferred mode of learning.

Visual learners will also profit from the art lessons as there will be more to see relating to the concepts than in a traditional class. Students identified as auditory learners will be able to learn the selected concepts more easily in the traditional way, because the learning style of the auditory learners matches more closely the teaching style used by the instructor.

Data were collected to demonstrate the extent to which teachers in the study use different modality approaches for instruction and how students' learning modalities affect the extent to which they profit from the special lessons.

Results of the study should demonstrate that when using art as a tool for teaching selected concepts:

(a) visual learners will fare better because there is more to see based on the demonstrations and products;

(b) kinesthetic/tactile learners will fare better because there are more hands-on experiences;

(c) auditory learners will fare no better; and,

(d) students with any modality strength combination which includes kinesthetic and visual will fare better than auditory learners.

Modality-based instruction is designed around the belief that teaching methods are most effective when compatible with a child's learning modality strengths (Milone, 1981). Although people learn through all their senses, in formal education the three senses most used are visual, auditory, and kinesthetic. According to Milone, a visual modality consists of seeing and of having mental images; an auditory modality consists of talking and hearing; and, a kinesthetic modality refers to touching, moving, and sensing spatial orientations. Milone further reported that the most frequent modality strengths are visual (30%) and mixed (30%) followed by auditory (25%) and kinesthetic (15%). In a study by Bonner (1981), who used the Swassing-Barbe Modality Index with 101 children in grades 1 through 5, 46% of the children were visual learners, while 16% were auditory, 12% were visual/auditory, 11% were visual/kinesthetic, 6% were kinesthetic, and 9% visual/auditory/kinesthetic.

Lowenfeld (1945) described the idea of visual and haptical aptitudes of people. The visually-minded person

relies on visual experiences to interpret and learn from the world. The interpretation of information is objective rather than subjective. The haptically-minded person, in contrast, reacts as a blind person dependent on touch and kinesthesis for interpreting and learning. The haptical types, according to Lowenfeld, use their eyes only when they must although they have normal vision. He claimed that haptic individuals are not rare. Furthermore, he stated that learning is inhibited when a visually-minded person engages only in haptic experiences or when a haptically-minded person engages only in visual experiences.

Most people fall between the two extremes although approximately 75% of Lowenfeld's sample of 1128 adult individuals tended toward either visual or haptic aptitudes. He reported that 47% were clearly visual, 23% were haptic, and 30% were not clearly defined. According to his evidence, about one in four adults depends upon tactile/kinesthetic experiences for learning.

Over the past two decades, researchers have continued to investigate the idea that people acquire information in different ways. Researchers are divided in their opinions on whether or not modality-based instruction affects achievement.

Ast (1981) hypothesized that the Lowenfeld tests for identifying visual/haptic types might be used as variables in studies on children's learning in formal school settings.

She questioned if children identified as haptics, who interpret information subjectively and who need to manipulate materials, might be at a disadvantage in acquiring certain academic skills in traditional classrooms. She believed that children with visual aptitude might learn more easily in school because of the nature of the instruction. In her study of 243 children in first, second, and fourth grades, she found approximately 42% to be haptic learners. Others were visual or indefinites. This coincides with results from studies by Read (1945) and by Lowenfeld (1945) who said most children tend to be haptic.

Milone's (1981) work regarding the dominant modality of young children contrasts with the findings of other studies reviewed by the researcher. He stated that young children are least able to learn through their kinesthetic sense; their auditory modality is stronger than their visual modality. He also stated that modality strengths may change with age. As children progress from kindergarten to sixth grade the visual modality becomes the dominant one, followed by kinesthetic and auditory modalities. As children reach early adolescence and become adults, visual strengths remain dominant, but the auditory modality becomes stronger than the kinesthetic modality.

Research reviewed by Tarver and Dawson (1978) did not indicate a significant interaction between modality preferences and method of teaching in producing achievement.

Rosenshine and Stevens and Tobias (cited in Woolfolk, 1987) reported that when students have prior knowledge about a subject different teaching methods do not seem to affect achievement, but when students have little knowledge about a subject, the method of instruction does make a difference. Others (Barbe & Swassing, 1979; Cornett, 1983; Domino, 1970; Dunn & Dunn, 1978) report that some people learn better by hearing information, some by seeing examples or by watching demonstrations, and others by direct physical participation and hands-on manipulation of materials.

Although defined as "a consistent pattern of behavior" (Cornett, 1983, p. 12), modality strength can change through one's experiences and maturity. Although the mode of acquiring information may change as people mature, most youngsters do have a preferred modality for learning. Bruno (1982) stated:

> By far, the highest percentage of students are tactual/kinesthetic, and when these youngsters manipulate hands-on materials they tend to remember more of the required information than through the use of any other sense (p. 53).

Armstrong (1988) reminds us that traditional instruction addresses linguistic and logical-mathematical learners. Those with other dominant learning modalities are not taught in the ways in which they learn best.

> Sitting quietly in a classroom is totally against the natural inclinations of bodily-kinesthetic children, who need to move in order to learn and who may thus be considered "hyperactive." Spatial children, who need vivid images and pictures to learn, are apt to be

> classified as "dyslexic" because they are dragged too quickly into the world of abstract numbers and letters (p. 35).

Students should be able to learn in their preferred modalities while they strengthen other modes through their exposure to them. Teachers should encourage "flexing" capabilities (Cornett, 1983, p. 19) so students can adjust their learning styles to different teaching styles. If students strengthen all modalities and become multimodal learners, they will acquire information in whatever way it is presented. As children grow older the distinct modalities of childhood become more integrated. Adults tend to be mixed-modality learners more than children (Milone, 1981).

Dunn and Dunn (1975) reported increased achievement and motivation when learning and teaching styles were matched.

> When a student learns in ways that are natural to him, the outcomes usually are increased academic achievement, improved self-esteem, a liking for learning, improved basic skills, stimulated creativity, and gradually increasing learner--independence (p. 38).

Bruno (1982) also stated that presenting information to children in their preferred learning styles can have positive benefits in academic achievement.

Barbe and Swassing (1979) and Milone (1981) suggested that instruction is more effective if teachers speak to auditory learners, show pictures to visual learners, and model or demonstrate for kinesthetic/tactile learners. Other studies, by Jersild and by Ehrensberger (cited in Silvernail,

1979), indicated that when teachers used hand gestures for their students during instruction, without consideration of learning modality, significant retention levels for content occurred.

Cornett (1983) wrote of the physiological aspects of learning style which include all sensory perception (visual, auditory, kinesthetic, taste, and smell). Barbe and Swassing (1979) studied the perceptual elements of learning style and reported that "when information is presented in more than one modality, most children have little difficulty understanding the message" (p. 16). Others such as Eisner (1987) and Lowenfeld and Brittain (1987) spoke of the importance of perception and have emphasized the idea that art educates with and through the senses. When learners are exposed to instruction which uses multiple modes to transmit information, it is more likely to be comprehended and retained.

Teaching selected concepts through art is a method that can be used to incorporate auditory, visual, and kinesthetic learning modes in one lesson. In art lessons learners hear directions given by the teacher. They see results of the instruction by viewing what the teacher demonstrates, models, and exhibits. After receiving verbal and visual instruction about a concept, students immediately work on a solution to a similar problem by manipulating materials to create a product. They create something physically they can see--a

concrete example of the way a concept is used. The concept becomes meaningful for the learners as they become engaged in an activity which helps them comprehend. They "experiment" with an idea that involves them mentally and physically.

According to Bassett (1969), "we know, theoretically, that there is a value in applying knowledge as soon as it is acquired . . ." (p. 34). By using new information to solve problems closely after that information is seen and heard, concepts may be more readily imprinted on the brain. Or as Gardner (1973) stated, "careful viewing followed by making may result in a more accurate comprehension than attending to the symbolic description" (p. 158).

4. Will learning of concepts transfer when students see a problem in a testing situation not related to art?

Learning of concepts will transfer when students see problems in a testing situation not related to art because the lessons are designed to teach specific concepts which are common to art and other subject areas. Transfer will occur if scores on concepts taught through art are significantly higher on the posttests than they were on the pretests.

Various authors (Bassett, 1969; Broudy, 1979; Guilford, 1968; Hunter, 1971; Murphy & Jones, 1976; Perkins & Salomon,

1988) discussed the idea of the transfer of knowledge and skills from past learning to present situations. Transfer involves extending knowledge beyond learning in a particular incident to another or different context. Silver (1978) defined "transfer" as the ability to generalize from one experience to another. In addition, he stated his belief that art experiences can provide opportunities for the transfer of learning. To ensure that students retain information acquired from their studies, Rush (1987) suggested that lessons should be repeated in contexts different from the initial way the lesson was presented so that "real-world and art images interlock conceptually" (p. 207).

Bassett (1969) stated that all subjects penetrate many fields. Subjects in the curriculum should not be taught in isolation, but in cooperation. Furthermore, he stated that until recently there has been a tendency to deny that transfer of knowledge occurs between curriculum areas.

On the one hand, Broudy (1979) warned that "one must examine carefully whether the facilitating powers of art experience on other phases of schoolwork are anything more than a hope and a plausible conjecture" (p. 347). Guilford (1968), on the other hand, believed that if a person becomes skilled in understanding relationships within one type of content there will be transfer to other types of content.

Murphy and Jones (1976) reported that researchers attempted to establish the theory that competence in visual perception and involvement in producing art will aid in academic achievement, but without conclusive results. In their study of 100 underachievers who participated in an intensive summer program of the arts, no significant transference of skills to the three Rs was demonstrated. Murphy and Jones did report, though, that participation in the program generated excitement and served as an incentive for the students to succeed in school.

Cohen (1968) reported inconclusive results from a study that used art as a medium to teach conceptual skills thought to be important for reading and math. He stated that if an attempt is made to shape academic skills using arts as media, "undivided attention" must be paid to the achievement of target academic behaviors. It should not be assumed that transfer will occur. He further wrote of his belief that the arts should be used as reinforcers, not as media for learning.

In a study by Forseth (1976), the use of art activities on attitude and achievement in mathematics and art for fourth-grade children was examined. "Math/art lessons were designed to reinforce mathematical concepts . . ." (p. 106) such as place value, multiplication, fractions, and symmetry. Results of the experiment indicated an increase in positive attitude toward mathematics for those involved in the

math/art treatment group, but no significant difference in achievement.

In the results of another study that was based on the belief that visual art experiences aid in children's development in other disciplines, Schulte (1983) reported that his study did not integrate reading and visual arts experiences, but rather each was taught in isolation. He further stated that it appears from the results of his study that in order to increase reading scores, art experiences should be integrated into reading, and lessons should be designed to teach specific concepts.

O'Brien (1971), the developer of the Learning to Read through the Arts program which is designed to employ visual and performing arts as a core for learning, had positive results with students' reading and writing scores. Increased interest in other curriculum areas was an additional benefit. Knowledge gained through interdisciplinary lessons has had a significant affect on reading improvement. Evaluation results indicate that students improved an average of one to two months in reading for every month they participated in the program.

Recent work by Perkins and Salomon (1988) reported some discouraging evidence about transfer in the way it currently occurs (or does not occur) in school. They believe that transfer does not happen as often as educators would like to think. They write of specialized or "local knowledge" (p.

24) which is not generalizable to other situations. A study by Belmont (cited in Perkins & Salomon, 1988) found that strategies used to teach memory skills are frequently "contextually welded" to the experience in which they occur. Often they do not extend to new experiences.

Perkins and Salomon described what they term as "low road and high road transfer."

> Low road transfer reflects the automatic triggering of well-practiced routines in circumstances where there is considerable perceptual similarity to the original learning context . . . high road transfer depends on deliberate mindful abstraction of skill or knowledge from one context for application in another (p. 25).

Despite studies they cite to demonstrate that transfer has not occurred to the extent educators believe or wish it to happen, Perkins and Salomon provide two techniques which can be incorporated into current instruction to encourage the development of transfer. They called these techniques "hugging" and "bridging."

"Hugging" means helping students see connections in closely related information. It also involves helping students learn skills and knowledge so well that they can almost automatically shift from one context to another. Special skills necessary for a particular context can be further refined through additional practice. To use an example from art, children who have manipulated crayons to draw and express themselves from an early age probably will have little trouble adapting to drawing with pastels,

charcoal, different types of pencils, felt-tip markers, and pen and ink. Although skills needed for each particular drawing implement will need frequent practice to develop proficiency, the ability "to draw" will be readily transferred to each new medium. Hugging takes place as students easily see the connection between drawing in different media. They have become adept enough at drawing to make the transfer easily from drawing with crayon to drawing with other tools.

"Bridging" means guiding students to see "general principles behind particular skills or knowledge" (Perkins & Saloman, 1988, p. 28). Teachers need to ask questions which help students generalize how skills and knowledge can be used outside the particular context in which they are taught. When teaching the concept of pattern in art, a teacher might ask students to recall or locate natural and man-made patterns within the environment, to discuss patterns in one's life, and to discuss number patterns which are learned in math.

Perkins and Salomon have said that while transfer <u>can</u> occur, it should not be left to chance in order to be most successful. Teachers should teach for transfer by using hugging and bridging techniques.

Hunter (1971) has stated that "teaching for transfer" is the first and last goal of all teaching. She stated, in the foreward of her book, <u>Teach for Transfer</u>, that a

student's ability to transfer previously learned knowledge "to a new situation is the heart and core of all creativity, problem solving, and critical thinking" (p. iii). Teacher planning, according to Hunter, is the critical element in teaching for transfer. It makes the difference between hoping transfer will occur and seeing that it does. She reported "that knowledge about one thing can transfer to another if one of our sensory modes perceives it as the same and sends us the same signal" (p. 21). The teacher should help learners identify and label essential clues which signal similarities so that transfer between learning can occur more readily.

5. Do art lessons which are structured to teach specific concepts inhibit the creativity of students to whom they are taught?

In this study, creativity was measured by the subjective opinions of eight art teachers. They were asked to limit their judgment of creativity to originality (unusual or remote idea) and elaboration (embellishment or embroidery of an idea) (Lowenfeld & Brittain, 1987, p. 82) because they observed only the finished products of the student artists, not the process by which the works were created.

The treatment instruction was organized in such a way as to reduce the possibility that the creativity of the

products would be diminished. The format of each lesson was used to guide the students toward completion of a project. No lesson was to be interpreted by the students as restrictive. The students were asked to produce creative work. It was believed there would be no difference in the creativity of the works produced by the treatment group and the comparison group.

There are factors located in related literature which bear upon inhibiting creativity in students' artwork. Included among these factors are faulty teaching practices. According to Gaitskell (1975), faulty teaching practices in art, as in any subject area, can have profound effects on students. Some faulty methods are simply ineffective while others are actually harmful to artistic development. Most faulty teaching in art falls under the opposing categories of dictatorial or laissez-faire practices. In Gaitskell's study, 250 children had their creative art program replaced by restrictive and dictatorial lessons for ten consecutive days. The control group continued to work creatively. When a creative lesson was reintroduced to the treatment group, 44% of the children continued to draw the stereotyped subjects they had learned in the ten day experiment. After two years, 8% were still drawing stereotyped art (Gaitskell & Hurwitz, 1975, p. 75).

A similar study by Heilman (cited in Lowenfeld & Brittain, 1987) involved the influence of workbook exercises on second grade children. The retrogressive effects of copying symbols found in workbooks on children's artwork was demonstrated.

A contrasting but equally limiting faulty teaching method is the laissez-faire practice. In another study by Gaitskell, 200 children were provided with materials familiar to them, but no motivation or assignment was given. After five days almost every child lost interest in the activities and their work lacked vitality. Results of similar experiments indicate that laissez-faire lessons have adverse effects on art activities for children. Children apparently lose interest without motivation or guidance (Gaitskell & Hurwitz, 1975, p. 76).

In reviewing research, Lowenfeld and Brittain (1987) found no differences in creative skills for children who were taught in open versus traditional classrooms. Lowenfeld and Brittain also reported that it is possible to improve childrens' creative responses by telling them to be creative. They stated that saying "be creative" seems to enable students to enter a creative mode of thinking, something not asked of them very often in school. They also discussed the idea that art teachers value independence in thinking more than teachers in other fields.

Silver (1978) found that art experiences can be educational and therapeutic concurrently. Structuring art experiences does not necessarily inhibit spontaneity.

6. Does the "feeling tone" of the classroom affect the extent to which students learn selected concepts?

Students who are taught in a classroom which has a more positive feeling tone will learn the selected concepts to a greater extent than those students who are taught in classrooms with a more negative feeling tone.

A cooperative spirit, gentle-but-firm expectations, and warmth are qualities which make a classroom inviting for students. Purkey (1978) defined "inviting" as a summary description of messages which inform students that they are responsible, able, and valuable. Purkey also reported on studies (Braun, 1976; Brophy & Good, 1970) which indicated that students are able to function more efficiently when interaction between teacher and students and among students takes place in a cooperative learning environment. In addition, these studies and others (Michael, 1982) indicated that teachers who give encouragement and attentiveness to students increase the probability of student learning. The attitude of the teacher toward students has an effect on how students perform in the classroom. Brophy and Good (1974)

concluded from their studies that when teachers have high expectations for students, students actually achieve more. In a study conducted by Levin (cited in Lowenfeld & Brittain, 1987), it was found that in almost every classroom where positive relationships existed between the teacher and the class, students produced more required and more self-initiated work.

The way students feel about a situation affects the effort they will expend. Hunter (1983) has stated that a teacher can increase motivation to learn by making school pleasant. According to Hunter (1982), if the feeling tone of a class is pleasant and if the students expect to succeed, then the students will be more likely to put forth effort to learn.

Lowenfeld and Brittain (1987) discussed the atmosphere of the art classroom which fosters creative growth, inventiveness, and exploration. They said that it is not the same type of atmosphere that is favorable to learning multiplication tables. They cautioned that learning does not take place in a completely relaxed setting any more than it does in a highly structured, inhibiting environment. In addition, an art teacher should be a warm and friendly person who must encourage curiosity, original ideas, and self-initiated activity in a risk-free environment (p. 145).

7. What is the relationship between developed ability level and learning modality(ies)?

There will be no relationship between developed ability level and learning modality(ies).

Studies concerning the relationship between ability and learning modality(ies) have resulted in inconclusive findings. Dunn and Dunn (1978) reported that students with high reading achievement scores prefer not to learn through their tactile/kinesthetic senses while students with low reading achievement scores prefer to use their tactile/kinesthetic senses for learning. They list factors from their studies which relate to reading achievement and learning. They are:

> Individuals who achieve in reading are generally persistent, responsible, and self-motivated, desire a formal design, and do not like bright light; whereas low achievers in reading are not self-motivated, but are adult-motivated, wish to learn using tactile and kinesthetic senses, want food present while studying, and like an informal design and bright light (p. 398).

Dunn and Dunn caution that the failure of schools to meet students' preferred learning styles may affect the ability of students to achieve well in reading. In contrast, Bonner (1981) found that modality strength was independent of reading ability. In addition, she found that reading achievement level cannot be used as a predictor of modality strength. In her review of several studies, she found that

other researchers indicated that auditory learners outperform visual learners regardless of the modality used for instruction.

Students with middle and high scholastic aptitudes have been found to learn better through the visual modality while students with low scholastic aptitudes have been found to be evenly divided between the auditory and visual modalities (Larsen & Feder, 1940). In contrast, auditory learners have been found in similar percentages across I.Q. levels, while more visual learners have been found in lower I.Q. ranges (Smith, cited in Tarver & Dawson, 1978). In a study by Gilley, French, and Russell (cited in Bonner, 1981) conducted with third-graders in Tennessee, the conclusion was that the haptic mode (learning through the sense of touch and movement) was the most effective means of instruction for both high and low achievers. Robinson and Lilley and Kelleher (cited in Tarver & Dawson, 1978) indicated that I.Q. and modality preference do not interact.

8. How much do boys and girls differ in the extent to which they learn designated concepts?

Gender will not affect the extent to which students learn the selected concepts.

While it is generally accepted that males and females do not differ significantly in general intelligence (Jensen, 1980; Matarazzo, cited in Burns & Reynolds, 1988; Woolfolk, 1987), gender differences in verbal abilities, visual-spatial abilities, and mathematical abilities have been documented (Keenan & Smith, 1983; Maccoby & Jacklin, 1974). Maccoby and Jacklin reported that girls excel in verbal ability. Boys receive higher scores on visual and spatial tasks; boys are superior in mathematical performance.

Epstein's work (1978) suggested that girls are not as adept as boys at visual-spatial tasks such as interpreting graphs, charts, and maps, but are better at reading. Research by Burns and Reynolds (1988) confirmed other studies that reported male superiority in visual-spatial skills and female superiority on short-term memory tasks. Although it is generally believed that boys are better in mathematics than girls, results of one study conducted in Hawaii by Brandon (1988) indicated that girls had a higher achievement level in mathematics than did boys. Over an eleven-year period, a study conducted by Hall and Hoff (1988) demonstrated that on mathematics tests for grades 2, 4 and 6 no significant score differences by gender were shown.

An article from the New York Times cited in the Roanoke Times & World News (July 1, 1989) indicated that the impact of gender on test scores is not as significant as previously believed. Researchers, such as Marcia Linn at the University

of California at Berkeley, who have analyzed a wide range of test data, conclude that the gap between male and female performance on standardized mathematics tests has narrowed and the performance on standardized verbal tests has disappeared. The current findings are in contrast to many studies conducted in the 1970s which indicated significant differences in the test scores for males and females. These earlier studies concluded that males showed higher scores on mathematics examinations while females showed higher scores on verbal examinations. The unnamed author of the above newspaper article also stated that researchers reported that these new data are not consistent for all individual, standardized tests. For example, male performance in mathematics on the Scholastic Aptitude Tests has continued to be superior to female performance since the 1960s.

9. How much do black and white students differ in the extent to which they learn designated concepts?

Race will not affect the extent to which students learn the selected concepts.

Trueba (1988) asserted that minority students' academic achievement is influenced heavily by the culture from which they come. He wrote further that in order to make these children successful in school, educators must construct

learning environments conducive to their success. Standardized norm-referenced tests underestimate the ability of low-income black children because of test bias and different learning styles (Shade, 1982; Castenell, 1987).

Regardless of the ethnic group from which students come, if they are from low socioeconomic families, they tend to score lower on tests for mental abilities than do students from middle- and upper-class families. Loehlin, Lindsey, and Spuhler (cited in Woolfolk, 1987) reported that on the average, blacks score lower than Hispanics, who score lower than whites, who score lower than Asians. They also reported that on most intelligence tests, whites score about 15 points above blacks.

10. What is the association between learning modality(ies) and race?

There will be no association between learning modality(ies) and race.

Milone (1981) stated that little research has been conducted regarding differences among race and learning modalities. He did report that modality strengths of Hispanic children had been compared to those of white children in the standardization sample for the Swassing-Barbe Modality Index but were not found to be significantly

different. Studies by Barbe and Milone (1981) and by Bonner (1981) resulted in the conclusion that race was independent of modality strength.

Blacks tend to rely less on verbal skills than nonverbal ones, thus their learning styles do not mesh with traditional test-taking skills. The ability of blacks, then, may be mismeasured because of their learning styles or modalities (Castenell, 1987).

11. What is the association between learning modality(ies) and gender?

There will be no association between learning modality(ies) and gender.

Barbe and Swassing (1979) and Bonner (1981) found when modality scores of boys and girls were compared, no statistically significant differences were found. They cite their findings as consistent with an earlier study by Maccoby and Jacklin (1974) who reported perceptual skills of boys and girls in elementary school were similar. Dunn and Dunn (1978) found that although males and females begin in the lower grades preferring to learn through the tactile/ kinesthetic modality, when they reach higher grades their preference to learn through this modality is not as pronounced. The Dunns also found females in higher grades

preferred to learn through the auditory modality more than they did in lower grades. They suggest these findings may be due to the way schools reinforce the traditional instructional environment by teaching through auditory senses or that it may be the result of maturation.

Cullinan, Ringler, and Smith's study (cited in Tarver & Dawson, 1978) suggested boys may be more likely to have visual preferences, while Gilley, French, and Russell (cited in Bonner, 1981) confirmed that although children receive and process information differently, the variable of sex was not a significant determiner of learning modality.

CHAPTER 2

METHODOLOGY

This chapter contains a description of the subjects and design of the study. It also contains specification, explanation, and methods of measurement and analysis for the independent and dependent variables.

Subjects Studied

The subjects in the study consisted of 87 fifth-grade students who attended an elementary school in a middle-sized city in southwest Virginia. The students were heterogeneously grouped and assigned to four different classrooms.

The school was located in a low to middle class socioeconomic neighborhood. The student population in the school was 68% black. The fifth grade population was 71% black. Twenty-five of the children in the fifth grade were white; 62 were black. There were 44 boys and 43 girls. These students were chosen for the study because they attended the school to which the selected art teacher was assigned for the year.

Teachers

The Art Teacher

The art specialist (teacher), Mrs. W. is a white woman in her fifties who has taught school for fifteen years. Prior to the birth of her children, she taught for seven years. During those seven years she taught first grade for four years and seventh grade math, science, and reading for three years. She returned to college in 1978 to complete her art education degree at a nearby university. After completing student teaching, she was hired by the school division as a full-time elementary art teacher. She has remained an elementary art specialist in the same school division for eight years. During that time, her assignment has included several different schools. The year of the study her assignment was in a school that was new to her.

After discussing the study with three art specialists, Mrs. W. was selected by the researcher to participate in the experiment because she expressed willingness to devote extra time to be trained to teach new lessons and to teach different lessons to the treatment and comparison groups.

The Classroom Teachers

Mrs. A. is a white woman in her thirties who has taught elementary school for eleven years. During those eleven years, she has been employed by the same school division. She has always taught the fourth and fifth grades. She was transferred last year to the school in the study. She received her undergraduate degree in education from a large university located nearby.

Mrs. B. is a black woman in her fifties who has taught elementary school for thirty-three years. She has been employed by the same school division throughout her career. Before integration, she taught in all black schools. She has taught first and fifth grades. She was transferred to the school in the study for the year of the study while her former school was undergoing a renovation. She received her undergraduate degree in education from a predominately black state university in Virginia.

Mrs. C. is a white woman in her fifties who has taught elementary school for thirty-five years. She has been with the same school division for her entire career and in the same school for thirteen years. She has had experience teaching Head Start and fourth, fifth and sixth grades. She received her undergraduate degree in education from a nearby university and her master's degree in education from another state university.

Mrs. D. is a white woman in her forties. She taught school for four years in the early 1970's before the birth of her children. This was her first year back in teaching since that time. It was also her first year in the school division in the study. She received her degree in elementary education from a nearby university.

Design of the Study

This study is a pretest-posttest quasi-experimental design. The subjects in the study could not be randomly selected and assigned to the treatment and comparison groups as they had to remain within their regular classroom groupings. Each of the four intact classrooms of learners was randomly assigned to either the treatment or comparison group by using a random numbers table.

SRA subtests and an AIMS researcher-developed test were used as pre- and posttests to determine if students in the treatment group were able to learn concepts as well through art lessons as those students in the comparison group who were taught in a traditional manner.

Treatment Group

After being administered the subtests in mathematics and reading, students in the treatment group were taught seven

art lessons (Appendix A) which were specially designed to stress, more fully, selected concepts (area, volume, perimeter, congruency, pattern, and sequence) traditionally taught in academic areas, but also addressed in art class on a less structured basis. Each week over a seven week period, the art specialist taught these lessons to the treatment group during the regularly scheduled forty-five minute weekly art program provided to elementary school students in the school division. Each lesson stressed a concept taught in art and also in basic skill areas. The lessons were art lessons which had been extended to stress a designated concept more fully. Where necessary, formulas were included such as in the area, volume, and perimeter lessons.

The classroom teachers of the treatment group students did not address the mathematical and reading concepts taught in the art class during the time of the experiment.

Comparison Group

After being administered the subtests in mathematics and reading, students in the comparison group continued to have lessons from the art curriculum, taught by the art teacher, that did not address the designated mathematical and reading concepts. These lessons occurred over the seven week period during the students' regularly scheduled art class. The

comparison group students were taught the selected concepts by their classroom teachers, rather than by the art teacher, during their regular math and reading periods.

In order to ensure that time spent on teaching the concepts was not a factor in whether or not students learned each concept more readily through the traditional or treatment method, teachers of the comparison classes were asked to address each concept for the equivalent length of time as the art teacher. The comparison group classroom teachers used their regular methods of teaching each concept.

Specification of the Independent and Dependent Variables

The independent variables in the study were learning modalities of students; environment of the classroom, which included feeling tone and the percent of time teachers used auditory, visual, and/or kinesthetic/tactile teaching behaviors; ability level of students; and gender and race of students.

The dependent variables were student scores on subtests of reading comprehension and mathematical concepts from the Science Research Associates Achievement Series (1979) and on the researcher-developed test of questions from the item bank of the Academic Instructional Measurement System (1987). The specific variables were: area, volume, perimeter, pattern, sequence, and congruency.

The creativity of children's art products was another variable measured in this study. It was used to determine if the structured lessons inhibited creativity.

Explanation and Measurement of the Dependent Variables

This section contains an explanation of each variable in the study and describes how each variable was measured.

There were six concepts, or dependent variables, that were addressed in the specially designed lessons. They included: area, volume, perimeter, congruency, pattern, and sequence. Several questions, per concept, were used to measure achievement. The number of questions for each concept was: area (4), volume (4), perimeter (5), congruency (4), pattern (4), and sequence (7). Knowledge of each of these variables was pretested and posttested.

Prior to the beginning of instruction for the specially designed art lessons and before teachers had taught and/or reviewed the concepts selected for the study, subtests of the SRA Achievement Series, Level E/Form 1, from Science Research Associates, Inc. were administered to both the treatment and comparison groups by the four classroom teachers in the study. The SRA Achievement Series was selected for the study because it is nationally recognized as a valid and reliable measurement instrument that has been used for decades to help educators evaluate students' academic achievement according

to the SRA Achievement Series: User's Guide of 1979. It is a standardized, norm-referenced set of tests. The Commonwealth of Virginia discontinued its use in 1988 as the state-mandated test. It was available to the researcher for use in the school division in which the study took place.

Subtests which were administered to the treatment and comparison groups include:

Mathematics: Concepts

Reading: Comprehension.

The subtest Mathematics: Concepts consisted of 30 test items. This portion of the test took 25 minutes to administer. There were six questions embedded within the 30-question subtest which were related to the concepts taught through the interdisciplinary framework of the specially designed art lessons. An item-analysis was conducted to determine the number of correct responses to these specific questions on the pretest.

The subtest Reading: Comprehension consisted of 50 test items. This portion of the test took 35 minutes to administer. There were three questions embedded within the 50-question subtest which were related to the concepts taught through the interdisciplinary framework of the specially designed art lessons. An item-analysis was conducted to determine the number of correct responses to these specific questions on the pretest.

The four classroom teachers administered the SRA pre- and posttests at the suggestion of the school principal because they were familiar with the procedures for standardized testing. The researcher met with the teachers after school one afternoon prior to the beginning of the study to ask if they were willing to administer the tests. The teachers were asked to administer the pretests a week prior to the beginning of the experiment and to administer the posttests within a week after its completion and they did as requested. The reading and mathematical subtests were administered by the teachers on separate occasions.

In addition to the subtests of the SRA Achievement Series, students were administered a custom-made test designed by the researcher (Appendix B). The items for this measurement instrument came from the item bank of the Academic Instructional Measurement System (AIMS) published by The Psychological Corporation. Items were reviewed by content experts and field-tested with more than 150,000 students. "In terms of item selection, this means that the user can have confidence that all of the items over a given objective are valid measures of that objective" (AIMS: Test Development and Production Guide, 1987, p. 29).

Use of test items from AIMS allows educators "to develop tests that directly match the curriculum objectives being taught in the classroom" (AIMS: Test Development and Production Guide, 1987, p. 3). Over 7,000 test items are

organized into sets of six to eight items measuring objectives in reading/language arts and mathematics. All items are arranged by the grade level in which the material is most frequently emphasized. A consistent number of test items (three) was used by the researcher to measure each selected concept taught in the study. Items of interest were embedded in a larger number of items to decrease the treatment pretest interaction effect.

The school system in which the study took place has purchased the right to use the items in the "bank" for designing its own tests to use with its students. The director of testing for the school system made the bank of items available to the researcher for use within the school system for purposes of the study.

AIMS does not have test questions involving number patterns for grade 5, therefore for this concept the researcher developed three questions. The administration of the AIMS test required 30 minutes per class. The researcher conducted the pre- and posttests. The classroom teacher was given a break by the researcher while the tests were given to the students.

A few children who were absent during the administration of sections of pretests were eliminated from the part of the analysis which required pretest scores. Four children were absent from the posttests, but were administered the test during the following week.

The same SRA Achievement Series subtests and the AIMS test were also used as posttests. An item-analysis was conducted to determine the number of correct responses to the specific questions on the posttests.

In order to thank the teachers and the children for their help, the researcher presented a monetary gift to the fifth grade.

Explanation and Measurement of the Independent Variables

Learning Modality of Students

A learning modality is a sensory channel by which one receives and retains information (Barbe & Swassing, 1979; Gardner, 1983). It involves sensation, reception, and memory. Barbe and Swassing call these three processes the "essence of learning" and the modalities "keys to learning." They identify visual, kinesthetic, and auditory modalities as those which have the greatest impact on classroom instruction.

Adults are generally able to process information in whatever way it is presented because over the years each of the three modalities has been strengthened through use. Children usually have a dominant channel by which information is processed most efficiently (Barbe & Swassing, 1979). In school, many children struggle to adjust their learning style

to the teaching approaches used by the teacher. If the teaching style does not mesh with the learning style of individual children, learning can become frustrating and difficult, cause children to become unsure of themselves, and cause them to lose confidence in their ability to learn.

Many children have a secondary modality which complements and enhances their dominant modality. Those with a secondary modality can receive information from lessons taught in either mode. Those who have mixed modalities, with no modality dominant, can receive information through auditory, visual, or kinesthetic modes. They are, generally, at an advantage when receiving information.

In the traditional classroom where information is presented in a predominantly oral manner, those children who are auditory or mixed modality learners have the greatest chance for success. Visual learners can often watch demonstrations, observe charts, or look at others to see what to learn while listening. Kinesthetic learners are often at a disadvantage in the traditional classroom. They need to participate physically or by manipulating materials while listening and observing in order to gain the most from the lesson. Participation other than hand-raising, asking and answering questions, or writing with a pencil is seldom seen in many classrooms.

If all three modes of presenting materials to children (auditory, visual, and kinesthetic/tactile) are used with

lessons, children with any dominant modality will be able to receive information more efficiently. As they progress through school and as information is presented more and more auditorially, children who were initially visual or kinesthetic learners will not be at a disadvantage because their less dominant modes will have been strengthened through use in the early grades. Children can readily become mixed modality learners through practice, participating in all three modes.

All students in the treatment and comparison groups were individually administered the Swassing-Barbe Modality Index (SBMI) which was designed to identify the individual's most efficient learning mode. The SBMI was administered by the researcher assisted by an instructional aide at the school site.

This inventory enabled the researcher to determine the dominant learning modality of each student. Each student's modality was classified as visual, auditory, kinesthetic/ tactile, or mixed based on the results of the inventory. A difference of about five points on the modality percentage score is "an educationally relevant difference" according to Barbe and Swassing (1979, p. 40). If one modality score is at least five points higher than another, that modality is the stronger one. If a modality score is at least five points higher than the other two, then it is the dominant modality. Students with close scores were classified as mixed modality

learners. Possible individual and combination modalities are as follows:

1. visual
2. auditory
3. kinesthetic
4. visual and auditory
5. visual and kinesthetic
6. auditory and kinesthetic
7. visual, auditory, and kinesthetic.

Observation is another important part of the administration of the inventory according to Barbe and Swassing. Children often give clues as to their preferred modality while they are thinking about and reproducing the patterns in the inventory. Auditory learners frequently move their lips and say the names of the shapes to themselves. Kinesthetic learners often use their hands to "draw" or form the shapes in order to help them recall. Visual learners look into space or at a blank wall in order to concentrate on visual images in their minds. Children may employ all modalities as they begin the inventory, but as the sequences become longer and more difficult, they usually rely on their preferred mode in order to remember the sequence of objects.

The Swassing-Barbe Modality Index (SBMI) was developed to conform to the following specifications:

1. Administration time is relatively brief, approximately twenty minutes per student.

2. Neither extensive training nor certification is required for its administration.

3. Modality strengths rather than deficits are identified.

4. The test produces a profile of the relative modality strengths of each subject.

5. The instrument is standardized. That is, the administration of the instrument does not vary from student to student.

6. The stimuli presented to the child are consistent for each of the three modalities.

7. The same response is required of each modality.

8. The instrument has application both in the classroom and in research settings (Barbe & Swassing, 1979, p. 35).

Kerr and Myers, who reviewed the Swassing-Barbe Modality Index inventory in the Ninth Mental Measurements Yearbook for 1985 report that while "the SBMI might have some value as a research instrument" they feel it "suffers from insufficient research in its development and far too many unsubstantiated claims for its usefulness" (p. 1510) for wide marketing. Barbe and Swassing give no statistical data for the validity of the SBMI for which they are criticized by Kerr and Myers. The developers of the SBMI indicate that they have plans to test the SBMI with several instruments which "may provide appropriate criteria" (Barbe & Swassing, 1979, p. 49).

In an informal study conducted by the researcher, eight adults who were administered the SBMI indicated that they

felt it accurately reflected their dominant learning modality(ies).

The Swassing-Barbe Modality Index (SBMI) was administered to each child in the study over a period of six weeks from the middle of December, 1988, to the end of January, 1989. The classroom teachers excused each child from class one at a time to meet individually with the researcher and an instructional aide who assisted the researcher in the administration of the SBMI. Most of the children were met by the researcher in their classrooms. They walked to a small conference room where there was a quiet atmosphere. Several students were brought to the conference room by the student previously tested. As each child and the researcher walked to the conference room, the researcher told the child the purpose of the SBMI. If the child was brought to the conference room by another child, the SBMI was explained prior to testing. The researcher explained that some people learn best by listening, others by seeing, and still others by doing. Also, some people can learn best by using a combination of hearing, seeing, and/or touching or actual participation. Several of the children volunteered that they felt they learned best by seeing, touching, or hearing. Others said they had no idea how they learned best. Most seemed eager to participate in the SBMI; they were very willing to get out of class for a little while.

Administration of the SBMI took approximately 20-25 minutes per child. The researcher felt that she was able to establish rapport with the children easily. They had seen her in the classrooms observing their teachers; they seemed comfortable talking and participating in the study. Many of the children said that they thought the SBMI was fun and that they were glad to know the way they learned best. Generally, the ones who said they knew how they learned best were correct according to the results of the SBMI. Information about selected students during the administration of the SBMI is located in Appendix C.

Environment of the Classroom

Feeling Tone

The feeling tone is the "climate" or environment of a setting which can make a student feel an integral part of the classroom or not. A positive, neutral, or negative feeling tone within the classroom has influence on the amount of knowledge students acquire and retain. The feeling tone of the four classes in the study was coded and compiled using the Teacher Behavior Checklist (Appendix D).

Percentage of Time Teachers Use Auditory, Visual, and Kinesthetic/Tactile Modes

The teachers for the treatment and comparison groups

were asked to spend the same amount of time working with each concept in their classrooms. Approximately 10-15 minutes were to be used for introducing and explaining the lesson while 30 minutes were to be used for student work pertaining to the concept.

The researcher observed in the classrooms of the art teacher and the comparison group teachers to determine the actual percentage of time the teacher demonstrated auditory, visual, and kinesthetic/tactile instruction. The researcher used the Teacher Behavior Checklist (Appendix D) to code and compile auditory, visual, and kinesthetic modes used by teachers in the study.

The definitions used for these modes were:

1. Visual--teacher showing a film, slide, picture, photograph, chart, diagram, or other visual aid to the students; teacher writing on the chalkboard.
2. Auditory--teacher talking, explaining, and verbally instructing students in their classwork.
3. Kinesthetic--teacher demonstrating by drawing, acting out, and using other hand and body movements to illustrate a point.
4. Auditory/Visual--teacher verbalizing and exhibiting visuals or writing on the board simultaneously.
5. Auditory/Kinesthetic--teacher verbalizing while using hand/body movements simultaneously to demonstrate.

6. Auditory/Visual/Kinesthetic--teacher verbalizing, exhibiting visuals, and using hand/body movements to demonstrate simultaneously.

The Teacher Behavior Checklist (Appendix D) was used to code modes of teaching and feeling tone in each classroom as the selected concepts were being taught. The checklist was developed by the researcher based on the Roberson model. Roberson (1970, 1971) discussed the idea of the popularity of observation systems for collecting data regarding educational behavior and activities of learners and teachers. He stated that a useful system must isolate individual behaviors or actions so that they may be separated or coded into categories. Roberson cautioned that the observer must be provided with a simple format for coding observations. The coding procedures should also be easy to analyze. They should provide descriptive information relative to the teaching/learning situation. Of the six types of observation systems which Roberson named, three seemed especially appropriate to this study - activity, non-verbal observation, and verbal interaction. Activity focuses on a description of what the teacher does in the classroom during a lesson. For this study, activity equated to the modes (auditory, visual, and kinesthetic) that the teacher used when addressing a concept. Non-verbal observation focuses on gestures and expressions using body language during a lesson. Verbal interaction focuses on teacher-learner verbal

interaction during a class. From observation of verbal and non-verbal behaviors, a positive, negative, or neutral learning "climate" was abstracted to determine the feeling tone each minute within each classroom during the lessons.

The researcher used a time sample code in which feeling tone and mode of teaching were recorded once per minute.

Prior to the beginning of the study a principal from another school was asked to code three lessons taught by different teachers with the researcher in order to ascertain the reliability of the observation checklist. The principal and the researcher sat across the room from each other, but marked the checklist simultaneously. The resulting data were analyzed for consistency in scoring to establish interrater reliability. Results were found to be consistent. The mean scores for feeling tone in the three classrooms were found to be 15% positive, 85% neutral, and 0% negative by the principal and to be 16% positive, 84% neutral, and 0% negative by the researcher.

All observations were conducted on-site. A description of classroom observations is located in Appendices E and F.

Ability Level of Students

The COGAT (Cognative Abilities Test) scores from the 1987-88 school year were made available to the researcher for each child in the study. These scores, which are located in

the permanent record files at the school, were used as a variable to determine if there was a significant statistical relationship between a child's developed ability level and his/her dominant learning modality. Further analysis was conducted to determine the interaction between ability level, dominant learning modality, and gain scores.

The COGAT measures the ability level of each child "to work with three basic types of symbols--verbal, quantitative, and geometric . . ." which have "important implications for success in school or other learning activities" (Thorndike & Hagen, 1986, p. 3). "Thus, an individual's score on the test should reflect primarily his or her ability to discover relationships and show flexibility in reasoning and problem-solving" (p. 5). The Standard Age Score (normalized standard score) for each battery by age group has a mean of 100 with a standard deviation of 16 (p. 47).

The ". . . K-R #20 reliability estimates (coefficients of equivalence), by test level, averaged about .90 for the Verbal Battery, .91 for the Quantitative Battery, and .91 for the Nonverbal Battery" (Thorndike & Hagen, 1986, p. 3).

For standardization and norming samples, 167,500 students from public and private schools in different geographic and socioeconomic areas were tested during 1984-85 (Thorndike & Hagen, 1986).

Gender of Students

The gender of the students in the study was analyzed to see if there was an association between sex and learning modality(ies).

Race of Students

The race (black or white) of the students in the study was analyzed to see if there was an association between race and dominant learning modality(ies). In addition, the data were analyzed to see if black or white students learned the concepts more thoroughly through the structured lessons used in the study.

Creativity of Student Art Products

Products of the treatment group were compared to those of the comparison group to determine if the structured lessons affected the creativity of the children's artwork. The measures of creativity, which normally include fluency, flexibility, originality, and elaboration (Lowenfeld & Brittain, 1987; Read, 1945; and Torrance, 1965) were limited in this study to originality and elaboration. This limitation was necessary because the assessment of the students' work was conducted only on the results of their

finished products. The actual process of creating the artwork was not observed by the assessors. Therefore, they had no knowledge concerning the generation of multiple ideas (fluency) nor the shifting of thoughts (flexibility) as the learners progressed through the process of creating their artwork. Although in a forty-five minute art period, students did not have time for much elaboration in their work, the embellishment of their work was still considered.

A random numbers table was used to select 25 pieces of art from the approximately 235 pieces created by children during the treatment lessons. These were compared to 25 pieces of art randomly selected from approximately 300 pieces created by children in the comparison group during the same time period. The treatment group products consisted of fewer pieces than the comparison group because the City Planning lesson which included area, volume, and perimeter was worked on for four weeks. All artwork done by the children in the treatment and comparison groups was included in the population of art pieces. This included several pieces the art teacher felt were not complete although each child had the same amount of time to work on each of them.

Eight elementary art teachers from the school system in which the study took place, but who knew little if anything about the study, attended a meeting where they were asked to rate the 50 samples of art. The artwork was displayed randomly on the classroom tables throughout the room. Only

the researcher and the art teacher who was involved in the study knew which artwork came from the treatment and comparison groups. Neither of them participated in the rating. The eight teachers were asked to judge each piece of art independently and to rate it in terms of creativity (originality and elaboration) on a scale from 1 to 5. A "one" signified not very creative while a "five" signified very creative. A Creativity Assessment of Student Products score sheet is located in Appendix D.

A mean score was obtained for each group. The mean score of the treatment group was compared to that of the comparison group to see if there was a significant difference in the creativity of the products of the two groups.

In addition, three art teachers read the specially designed lessons to assess the potential for creativity in the children's art within the framework of the structured lessons. A scale similar to the one for assessing creativity of student work was used. The Assessment of Art Lessons for Potential Creativity is located in Appendix D. A mean score was obtained from the ratings of the three teachers' scores and compared to the rating scale to determine potential for creativity.

Analysis

1. **Can the making of art enhance the learning of specific concepts?**

The subjects in the study could not be assigned to treatment and comparison groups randomly as they had to stay within their regular classroom groupings. Each of the four intact classrooms of learners was randomly assigned to either the treatment or comparison group by using a random numbers table. As the groups had to be studied as they were, an analysis of covariance was used to test the differences in means between the posttest scores after the initial differences in pretest scores were taken into account (Kerlinger, 1965). An analysis of covariance was conducted for each of the six dependent variables in the study. The variables were: area, volume, perimeter, congruency, pattern, and sequence. An additional analysis of covariance was conducted on the total score calculated across dependent variables.

2. **What differences are there between the teaching modalities used by the art teacher and those used by the classroom teachers?**

A chart was designed to compare the percentage of time auditory, visual, kinesthetic/tactile and mixed modalities were emphasized in teaching by the art teacher and by the classroom teachers in the comparison group.

Information for the chart was obtained through observation using the Teacher Behavior Checklist found in Appendix D. The reported percentages are averages for the two classes in the treatment group and for the two classes in the comparison group.

3. **Do students with a particular dominant or combination of learning modalities learn concepts more easily through art?**

An analysis of covariance was used for each of seven independent variables to determine if children with particular learning modality(ies) learn concepts more readily through the integration of art activities.

4. **Will learning of concepts transfer when students see a problem in a testing situation not related to art? That is, when students who have been taught a concept through an art activity see the concept in a testing situation not related to art, will knowledge of the concept transfer?**

Results of the SRA Achievement Series posttest and the AIMS posttest were compared against scores on the pretests for the treatment and comparison groups. If student scores were significantly different (higher) on the posttests, then it can be assumed that transfer occurred. If student scores were not significantly different on the posttests, then it can be assumed that transfer did not occur.

Test item answers were analyzed to determine if students were able to transfer knowledge gained from art lessons to more specific items as found in a testing situation. Also answers were examined to determine if students were able to complete items on the test correctly which dealt with inches, meters, and so forth when they were taught the concepts using "units" for measurement.

5. **Do art lessons which are structured to teach specific concepts inhibit the creativity of students to whom they are taught?**

An independent t-test was conducted to compare the mean scores of the treatment group to the mean scores of the comparison group to determine if there was a significant difference in the creativity of the products of the two groups as measured by the Creativity Assessment of Student Products.

6. **Does the "feeling tone" of the classroom affect the extent to which students learn the selected concepts?**

Prior to answering this question, data were gathered to determine how often the treatment and the comparison teachers exhibited positive, negative, and neutral feeling tone while teaching the specified concepts. A one-way analysis of covariance was conducted to determine if feeling tone in the classroom affected the way the students learned the selected concepts.

7. **What is the relationship between developed ability level and learning modality(ies)?**

A one-way analysis of variance was conducted to determine if there was a significant relationship between the COGAT score and learning modality(ies).

8. **How much do boys and girls differ in the extent to which they learn the designated concepts?**

A two-way analysis of covariance was used on all seven dependent variables on both SRA and AIMS tests to determine whether boys or girls within the treatment and comparison groups learned the selected concepts more thoroughly.

9. **How much do black and white students differ in the extent to which they learn the designated concepts?**

A two-way analysis of covariance was used on all seven dependent variables on both SRA and AIMS tests to determine whether black or white students within the treatment and comparison groups learned the selected concepts more thoroughly.

10. **What is the association between learning modality(ies) and race?**

A chi-square analysis was used to determine the association between learning modality(ies) and race.

11. **What is the association between learning modality(ies) and gender?**

A chi-square analysis was used to determine the association between learning modality(ies) and gender.

CHAPTER 3

RESULTS

This chapter contains the findings from the analyses of the data obtained from the study of the teachers and of the students. The results were obtained by conducting chi-square tests, *t*-tests, analyses of variance, and analyses of covariance.

Learning Concepts Through Art

1. Can the making of art enhance the learning of specific concepts?

The results of the analyses of covariance (Table 1) indicated that in the combined achievement scores across all concepts there was a significant difference in adjusted posttest means between the comparison and the treatment groups in favor of the treatment group. From a possible score of two, the mean score for the comparison group was 1.67 while the mean score for the treatment group was 1.71. A "one" signified an incorrect response to a question. A "two" signified a correct answer. In the individual concepts, there was a significant difference between adjusted posttest group means for the concept of pattern. This

Table 1. Results of the Analyses of Covariance for Differences Between Groups on Adjusted Posttest Mean Scores for the Concepts of Area, Volume, Perimeter, Congruency, Pattern, Sequence, and Total (N=87)

Analyses of Covariance Summary Tables

Source of Variation	SS	df	MS	F	Sig of F
		Area			
Within cells	3.98	84	.05		
Regression	1.49	1	1.49	31.48	.00
Group	.18	1	.18	3.74	.056*
		Volume			
Within cells	3.98	84	.05		
Regression	2.63	1	2.63	55.59	.00
Group	.02	1	.02	.46	.50
		Perimeter			
Within cells	2.27	84	.03		
Regression	.36	1	.36	13.35	.00
Group	.02	1	.02	.80	.37
		Congruency			
Within cells	1.03	84	.01		
Regression	.06	1	.06	4.63	.03
Group	.02	1	.02	1.95	.17
		Pattern			
Within cells	2.45	84	.03		
Regression	.04	1	.04	1.51	.22
Group	.18	1	.18	6.00	.02*
		Sequence			
Within cells	2.27	84	.03		
Regression	.36	1	.36	13.35	.00
Group	.02	1	.02	.80	.37
		Total			
Within cells	.52	84	.01		
Regression	.58	1	.58	94.03	.00
Group	.04	1	.04	6.95	.01**

*$p < .05$. **$p < .01$.

(continued)

Table 1 (continued)

Summary of Analyses of Covariance

	Treatment			Comparison				
	n	M	SD	n	M	SD	F	p
Area	47	1.54	.26	40	1.45	.24	3.74	.056*
Volume	47	1.21	.28	40	1.17	.27	.46	.50
Perimeter	47	1.81	.18	40	1.84	.16	.80	.37
Congruency	47	1.97	.09	40	1.93	.14	1.95	.17
Pattern	47	1.96	.09	40	1.87	.23	6.00	.02*
Sequence	47	1.81	.18	40	1.75	.23	2.41	.12
Total	47	1.71	.12	40	1.67	.11	6.95	.01**

*$p < .05$. **$p < .01$.

Note. The covariate was the corresponding pretest score in each analysis. The number of questions for each concept was: area (4), volume (4), perimeter (5), congruency (4), pattern (4), sequence (7), and total (28).

difference was in favor of the treatment group. The mean score for the comparison group was 1.87 while the mean score for the treatment group was 1.96. There was also a significant difference in the adjusted posttest mean for the concept of area in favor of the treatment group. The mean score for the comparison group was 1.45 while the mean score for the treatment group was 1.54. There were no significant differences in adjusted posttest mean scores for the concepts of perimeter, congruency, volume, and sequence when examined individually.

Whether students were taught the selected concepts by teachers in the comparison group using traditional methods or by the art teacher using the specially designed art lessons, as a whole they improved their average posttest scores over their pretest scores.

Upon reviewing the results of statistical analyses, the data indicate that the making of art did enhance the learning of concepts. When observing the total adjusted means for the concepts of area, volume, perimeter, congruency, pattern, and sequence as a whole, the difference between the treatment group and the comparison group was statistically significant in favor of the treatment group. In particular, the students in the treatment group were able to learn the concepts of area and pattern more efficiently through art than the students in the comparison group. There were no significant

differences between group means on the individual concepts of perimeter, volume, congruency, and sequence.

Many psychologists and educators have recognized the importance of linking areas of the curriculum to help students learn. Others have stated that linking information in a student's mind through visual symbols can help students retain and recall. In this study, an art teacher was given the opportunity to connect subject areas through the creation of art products. Favorable results were obtained by using art as a tool to aid learning in other disciplines. Perhaps, as Read (1945) stated, art is a natural mode of integration for children.

From the results of this study, it appears that students whose teachers presented the selected concepts to them using traditional or treatment methods improved in their knowledge of those concepts. When art was used as a vehicle to teach concepts, a significantly higher mean posttest score across concepts resulted for the treatment group. In the treatment group, when art was used as a link between certain mathematical concepts and between certain reading concepts, it appears to have enhanced learning. During observation of the art teacher as she taught, it was noted that she spoke of the need to use mathematical formulas when making a city plan. She also discussed with her students the idea of pattern in relation to patterns in clothing, patterns in

numbers, and patterns in the natural and man-made environment. She talked about the importance of the order or sequence of steps needed to create certain types of artwork. She connected that idea to the sequence of events that occurs when reading a story in order to comprehend its meaning. The linking of subjects by the comparison teachers did not occur.

When another discipline can be easily integrated into an art lesson to assist learning, without jeopardizing the content of either subject, it would seem to be an appropriate teaching strategy for teachers to use.

Differences Between Teaching Modalities of Art Teacher and Classroom Teachers

2. What differences are there between the teaching modalities used by the art teacher and those used by the classroom teachers?

The results obtained through observation using the Teacher Behavior Checklist indicate that the art teacher (treatment teacher) and the classroom teachers (comparison teachers) all used visual, auditory, and kinesthetic modalities plus combinations of these modalities in their teaching while being observed by the researcher. A difference in the amount of time spent teaching in each modality or combination of modalities was discovered. Table

2 compares the number of minutes modalities were emphasized by the treatment and comparison teachers. It also depicts the mean and percentage of time different modalities were used during instruction. Overall the auditory and visual/auditory modalities were emphasized most often by teachers when teaching all concepts. From the results of the data shown in this table, it appears that the comparison teachers spent approximately triple the amount of time using visuals alone as the treatment teacher. The comparison teachers spent approximately twice as much time as the treatment teacher using the auditory modality alone. The treatment teacher spent twice as much time as the comparison teachers using kinesthetic modalities alone while teaching. When the treatment teacher showed visuals while talking about the concepts to be learned, she did so about one and a half times as often as the comparison teachers. She used the visual modality in combination with the kinesthetic modality slightly more often than the comparison teachers. In addition, the treatment teacher spent more time using auditory/kinesthetic combinations of instruction than the comparison teachers. She also spent approximately four times the amount of time using a combination of visual/auditory/kinesthetic modalities as the comparison teachers.

Table 3 illustrates the mean number of minutes particular modalities were emphasized during the instruction

Table 2. Number of Minutes Modalities Were Emphasized by Treatment and Comparison Teachers During Instruction of Each Concept

Teacher	Concepts	Modalities 1 V	2 A	3 K	4 VA	5 VK	6 AK	7 VAK
Comparison Group 1 (Mrs. C.)	1 perimeter	5	22	0	8	1	0	0
	2 area	7	28	0	7	0	0	0
	3 volume	6	26	2	1	1	0	1
	4 congruency	2	22	0	0	2	0	1
	5 pattern	3	11	2	5	0	0	0
	6 sequence #1	0	14	0	9	0	0	0
	7 sequence #2	0	20	0	9	0	0	0
	Total	23	143	4	39	4	0	2
Comparison Group 2 (Mrs. A.)	1 perimeter	1	22	0	8	0	0	3
	2 area	2	25	0	3	1	1	3
	3 volume	0	18	2	7	1	0	5
	4 congruency	1	21	0	6	0	0	4
	5 pattern	3	14	0	6	1	0	2
	6 sequence #1	2	14	0	5	0	0	0
	7 sequence #2	1	12	0	6	0	0	1
	Total	10	126	2	41	3	1	18
Total Minutes for Comparison Group		33.0	269.0	6.0	80.0	7.0	1.0	20.0
Mean		16.5	134.5	3.0	40.0	3.5	0.5	10.0
Percentage of Time		5.2	42.7	1.0	12.7	1.1	0.2	3.2

(continued)

Table 2 (continued)

Teacher	Concepts	Modalities 1 V	2 A	3 K	4 VA	5 VK	6 AK	7 VAK
Treatment Group 3 (Mrs. W.)	1 perimeter	1	11	1	6	1	2	8
	2 area	1	15	4	15	2	3	0
	3 volume	1	13	1	6	0	0	9
	4 congruency	2	7	0	13	1	0	5
	5 pattern	2	10	1	9	0	5	3
	6 sequence #1	1	6	0	7	1	0	7
	7 sequence #2	0	13	0	2	1	2	8
	Total	8	75	9	58	6	12	40
Treatment Group 4 (Mrs. W.)	1 perimeter	0	12	0	6	0	3	7
	2 area	2	12	0	8	0	2	5
	3 volume	0	8	0	8	3	0	8
	4 congruency	1	5	0	11	0	0	7
	5 pattern	0	6	2	8	0	5	3
	6 sequence #1	0	12	0	8	0	0	5
	7 sequence #2	0	9	2	5	1	1	4
	Total	3	64	4	54	4	11	39
Total Minutes for Treatment Group		11.0	139.0	13.0	112.0	10.0	23.0	79.0
Mean		6.0	70.0	7.0	56.0	5.0	12.0	40.0
Percentage of Time		1.7	22.1	2.1	17.8	1.6	3.7	12.5

Note. The explanation for abbreviations is as follows.
V = visual; A = auditory; K = kinesthetic;
VA = visual/auditory; VK = visual/kinesthetic;
AK = auditory/kinesthetic;
VAK = visual/auditory/kinesthetic.

Totals of minutes do not equal 630 and totals of percentages do not equal 100 because of use by teachers of combinations of modalities and non-direct teaching. Treatment group (2 classes per concept) = 2 X 7 lessons X 45 minutes = 630 minutes. Comparison group (2 classes per concept) = 2 X 7 lessons X 45 minutes = 630 minutes.

Table 3. Mean Differences Between Groups on Number of Minutes Modalities Were Emphasized During Instruction of Each Concept

	Treatment			Comparison		
	n	M	SD	n	M	SD
		Visual				
Perimeter	2	.50	.71	2	3.00	2.83
Area	2	1.50	.71	2	4.50	3.54
Volume	2	.50	.71	2	3.00	4.24
Congruency	2	1.50	.71	2	1.50	.71
Pattern	2	1.00	1.41	2	3.00	.00
Sequence #1	2	.50	.71	2	1.00	1.41
Sequence #2	2	.00	.00	2	.50	.71
		Auditory				
Perimeter	2	11.50	.71	2	22.00	.00
Area	2	13.50	2.12	2	26.50	2.12
Volume	2	10.50	3.54	2	22.00	5.66
Congruency	2	6.00	1.41	2	21.50	.71
Pattern	2	8.00	2.83	2	12.50	2.12
Sequence #1	2	9.00	4.24	2	14.00	.00
Sequence #2	2	11.00	2.83	2	16.00	5.66
		Kinesthetic				
Perimeter	2	.50	.71	2	.00	.00
Area	2	2.00	2.83	2	.00	.00
Volume	2	.50	.71	2	2.00	.00
Congruency	2	.00	.00	2	.00	.00
Pattern	2	1.50	.71	2	1.00	1.41
Sequence #1	2	.00	.00	2	.00	.00
Sequence #2	2	1.00	1.41	2	.00	.00
		Visual/Auditory				
Perimeter	2	6.00	.00	2	8.00	.00
Area	2	11.50	4.95	2	5.00	2.83
Volume	2	7.00	1.41	2	4.00	4.24
Congruency	2	12.00	1.41	2	3.00	4.24
Pattern	2	8.50	.71	2	5.50	.71
Sequence #1	2	7.50	.71	2	7.00	2.83
Sequence #2	2	3.50	2.12	2	7.50	2.12

(continued)

Table 3 (continued)

	Treatment			Comparison		
	n	M	SD	n	M	SD
		Visual/Kinesthetic				
Perimeter	2	.50	.71	2	.50	.71
Area	2	1.00	1.41	2	.50	.71
Volume	2	1.50	2.12	2	1.00	.00
Congruency	2	.50	.71	2	1.00	1.41
Pattern	2	.00	.50	2	.00	.71
Sequence #1	2	.50	.71	2	.00	.00
Sequence #2	2	1.00	.00	2	.00	.00
		Auditory/Kinesthetic				
Perimeter	2	2.50	.71	2	.00	.00
Area	2	2.50	.71	2	.50	.71
Volume	2	.00	.00	2	.00	.00
Congruency	2	.00	.00	2	.00	.00
Pattern	2	5.00	.00	2	.00	.00
Sequence #1	2	.00	.00	2	.00	.00
Sequence #2	2	1.50	.71	2	.00	.00
		Visual/Auditory/Kinesthetic				
Perimeter	2	7.50	.71	2	1.50	2.12
Area	2	2.50	3.54	2	1.50	2.12
Volume	2	8.50	.71	2	3.00	2.83
Congruency	2	6.00	1.41	2	2.50	2.12
Pattern	2	3.00	.00	2	1.00	1.41
Sequence #1	2	6.00	1.41	2	.00	.00
Sequence #2	2	6.00	2.83	2	.50	.71

of each individual concept by the treatment and comparison teachers. The comparison teachers spent more time using visuals alone while teaching the concepts except for congruency. Both groups averaged one and one-half minutes using visuals alone while teaching the concept of congruency. It was expected that, as a whole, the treatment teacher would use visuals more often than the comparison teachers. When all modalities which contained the visual element were combined (visual, visual/auditory, visual/kinesthetic, and visual/auditory/kinesthetic), it was found that she did. The treatment teacher averaged 15.1 minutes of visual/visual combinations while teaching a class, whereas the comparison teachers averaged 10 minutes of visuals. These data are located in Table 4.

During the teaching of the specific concepts, it was found that the comparison teachers used visual/visual combinations only 22% of the time while the treatment teacher used visual/visual combinations over 33% of the time. The treatment teacher spent about 30% more time on visual/visual combinations than did the comparison teachers. Of the 630 minutes available for instruction of the specific concepts, the treatment teacher spent 212 minutes engaged in visual/visual combination teaching. The comparison teachers spent 140 minutes of the 630 minutes in visual/visual combination teaching. The remainder of the time was non-visual. The non-visual time was spent in either

Table 4. Mean Differences Between Groups in Number of Minutes Each Modality Combination was Emphasized by Concept

	Treatment			Comparison		
	n	M	SD	n	M	SD
Visual Modalities						
Perimeter	2	14.5	2.1	2	13.0	1.4
Area	2	16.5	2.1	2	11.5	3.5
Volume	2	17.5	2.1	2	11.0	2.8
Congruency	2	20.0	1.4	2	8.0	4.2
Pattern	2	12.5	2.1	2	10.0	2.8
Sequence 1	2	14.4	2.1	2	8.0	1.4
Sequence 2	2	10.5	0.7	2	8.5	0.7
Total	2	15.1		2	10.0	
Total Number of Minutes		212.0				140.0
Total Percentage of Time		33.7				22.2
Auditory Modalities						
Perimeter	2	27.5	0.7	2	31.5	2.1
Area	2	30.0	4.2	2	33.5	2.1
Volume	2	26.0	2.8	2	29.0	1.4
Congruency	2	24.0	1.4	2	27.0	5.7
Pattern	2	24.5	3.5	2	19.0	4.2
Sequence 1	2	22.5	3.5	2	21.0	2.8
Sequence 2	2	22.0	4.2	2	24.0	7.0
Total	2	25.2		2	26.4	
Total Number of Minutes		353.0				370.0
Total Percentage of Time		56.0				58.7
Kinesthetic Modalities						
Perimeter	2	11.0	1.4	2	2.0	1.4
Area	2	8.0	1.4	2	2.5	3.5
Volume	2	10.5	0.7	2	6.0	2.8
Congruency	2	6.5	0.7	2	3.5	0.7
Pattern	2	9.5	0.7	2	2.5	0.7
Sequence 1	2	6.5	2.1	2	0.0	0.0
Sequence 2	2	9.5	2.1	2	0.5	0.7
Total	2	8.8		2	2.4	
Total Number of Minutes		125.0				34.0
Total Percentage of Time		19.8				5.4

auditory, kinesthetic, a combination of auditory and kinesthetic modes, or in non-direct teaching (Table 4).

Literature on teaching behavior indicates that teachers spend a large portion of available classroom time in the verbal mode of instruction (Flanders, 1965). This study confirms that research. The treatment teacher and the comparison teachers all spent over 50% of their teaching time using auditory/auditory combinations. The treatment teacher spent 56% of the teaching time using auditory/auditory combinations while the comparison teachers used almost 59% of their time in auditory/auditory combinations (Table 4). The treatment teacher spent 353 minutes and the comparison teachers spent 370 minutes of the 630 possible minutes engaged in teaching using auditory/auditory combinations. This finding did not reveal as great a difference between groups as expected. What was more revealing was that while both the comparison and treatment teachers used auditory/auditory combinations for a similar amount of time, when the auditory modality was separated from the auditory combinations, a different picture was observed. Mrs. C., a comparison teacher, used speech alone for 143 minutes, and combined it with visuals or kinesthetics for only 41 minutes. Mrs. A., a comparison teacher, used speech alone for 126 minutes, and combined it with visuals or kinesthetics for only 60 minutes. In contrast, the treatment teacher used

speech alone for an average of almost 70 minutes, but combined it with visuals or kinesthetics for 108 minutes.

In using the auditory modality alone, the comparison teachers verbalized overall almost twice as much as the treatment teacher. When teaching perimeter, area, and volume, the comparison teachers talked almost twice as much as the treatment teacher. When teaching the concept of congruency, the comparison teachers verbalized over three times as much as the treatment teacher. In addition, they talked about one and one-half times as often as the treatment teacher when instructing the students in the concepts of pattern and sequence.

Another expectation which was confirmed by the study was the use of the kinesthetic mode of instruction. It was expected that the treatment teacher would use more "hands-on" demonstrations and gestures while instructing than the comparison teachers. In fact, she used over twice as much time teaching with the kinesthetic modality alone than did the other teachers (Table 2). When teaching the concepts of perimeter, area, congruency, and sequence, no kinesthetics alone were used by the comparison teachers (Table 2). They spent 1/3 less time using kinesthetics to teach the concept of pattern than the treatment teacher. Only in instructing the concept of volume did the comparison teachers demonstrate and gesture more than the treatment teacher. When all modalities which contained the kinesthetic element were

combined, it was found that the treatment teacher averaged approximately four times as many kinesthetic/kinesthetic combinations as did the comparison teachers per class. The treatment teacher spent 125 minutes using kinesthetic/kinesthetic combinations while the comparison teachers spent only 34 minutes instructing with kinesthetic/kinesthetic combinations (Table 4). The mean differences between groups in number of minutes the treatment teacher and the comparison teachers used visual combinations, auditory combinations, and kinesthetic combinations per concept taught is also depicted in Table 4.

The treatment and comparison teachers used a multimodal approach when teaching the selected concepts. Each teacher, at some point, used visual, auditory, and kinesthetic modes of instruction and their combinations, but the extent to which different modalities were used varied greatly. The data indicated that as a whole the treatment teacher averaged more of each 45-minute period instructing with visual/visual combinations and with kinesthetic/kinesthetic combinations than the comparison teachers. The comparison teachers spent more time using auditory combinations than the treatment teacher.

Although all teachers used kinesthetic modality when attempting to convey the concept of volume, the comparison teachers used kinesthetics alone more often than the treatment teacher. Mrs. A. constructed a paper cube and ran

her fingers along the sides of the cube and demonstrated how to compute volume. She did little talking during the demonstration. After her demonstration, the children each made a paper cube from a pattern. They measured their cubes to compute volume.

Mrs. C. picked up a book and a box and pointed out the length, width, and height with her fingers. She, too, did not talk a great deal while demonstrating. Children seated at the front of the room were handed boxes or books and asked to compute their volume. After this was done, the children followed the presentation of the lesson by computing volume from a page of problems in their textbooks.

The treatment teacher combined her use of kinesthetics with visuals and verbal discussion, rather than relying on kinesthetics alone. She constructed a box, discussed how it contained space, and drew a box on the chalkboard. She asked questions of the students while she demonstrated. The children created several cubes from colored paper after the teacher showed them how to do it and then combined them to make paper buildings. They measured their buildings to compute volume.

Although the comparison teachers spent more time using kinesthetics alone while teaching volume, the treatment teacher spent more time using a combination of kinesthetic/kinesthetic modalities than the comparison teachers.

Relationship of Modality on Learning Through Art

3. Do students with a particular dominant or combination of learning modalities learn concepts more easily through art?

The results obtained through the administration of the Swassing-Barbe Modality Index are revealed in Table 5. The table depicts the number and percent of students in the study by dominant learning modality. There were 27.6% who were visual learners; 16.1% who were auditory learners; 14.9% who were kinesthetic learners; 16.1% who were visual/auditory learners; 10.3% who were visual/kinesthetic learners; 6.9% who were auditory/kinesthetic learners; and 8% who were visual/auditory/kinesthetic learners. These results are similar to findings by Milone (1981) who had also administered the Swassing-Barbe Modality Index (SBMI) to children. Results of Bonner's (1981) study using the SBMI are also similar to this researcher's findings for auditory and mixed learners, but Bonner found more visual learners and less kinesthetic learners in her sample than Willett or Milone. Lowenfeld (1945), using his own survey, found that with adults, 47% were visual learners, 23% were haptic learners (similar to tactile/kinesthetic), and 30% were not clearly defined. (Lowenfeld did not address the auditory learner in his work.) Ast (1981) used Lowenfeld's (1945) theory of visual-haptics in a study with children and found

Table 5. Number and Percentage of Students in the Study by Dominant Learning Modality

Modality	Count	Percent
Visual	24	27.6
Auditory	14	16.1
Visual/Auditory	14	16.1
Kinesthetic	13	14.9
Visual/Kinesthetic	9	10.3
Visual/Auditory/ Kinesthetic	7	8.0
Auditory/Kinesthetic	6	6.9
Total	87	99.9

Note. Total percentage does not equal 100 because of rounding.

that approximately 42% were haptic learners. Others in the study were divided between visual and non-defined learners. Table 6 provides a comparison of percentages from the five studies.

An analysis of covariance was run for each dependent variable (area, volume, perimeter, congruency, pattern, sequence, and total) to determine if students with particular learning modalities were able to learn the concepts more easily through art activities (Table 7). The respective pretest score was used as the covariate. The adjusted score per modality for each group was the dependent variable. It was expected that students who were identified through the administration of the Swassing-Barbe Modality Index as kinesthetic and visual learners would learn the selected concepts better through the art lessons while the auditory learners would learn more through traditional auditory teaching styles. Results of the analyses revealed there were no significant differences in the amount of knowledge gained by students based on their individual learning modalities and method of instruction.

A child's dominant learning modality, determined from the results of the Swassing-Barbe Modality Index, appeared to have no influence on the amount of knowledge gained by the type of instruction received. Children with visual or kinesthetic learning dominance apparently did not learn more from the treatment teacher than auditory learners as expected

Table 6. Comparison of Percentage of Learners by Modality Strength in Five Different Studies

	Willett	Milone	Lowenfeld	Ast	Bonner
Visual learners	28	30	47	--	46
Auditory learners	16	25	--	--	16
Kinesthetic learners	15	15	23	42	6
Mixed	41	30	--	--	32
Not defined	--	--	30	--	--

Note. Willett's (1987) population consisted of low to middle socioeconomic 5th grade children. Bonner's (1981) population consisted of children in grades 1 through 5. Milone's (1981) and Ast's (1981) population also consisted of children. Lowenfeld's (1945) population consisted of adults.

Table 7. Results of the Analyses of Covariance for Differences Between Learning Modalities on Adjusted Posttest Mean Scores for the Concepts of Area, Volume, Perimeter, Congruency, Pattern, Sequence, and Total (N=87)

Analyses of Covariance Summary Tables

Source of Variation	SS	df	MS	F	Sig of F
		Area			
Within cells	3.88	79	.05		
Regression	1.14	1	1.14	23.15	.00
Modality	.28	6	.05	.95	.46
		Volume			
Within cells	3.55	79	.04		
Regression	2.29	1	2.29	50.96	.00
Modality	.45	6	.07	1.66	.14
		Perimeter			
Within cells	2.01	79	.03		
Regression	.34	1	.34	13.48	.00
Modality	.28	6	.05	1.84	.10
		Congruency			
Within cells	1.00	79	.01		
Regression	.03	1	.03	2.71	.10
Modality	.05	6	.01	.72	.63
		Pattern			
Within cells	2.52	79	.03		
Regression	.06	1	.06	1.81	.18
Modality	.11	6	.02	.57	.75
		Sequence			
Within cells	2.59	79	.03		
Regression	1.06	1	1.06	32.30	.00
Modality	.10	6	.02	.51	.80
		Total			
Within cells	.51	79	.01		
Regression	.51	1	.51	78.76	.00
Modality	.05	6	.01	1.34	.25

(continued)

Table 7 (continued)

Summary of Analyses of Covariance

	V (n=24)		A (n=14)		K (n=13)		VA (n=14)		VK (n=9)		AK (n=6)		VAK (n=7)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Area	1.50	.25	1.53	.27	1.58	.28	1.46	.21	1.37	.22	1.47	.29	1.47	.24
Volume	1.17	.30	1.20	.37	1.32	.24	1.08	.15	1.16	.21	1.25	.39	1.13	.09
Perimeter	1.83	.20	1.86	.12	1.88	.13	1.72	.22	1.83	.12	1.89	.16	1.75	.15
Congruency	1.93	.13	1.93	.16	1.93	.11	2.00	.00	1.97	.08	1.96	.10	1.96	.09
Pattern	1.93	.18	1.94	.15	1.86	.28	1.90	.16	1.91	.18	2.00	.00	1.96	.09
Sequence	1.79	.26	1.72	.21	1.80	.17	1.78	.17	1.84	.24	1.82	.17	1.73	.18
Total (N=87)	1.70	.13	1.71	.14	1.72	.09	1.66	.06	1.68	.10	1.74	.15	1.66	.07

Note. The explanation for abbreviations is as follows. V = visual; A = auditory; K = kinesthetic; VA = visual/auditory; VK = visual/kinesthetic; AK = auditory/kinesthetic; VAK = visual/auditory/kinesthetic.

although the teaching style included the use of more visuals and more tactile/kinesthetic demonstrations. Likewise, children who were identified as auditory learners gained no more knowledge from the comparison teachers who taught in a more auditory mode than they did from the treatment teacher.

A review of the literature revealed mixed results from studies which attempt to link learning styles with teaching styles to increase knowledge and enhance retention. Further research will be helpful to educators to determine if teaching to students' specific modalities can increase learning. If more research indicates teaching to students' dominant modality can increase learning, then it will be necessary to accurately determine each student's learning modality to benefit fully from the teaching/learning style match. Additional studies should be conducted to determine which tests or indices reveal valid data for determining dominant learning styles.

Transfer of Concepts

4. Will learning of concepts transfer when students see a problem in a testing situation not related to art?

The posttest scores of the SRA Achievement Series and the AIMS tests were compared against scores on the pretests

for the treatment group (and comparison group). A chart depicting the results is displayed in Table 8.

The results obtained through analyzing the pre- and posttests for the treatment group indicated that the learning of concepts transferred from art lessons to the testing situation. The mean scores for each of the selected concepts, including the total, were higher on the posttest than they were on the pretest.

Results of further analyses indicated that students in the treatment group scored higher overall than students in the comparison group. When observing the transfer of each individual concept, the following results were obtained. On each concept (area, volume, congruency, pattern, and sequence), students in the treatment group improved their posttest scores over their pretest scores by more than the comparison group. Only on the concept of perimeter did the comparison group improve their scores more than the treatment group.

When teaching the concepts of area, volume, and perimeter, the treatment teacher explained to her students that she would use the term "unit" or "units" to signify inches, feet, meters, or other units of measurement in order to simplify the lesson. The comparison teachers used a combination of terms such as units, feet, inches, and meters during their instruction. If the term units were used during instruction by the treatment teacher, would understanding of

Table 8. Comparison of Pretest and Posttest Scores From the SRA Achievement Series and the AIMS Tests to Determine Transfer of Knowledge of Concepts by Concept

	Comparison (n=40)			Treatment (n=47)		
Concept	Pre	Post	Diff	Pre	Post	Diff
Area	1.37	1.45	.08	1.35	1.53	.18
Volume	1.16	1.20	.04	1.10	1.18	.08
Perimeter	1.72	1.84	.12	1.74	1.81	.07
Congruency	1.91	1.94	.03	1.84	1.96	.12
Pattern	1.85	1.87	.02	1.89	1.96	.07
Sequence	1.61	1.74	.13	1.64	1.82	.18
Total	1.60	1.67	.07	1.59	1.71	.12

the concepts transfer when students in the treatment group saw the terms meters, centimeters (cm), and cubic centimeters (cm^3) on a test? Answers to individual questions for the concepts of area, volume, and perimeter were examined for both the comparison and treatment groups to determine if the mean of the treatment group responses per question on these items improved as much as or more than the mean of the comparison group responses when different terms for units of measurement were used.

Table 9 depicts the results of the pre- and posttest mean scores for area, volume, and perimeter for the treatment and comparison groups. The pretest/posttest differences between groups are also shown.

Overall, for the thirteen questions on the SRA and on the AIMS tests dealing with area, volume, and perimeter, the treatment group had higher gain scores than the comparison group. Nine of thirteen posttest mean scores showed more improvement for the treatment group. On every question where the measurement term was units, the treatment group increased its posttest scores over its pretest scores by more than the comparison group. The treatment group also increased its posttest scores over its pretest scores by more than the comparison group on all the questions about the concept of area even when the measurement terms were different from the ones used for instruction (e.g., square centimeters or square meters instead of units). This would indicate that the

Table 9. Comparison of Pre- and Posttest Mean Scores for Area, Volume, and Perimeter per Question by Group

	Pretest						Posttest							
	Comparison			Treatment			Comparison			Treatment			Pre/Posttest Diff.	
Concept	n	M	SD	n	M	SD	n	M	SD	n	M	SD	Comp	Treat
SRA														
Perimeter														
1. cm	39	1.85	.37	47	1.85	.34	40	1.98	.16	47	1.89	.31	.13	.04
2. meters	39	1.67	.48	47	1.77	.43	40	1.90	.30	47	1.85	.36	.23	.08
Area														
1. square units	39	1.31	.47	47	1.30	.46	40	1.35	.48	47	1.49	.51	.04	.19
Volume														
1. cubic units	39	1.26	.44	47	1.15	.36	40	1.18	.38	47	1.19	.40	-.08	.04
AIMS														
Perimeter														
1. m	40	1.95	.22	47	1.98	.15	40	1.95	.22	47	1.96	.20	.00	-.02
2. units	40	1.93	.27	47	1.91	.28	40	1.98	.16	47	1.98	.15	.05	.07
3. cm	40	1.23	.42	47	1.17	.38	40	1.38	.49	47	1.36	.49	.15	.19
Area														
1. square cm	40	1.93	.27	47	1.83	.38	40	1.98	.16	47	1.94	.25	.05	.11
2. m^2	40	1.08	.27	47	1.11	.31	40	1.15	.36	47	1.34*	.48	.07	.23
3. $units^2$	40	1.15	.37	47	1.17	.38	40	1.33	.47	47	1.36	.49	.18	.19
Volume														
1. cubic cm	40	1.20	.41	47	1.15	.36	40	1.28	.45	47	1.21	.41	.08	.06
2. $units^3$	40	1.10	.30	47	1.04	.20	40	1.20	.41	47	1.15	.36	.10	.11
3. cm^3	40	1.10	.30	47	1.06	.25	40	1.15	.36	47	1.17	.38	.05	.11

*$F = 4.26$, $p < .05$.

concept of area transferred because students were able to solve problems which contained different measurement terms from the one stressed by their teacher.

There were mixed results for the questions on the concept of perimeter. The results of the SRA questions on perimeter revealed that the comparison group made more gain than the treatment group. The measurement terms used for the questions on the tests were cm and meters. The results of two questions on the AIMS test revealed that the treatment group made more improvement than the comparison group. The measurement terms were units and cm. On one of the AIMS questions for perimeter, the comparison group showed no improvement while the treatment group mean declined .02 from the pretest. The measurement term was m. The pretest means for this question were the highest of any question indicating that most children were knowledgeable about this concept before instruction. Lack of future gain was probably due to the "ceiling" effect.

The treatment group showed higher gains in means on three of four questions dealing with the concept of volume. The measurement terms used were cubic units, units^3, and cm^3. The comparison group showed higher gains in means on one question which used the measurement term of cubic cm.

Although the treatment and the comparison groups were taught differently, both groups were able to transfer the

learning from the instructional situation to the testing situation. However, it appeared that the students taught with art were able to do better than the comparison group at transferring their knowledge of concepts from the instructional situation to the testing situation.

Research has indicated that transfer of knowledge from one context to another can and does occur. When people learn information or skills in one context and then are able to apply that information or those skills in another context, transfer has occurred. In school the ability to develop transfer skills should not be left to chance alone because many students do not see connections between disciplines or situations on their own. When teachers teach for transfer they assist students to see connections and to apply pieces of information they learn to new situations.

Through a technique Perkins and Salomon (1988) call bridging, the teacher guides students to see how skills and knowledge can be used in a context different from the one in which it is learned. They also refer to high road transfer. High road transfer depends on the deliberate linking of concepts to different situations. In particular, when concepts are taught and linked together for students as the art teacher did, students are able to use learned information in different situations. As the art teacher taught concepts she verbalized about using each concept in different

situations. She helped students see connections between what they were learning in a particular lesson and how it could be used in other situations. By practicing to see connections while learning concepts, it is more likely that high road transfer can occur for students. When students in the treatment group practiced using a given concept, it was integrated into an art project. Later when they encountered questions on a test dealing with a concept they had learned in art, their knowledge of that concept had to transfer to a new context. They learned a concept through an art lesson and in order to answer a test question had to generalize or to recognize that the question on the test dealt with the same concept they had encountered in art. When they were able to accomplish this, high road transfer occurred.

Perkins and Salomon (1989) also spoke of hugging which means helping students learn skills so well that it will be easy for them to shift from one context to another. When the comparison teachers taught the concepts they used the hugging technique of practice, but did not use bridging techniques. The teachers did not help students see connections between what they were learning in a particular lesson and how it might be linked to other situations. They did have students practice using a concept by completing assignments in order to learn certain skills or knowledge.

When the students in the comparison group were in a testing situation, the problems encountered were similar to

the ones which were practiced in class. The similarity of the format between the way the concepts were practiced and the test questions triggered the memory recall. Transfer of knowledge was more specific. Perkins and Salomon refer to this as "low road transfer." In an example from the study, after students were introduced to the concept of congruency, they looked at diagrams of shapes in a book or on a worksheet. They observed a shape on the page and then found the shape which was congruent to it from a series of four or five other shapes. Practice was in the same format as seen on the tests. In contrast, in the art class, when students learned the concept of congruency, the art teacher demonstrated by using the overhead projector to place colored acetate shapes on top of other congruent colored acetate shapes. She asked students to discuss the importance of congruency and to point out shapes in the room which were congruent. To practice, students created an original shape from paper. They cut multiples of their shape from other paper to create congruent shapes. These were pasted onto background paper to create a pattern of congruent shapes.

Hugging and bridging techniques were used by the art teacher to help teach concepts. Using both techniques appears to enhance high road transfer whereby students understand a concept well enough that they can transfer their knowledge of it to a situation which is not as specific as the way in which it was initially learned. This is evidenced

by the results of the posttest mean scores for the concepts of area, volume, and perimeter. The treatment teacher used the measurement term units, while the comparison teacher used several terms such as inches, feet, meters, and so forth. In the testing situation a combination of terms was used. Overall students in the treatment group were able to transfer their knowledge of a given concept to solve problems on the tests which used a variety of measurement terms. As a group, they improved their knowledge of the tested concepts in nine of the 13 questions.

Relationship of Structured Lessons on Creativity

5. Do art lessons which are constructed to teach specific concepts inhibit the creativity of students to whom they are taught?

The mean score for each piece of artwork as measured by the subjective opinion of eight art teachers is displayed in Table 10. An independent *t*-test was conducted to compare the mean scores of the treatment group to the mean scores of the comparison group. The mean score of the treatment group was 3.61 on a 5-point scale with a standard deviation of .44. The mean score of the comparison group was 3.5 on a 5-point scale with a standard deviation of .64. A "one" signified not very creative, while a "five" signified very creative (Table 11). The results of the *t*-test indicated that there

Table 10. Mean Rating of Creativity for Art Produced by Students in Comparison and Treatment Groups (Eight Raters)

1.	2.250	*26.	4.125
2.	3.875	*27.	3.750
*3.	3.750	28.	3.625
4.	3.500	*29.	4.000
5.	3.375	*30.	4.000
6.	2.500	*31.	3.375
7.	2.500	*32.	4.000
8.	3.750	*33.	3.375
9.	4.000	34.	4.375
*10.	3.125	35.	3.250
11.	3.500	*36.	3.500
*12.	3.750	37.	4.625
13.	4.625	*38.	2.875
14.	2.875	39.	3.625
*15.	3.875	40.	2.625
*16.	2.875	*41.	4.000
*17.	3.250	*42.	4.625
18.	3.750	*43.	3.875
19.	3.375	*44.	2.875
*20.	3.375	*45.	3.375
21.	3.250	*46.	3.250
22.	3.875	47.	3.250
23.	3.000	*48.	3.500
24.	4.000	*49.	3.875
25.	4.125	*50.	3.875

*Treatment means

Table 11. Mean Difference in the Creativity of Art Produced by Students in the Treatment and Comparison Groups

	Treatment			Comparison				
	n	M	SD	n	M	SD	t	p
Creativity	25	3.61	.44	25	3.50	.64	-.71	.48

was no significant difference in the creativity of the products of the two groups as measured by the Creativity Assessment of Student Products.

Three art teachers, not involved in the rating of the art products, were asked to read and judge the lessons on the basis of their potential for encouraging creative product-making from children. The results of their ratings, tallied from the Creativity Assessment of Art Lessons, are found in Table 12. The mean score for the total of all seven lessons was 3.86 on a 5-point scale.

From the results of this analysis, it appears that lessons which are constructed to teach specific concepts do not inhibit the creativity of the children to whom they are taught. If the lessons are art lessons which have academic concepts integrated into them, they do not cause a loss in creativity of the artwork that children produce. The structure of the lessons helps give focus to the children's work, rather than inhibiting their spontaneity and creativity. These particular lessons were found to be above average (3.86 on a five-point scale) in their potential for eliciting creativity from children as judged by three art teachers.

The researcher's experience indicates that most children enjoy creating art products. Many do not enjoy learning

Table 12. Scores and Means for the Creativity Assessment of Art Lessons

		Assessors 1	2	3	Mean
Lesson	1.	4	3	4	3.67
	2.	3	2	5	3.33
	3.	5	4	5	4.67
	4.	5	4	5	4.67
	5.	4	4	4	4.00
	6.	3	2	3	2.67
	7.	4	4	4	4.00
Mean		4	3.29	4.29	3.86

mathematical formulas or reading and remembering information from stories they do not find interesting. When concepts taught in art class coincide with concepts taught in traditional subjects it seems that combining them can provide a way to teach or to reinforce academic concepts. Educators knowledgeable about the importance of art education for children would not want to use art as a tool for instructing academic concepts if the quality of the art experience and the creativity of the products made by children would be diminished. If art educators and classroom teachers worked together to design curriculum to teach subject matter in integrated lessons no subject area would need to lose its inherent qualities. Using art as a vehicle to help teach selected concepts can be a valid instructional strategy without a loss to art or to academic concepts as indicated by the results of this study.

Relationship of Feeling Tone in Classrooms on Learning of Concepts

6. Does the feeling tone affect the extent to which students learn the selected concepts?

The results obtained through observation using the Teacher Behavior Checklist are reported in Table 13. The table shows the mean number of minutes and the percentage of time teachers in the study exhibited positive (+), neutral

(0), or negative (-) feeling tone during the twenty-eight 45 minute lessons which were observed by the researcher. The average is calculated over the fourteen lessons taught by the treatment teacher and the seven lessons taught by each of the two comparison teachers. Lessons taught by the treatment teacher were those specially designed by the researcher for teaching the concepts of area, volume, perimeter, congruency, sequence, and pattern through art. The comparison teachers taught the same concepts as the treatment teacher, but used their traditional methods of instruction as requested by the researcher.

Results reported in Table 13 indicate that the treatment teacher exhibited positive feeling tone in her teaching an average of 7.36 minutes (or 16% of the time) during each 45 minute lesson in which she taught the selected concepts through art. She exhibited negative feeling tone .71 minutes (or 2% of the time). During the remainder of the lesson neutral feeling tone was exhibited; it accounted for 36.93 minutes (or 82% of the time). Of the comparison teachers, Mrs. A. exhibited behavior characteristic of a positive feeling tone 8% of the time while Mrs. C. exhibited positive behavior only 4% of the time. Mrs. W. was classified as the "positive" teacher because she exhibited positive behavior more often than either Mrs. C. or Mrs. A.

Mrs. C. was classified as the "negative" teacher. She displayed negative behavior 15% of the time whereas Mrs. W.

Table 13. Mean Number of Minutes and Percentage of Time Teachers Exhibited Positive, Negative, or Neutral Feeling Tone

	Feeling Tone					
	Positive		Negative		Neutral	
	M	%	M	%	M	%
Art Teacher (Mrs. W.)	7.36	16	.71	2	36.93	82
Comparison Teacher (Mrs. C.)	1.86	4	6.71	15	36.43	81
Comparison Teacher (Mrs. A.)	3.71	8	2.00	4	39.29	87
Treatment Teacher	7.36	16	.71	2	36.93	82
Comparison Teachers	2.79	6	4.36	10	37.86	84

Note. The average number of minutes of positive, negative, and neutral feeling tone exhibited by the treatment teacher (art teacher) is calculated over 14 lessons. The average minutes for each individual comparison teacher is calculated over 7 lessons. Each lesson was 45 minutes long.

exhibited behavior characteristic of a negative feeling tone only 2% of the time and Mrs. A. displayed a negative feeling tone 4% of the time.

Mrs. A. exhibited behavior characteristic of a neutral feeling more often than the other two teachers. She was classified as the "neutral" teacher and exhibited neutral feeling tone 87% of the time.

Results of an analysis of covariance indicate that the adjusted means for achievement calculated across the total group of concepts differed significantly among groups. There was a significant difference found between the adjusted mean scores of group 3 (positive feeling tone) and group 1 (negative feeling tone) in favor of group 3. In addition, there was a significant difference in means found between group 3 (positive feeling tone) and group 2 (neutral feeling tone) in favor of group 3. There was no significant difference in means between group 1 (negative feeling tone) and group 2 (neutral feeling tone). Students scored significantly higher on the posttest when taught by a teacher who exhibited positive rather than neutral feeling tone in her classroom. In addition, students scored significantly higher on the posttest when taught by a teacher who exhibited positive rather than negative feeling tone in her classroom (Table 14).

Table 14. Results of the Analysis of Covariance for Differences in Concept Scores by Feeling Tone Groups

Pretest, Posttest, and Adjusted Means with Standard Deviations

	Pretest		Posttest				
			Obtained			Adjusted	
Feeling Tone	n	M	n	M	SD	M	SD
Group 1 (Negative)	23	1.61	23	1.68	.13	1.67	.11
Group 2 (Neutral)	17	1.59	17	1.66	.12	1.67	.11
Group 3 (Positive)	47	1.59	47	1.71	.13	1.71	.12

Analysis of Variance Table

Source of Variation	SS	df	MS	F	Sig of F
Within cells	.52	83	.01		
Regression	.57	1	.57	92.48	.00**
Group	.04	2	.02	3.48	.04*

Post Hoc Comparisons

Differences in Adjusted Total Posttest Scores for Feeling Tone Groups

Group	1	2	3
1	X	0	.04*
2	X	X	.04*

*$p < .05$. **$p < .01$.

Results of the analysis of covariance reveal that feeling tone within the classroom did influence the amount of knowledge gained by students in this study. The students of the teacher who exhibited more "positive" behavior while teaching the designated concepts achieved higher adjusted means on the posttest than those students who were taught by the teachers who exhibited more "negative" or "neutral" behavior.

The literature on feeling tone within classrooms strongly suggests that where there is a risk-free, pleasant atmosphere, children are able to learn more efficiently. The results of this study validate prior research.

Relationship Between Developed Ability Level and Learning Modality

7. What is the relationship between developed ability level and learning modality(ies)?

Table 15 depicts the mean, number, and standard deviation for the Cognitive Abilities Test (COGAT) scores for the verbal, quantitative, and non-verbal subtests by modality. The results of the one-way analysis of variance for each subtest indicated that there was no relationship between developed ability level and learning modality(ies).

Table 15. Mean, Number, and Standard Deviation for COGAT Scores by Modality

Modality	Verbal	n	SD	Quantitative	n	SD	Non-Verbal	n	SD	M	n	SD
Visual	96.6	18	14.7	90.4	18	16.0	87.3	18	12.5	91.4	18	13.4
Auditory	95.6	8	17.3	89.6	8	13.4	85.8	8	12.6	90.4	8	13.9
Kinesthetic	104.1	11	17.8	97.7	11	20.1	90.0	11	16.9	97.3	11	16.0
Auditory/ Visual	91.6	12	9.1	90.9	12	11.0	83.3	12	5.0	88.6	12	6.1
Visual/ Kinesthetic	94.0	8	9.9	92.8	8	15.5	87.4	8	19.2	91.4	8	14.2
Auditory/ Kinesthetic	97.8	4	13.6	93.0	4	20.8	87.8	4	18.1	92.8	4	16.0
Auditory/ Visual/ Kinesthetic	99.8	5	17.1	96.8	5	19.0	86.2	5	14.9	94.3	5	14.7
M =	96.8	66	14.4	92.6	66	16.1	86.8	66	13.9			

Note. COGAT scores were available for only 66 of the 87 students in the study. The students for whom no scores were available had either missed the testing or were new to the school.

These findings were as anticipated. The results of the analysis are located in Table 16.

From the results of the analysis, it can be concluded that a student's developed ability level (verbal, quantitative, or non-verbal) as measured by the Cognitive Abilities Test is not related to the student's dominant learning modality(ies).

Relationship Between Gender and Learning of Concepts

8. How much do boys and girls differ in the extent to which they learn designated concepts?

Of the 87 fifth graders in the study, 43 or 49.4% were girls and 44 or 50.6% were boys. A two-way analysis of covariance was run on all seven dependent variables (area, volume, perimeter, pattern, congruency, sequence, and total) in order to determine if boys or girls were able to learn the concepts more thoroughly. As expected, the analyses revealed that there were no significant differences in the amount of knowledge gained from the instruction based on whether or not the students were boys and girls. The results of the analyses are located in Tables 17 and 18.

Results of this study indicate that gender had no significant relationship to the amount of information

Table 16. Analysis of Variance Summary Table for Comparing COGAT Scores By Modality

SOURCE	df	SS	MS	F	Sig of F
		Verbal			
Modality	6	1034.29	172.38	.83	.55
Error	59	12275.53	208.06		
Total	65	13309.82			
		Quantitative			
Modality	6	566.54	94.42	.36	.90
Error	59	15387.72	260.81		
Total	65	15954.26			
		Non-verbal			
Modality	6	277.83	46.31	.24	.96
Error	59	11359.20	192.53		
Total	65	11637.03			

Table 17. Two-Way Analysis of Covariance Summary Table for Difference in Concept Scores by Gender and Race

SOURCE	df	SS	MS	F	Sig of F
		Area			
Covariate					
Area	1	1.46	1.46	29.20	.00**
Main Effects	2	.05	.03	.54	.59
Gender	1	.00	.00	.02	.88
Race	1	.05	.05	1.07	.31
2-Way Interaction	1	.01	.01	.13	.72
Explained	4	1.52	.38	7.60	.00**
Error	82	4.10	.05		
Total	86	5.62	.07		
		Volume			
Covariate					
Volume	1	2.62	2.62	58.82	.00**
Main Effects	2	.31	.15	3.43	.04*
Gender	1	.01	.01	.26	.61
Race	1	.29	.29	6.52	.01**
2-Way Interactions	1	.04	.04	.98	.33
Explained	4	2.97	.74	16.67	.00**
Error	82	3.65	.05		
Total	86	6.62	.08		
		Perimeter			
Covariate					
Perimeter	1	.35	.35	13.47	.00**
Main Effects	2	.07	.04	1.39	.26
Gender	1	.02	.02	.82	.37
Race	1	.05	.05	2.02	.16
2-Way Interactions	1	.06	.06	2.33	.13
Explained	4	.49	.12	4.64	.00**
Error	82	2.16	.03		
Total	86	2.64	.03		

*p<.05. **p<.01.

(continued)

Table 17 (continued)

SOURCE	df	SS	MS	F	Sig of F
		Congruency			
Covariate					
Congruency	1	.05	.05	3.79	.06
Main Effects	2	.03	.02	1.28	.28
Gender	1	.01	.01	.99	.32
Race	1	.02	.02	1.52	.22
2-Way Interactions	1	.02	.02	1.21	.27
Explained	4	.09	.02	1.89	.12
Error	82	1.01	.01		
Total	86	1.11	.01		
		Pattern			
Covariate					
Pattern	1	.06	.06	1.96	.17
Main Effects	2	.13	.06	2.04	.14
Gender	1	.10	.10	3.16	.08
Race	1	.03	.03	1.06	.31
2-Way Interactions	1	.00	.00	.07	.79
Explained	4	.18	.05	1.53	.20
Error	82	2.50	.03		
Total	86	2.69	.03		
		Sequence			
Covariate					
Sequence	1	1.02	1.02	31.31	.00**
Main Effects	2	.02	.01	.27	.76
Gender	1	.01	.01	.38	.54
Race	1	.01	.01	.14	.71
2-Way Interactions	1	.00	.00	.01	.92
Explained	4	1.04	.26	7.97	.00**
Error	82	2.67	.03		
Total	86	3.71	.04		

**$p<.01$.

Table 18. Two-Way Analysis of Covariance Summary Table for Total Difference in Concept Scores by Gender and Race

SOURCE	df	SS	MS	F	Sig of F
Covariate					
Total	1	.57	.57	88.01	.00**
Main Effects	2	.03	.01	1.95	.15
Gender	1	.01	.01	1.21	.27
Race	1	.02	.02	2.80	.10
2-Way Interactions	1	.01	.01	.90	.34
Explained	4	.60	.15	23.20	.00**
Error	82	.53	.01		
Total	86	1.13	.01		

**p<.01.

students were able to learn from the instruction received. Results of studies on the subject of intelligence and of mathematical and verbal abilities according to gender have been mixed over the years. The findings in this study were consistent with current research which indicates that the scores of males and females do not differ significantly on most tests.

Relationship Between Race and Learning of Concepts

9. How much do black and white students differ in the extent to which they learn designated concepts?

Of the 87 fifth graders in the study, 62 were black and 25 were white. A two-way analysis of covariance was run on all seven dependent variables (area, volume, perimeter, pattern, congruency, sequence, and total) in order to determine if black or white students were able to learn the concepts more thoroughly. The analyses revealed no significant differences in total mean scores for the amount of knowledge gained from the instruction based on whether or not the students were black or white (Table 17 and Table 18). When the scores for individual concepts were observed independently, volume was the only concept in which there was a significant difference in means based on race. The difference was in favor of the white students. For each

other concept, there was no significant difference in mean scores based on race.

Results of this study indicate that race had no significant relationship to the amount of information students were able to learn from the instruction received, except for the concept of volume. The mean and standard deviation for the concept of volume by race is shown in Table 19. When the concepts were observed as a whole, there was no difference in the amount students learned according to whether they were black or white.

Recent studies indicate that children's socioeconomic status or the culture from which they come have greater bearing on academic achievement than race. Children from lower socioeconomic families tend to score lower on mental abilities tests. The children in this study were from low to middle class socioeconomic neighborhoods. Whereas the average score nationally on the subtests of the Cognitive Abilities Test (COGAT) is 100, on the average children in this study fall within one standard deviation below the mean. Their mean scores for the subtests were: verbal - 96.8; quantitative - 92.6; and non-verbal - 86.8.

Table 19. Mean, Number, and Standard Deviation for the Concept of Volume by Race

	n	M	SD
Black	62	1.15	.23
White	25	1.30	.36
Total	87	1.19	.27

Relationship Between Learning Modality and Race

10. What is the association between dominant learning modality(ies) and race?

The results of a chi-square analysis indicated that there was no significant association between dominant learning modality(ies) and race. The obtained chi-square = 5.6, df = 6, was not significant at the .05 level. Table 20 depicts the results of the cross tabulation.

Relationship Between Learning Modality and Gender

11. What is the association between dominant learning modality(ies) and gender?

The results of a chi-square analysis indicated that there was no significant association between dominant learning modality(ies) and gender. The obtained chi-square = 7.1, df = 6, was not significant at the .05 level. Table 21 depicts results of the cross tabulation.

Table 20. Chi-Square Results of Race by Modality

	Black		White		Total	Chi-
	n	Exp. n	n	Exp. n	n	Square
Visual	15	(17)	9	(7)	24	.9
Auditory	9	(10)	5	(4)	14	.3
Kinesthetic	10	(9)	3	(4)	13	.2
Visual/Auditory	13	(10)	1	(4)	14	3.2
Visual/ Kinesthetic	7	(6)	2	(3)	9	.2
Auditory/ Kinesthetic	4	(4)	2	(2)	6	.1
Visual/Auditory/ Kinesthetic	4	(5)	3	(2)	7	.7
Total	62	(62)	25	(25)	87	
Chi-Square						5.6

Note. The cells were collapsed into auditory, visual, kinesthetic, and mixed modalities because of the large number of cells containing less than five observations. When the chi-square analysis was rerun, the results again indicated no significance.

Table 21. Chi-Square Results of Gender by Modality

	Boy		Girl		Total	Chi-
	n	Exp. n	n	Exp. n	n	Square
Visual	14	(12)	10	(12)	24	.8
Auditory	3	(7)	11	(7)	14	4.4
Kinesthetic	8	(6)	5	(7)	13	.8
Visual/ Auditory	6	(7)	8	(7)	14	.2
Visual/ Kinesthetic	5	(4)	4	(5)	9	.1
Auditory/ Kinesthetic	4	(3)	2	(3)	6	.7
Visual/ Auditory/ Kinesthetic	3	(3)	4	(4)	7	.1
Chi-Square						7.1

Note. The cells were collapsed into auditory, visual, kinesthetic, and mixed modalities because of the large number of cells containing less than five observations. When the chi-square analysis was rerun, the results again indicated no significance.

CHAPTER 4

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND DISCUSSION

Summary

The primary purpose of this study was to investigate the hypothesis that specially designed art lessons can be used as a vehicle to enhance the learning of specific concepts. The concepts selected for the study were those traditionally taught in an elementary art program which coincided with concepts measured on standardized tests for 5th grade students. They were area, volume, perimeter, congruency, pattern, and sequence. The standardized tests used as pre- and posttests were subtests for mathematics and reading from the SRA Achievement Series, Level E/Form 1, from Science Research Associates, Inc., and a custom-made test designed by the researcher using questions from the item bank of the Academic Instructional Measurement System (AIMS) published by The Psychological Corporation.

Recent research focusing on certain strategies which appear to enable students to acquire and retain knowledge and to achieve academic success from classroom instruction was investigated and integrated into this study. Among those strategies which became part of the study were an

investigation of the teachers' use of multimodal approaches for instruction. Teachers in the study were regularly observed by the researcher during instruction of the selected concepts. A researcher-designed checklist was used to tally instances of auditory, visual, tactile/kinesthetic, or mixed modality instructional practices. In addition, each child in the study was individually administered the Swassing-Barbe Modality Index by the researcher with the assistance of an instructional aide in order to determine each learner's most efficient modalities for learning. Also examined was whether or not children who were taught in ways which matched their modality strengths learned more than those who were taught in ways which did not match their modality strengths.

Another strategy integrated into the study was the use of interdisciplinary lessons which were especially designed to enable learners to form connections between disciplines in order to aid in the retention of content. Math and reading concepts which coincided with those traditionally taught in art were integrated more fully into art lessons. The art teacher also stressed connections between subject matter in order to facilitate transfer of concepts from one context to another.

Maintenance of a positive feeling tone within the classroom, another strategy believed by many educators to encourage learning, was also investigated. A researcher-designed checklist was used to tally instances of

positive, negative, and neutral feeling tone in the classrooms during the instruction of the concepts.

The researcher also tested whether or not the art lessons, structured to teach specific concepts, would inhibit the creativity of the students to whom they were taught. In addition, the relationships between learning modality(ies) and developed ability level, race, and gender were tested. Whether or not gender or race affected the extent to which students learned the designated concepts was also investigated.

The sample of the study consisted of 87 fifth grade students who attended an elementary school located in a low to middle class socioeconomic neighborhood. The school is part of a system which educates approximately 13,000 students in 29 schools. The school system is located in a middle-sized city in southwest Virginia. Five teachers were also part of the study. Four of them were classroom teachers of the children in the study. The fifth was the art teacher assigned to the school to teach art to children on a weekly basis. Of the 87 children, 25 were white; 62 were black. Forty-four of the children were boys; 43 were girls.

The researcher spent three to four days each week at the school during a three month period observing instruction in the rooms of two classroom teachers and the art teacher. A total of twenty-eight 45 minute lessons was observed. During this time, the researcher administered the Swassing-Barbe

Modality Index to the 87 children in the study. The SRA and AIMS tests were given as pretests prior to the beginning of the study and again as posttests at the conclusion of the study. The SRA tests were administered by the classroom teachers; the AIMS test was administered by the researcher.

Analysis of the data included t-tests, analysis of variance tests, analysis of covariance tests, and chi-square tests. The results of an analysis of covariance indicated that in the total combined achievement score across all concepts there was a significant difference in adjusted posttest means in favor of the treatment group. The findings suggest that the use of specially designed art lessons did enhance the learning of specific concepts.

Results obtained through observation using the Teacher Behavior Checklist indicated that the treatment (art) and comparison (classroom) teachers all used a multimodal approach to teaching, but there was a difference discovered in the amount of time spent instructing in each modality. The treatment teacher averaged more of each 45 minute class period instructing with visual/visual combinations (33.6%) than the comparison teachers (22.2%). She also spent more time instructing with kinesthetic/kinesthetic combinations (19.9%) than the comparison teachers (5.5%). Both groups spent over half of each instructional period using the auditory/auditory combination modality of teaching. The comparison teachers spent 58.8% and the treatment teacher

spent 56.1% on the average of each lesson teaching verbally with auditory combinations. (Totals do not equal 100% because of combination modalities and non-direct teaching.)

The Swassing-Barbe Modality Index was administered to the 87 children in the study in order to determine their dominant learning modalities. Twenty-eight percent of the students were visual learners; 16% were auditory learners; 15% were kinesthetic learners; and approximately 41% were of mixed dominance. The researcher expected students who were visual or kinesthetic learners to learn more when taught by a teacher who used more of these modalities during instruction. It was also expected that students identified as auditory learners would learn more when taught by teachers who stressed auditory teaching and used little of the other modalities. An analysis of covariance indicated that there was no statistically significant difference in achievement for those children whose teachers taught using the children's preferred modality or by teachers who did not. In this study teaching to a child's dominant modality apparently had no effect on the amount learned.

The treatment and comparison groups both were able to transfer learning from the instructional situation to the testing situation. Both groups improved their posttest scores over their pretest scores. However, it appears that the students who were taught the concepts through art lessons were able to score higher overall than the comparison group

as determined by an analysis of the posttest means. The treatment group was able to transfer its knowledge of the concepts from an instructional situation to a testing situation better than the comparison group, even though the teaching format did not match the testing format as closely as it did for the comparison group.

Eight art teachers observed and rated, using the Creativity Assessment of Student Products, a random sample of 50 art products produced by the treatment and comparison groups during the study. A *t*-test analysis was used to compare the mean scores of the art products for the two groups to determine if the structured lessons inhibited creativity. The results indicated that there was no significant difference in the creativity of the products of the two groups. The lessons which were constructed to teach specific concepts did not inhibit the creativity of the children to whom they were taught. In addition, three other art teachers read and judged the art lessons on the basis of their potential for encouraging creative product-making from children. The three teachers found the lessons to be above average in their potential for eliciting creative response.

Feeling tone within the classroom was found to affect the extent to which students learned the selected concepts. Results of an analysis of covariance indicated that the adjusted mean scores for achievement calculated across the total group of concepts differed significantly among groups

of students. Those students who were taught by the teacher who exhibited a more positive feeling tone increased their scores significantly over those students who were taught by either the teacher who exhibited a more negative or a more neutral feeling tone in the classroom. There was no significant difference in mean scores between the students who were taught by the teachers who exhibited negative or neutral feeling tone.

One-way analyses of variance indicated that there was no significant relationship between developed abilities (verbal, quantitative, or non-verbal) as measured by the Cognitive Abilities Test and learning modality(ies).

A two-way analysis of covariance revealed that there was no significant difference in the amount of knowledge gained from instruction based on gender or race. Chi-square tests indicated that there was no significant association between learning modality(ies) and race or gender.

Conclusions

The conclusions of this study are that when students are taught selected concepts by teachers using either traditional or treatment methods, as a whole they improved their knowledge of the concepts. The study revealed that students who were taught the concepts by the treatment (art) method increased their knowledge of the concepts, overall, more than

the students who were taught traditionally. The data indicate that the making of art did enhance the learning of two specific concepts, area and pattern, and the total.

Comparison and treatment teachers both used a multimodal approach when teaching, but the treatment teacher (art) averaged more of each class instructing with visual/visual combinations and with kinesthetic/kinesthetic combinations than the comparison teachers. The comparison teachers (classroom) averaged slightly more time using auditory/auditory combinations than the treatment teacher.

It was expected that students with particular dominant learning modalities would learn more from teachers who taught using the students' preferred learning style, but results of the statistical analysis did not indicate this. Rather, this study revealed that as a whole, students learned better in the treatment group (art) regardless of their dominant learning modality.

Although the teaching context and the instructional lessons did not match the testing situation for the treatment group as well as they did for the comparison group, students who were taught the selected concepts in the treatment group were able to transfer knowledge gained through the art lessons to a testing situation. The observer noted that students appeared to be mentally and physically engaged in creating the art projects. This, along with the treatment teacher's verbalization about different ways a concept could

be used, may have affected the amount of transfer which took place.

The particular art lessons used in this study were found to be above average (above 3 on a scale of 1 to 5) in their potential for eliciting creative responses from students. Students who were taught concepts using these art lessons were not inhibited from producing creative artwork. Carefully planned and constructed lessons can provide focus for learning, guide students to learn particular concepts, and encourage creativity.

Feeling tone in the classroom influenced the amount of knowledge students learned. Students whose teacher exhibited a more positive feeling tone learned more than those students who were taught by teachers who used a neutral or more negative tone.

Developed ability level, race, and gender were not related significantly to dominant learning modality. Gender and race were not related significantly to the amount students learned.

Discussion and Recommendations

The conclusions of this study lead to considerations and recommendations that may be helpful to educators who are attempting to improve teaching strategies which enable

students to obtain and retain more knowledge from their instruction.

The integration of art activities into mathematics and reading can enhance the learning of specific concepts. This finding supports the work of Read (1945), McFee (1961), Field (1970), Pfeuffer (1982), Silver (1978), Eaton (1985), and Steger (1988) who report that art can and should be used as a vehicle for carrying content to be learned, for it serves as a connection or link between disciplines. This linking of information in a student's mind through visual and kinesthetic involvement helps students understand and learn more information from their lessons. Educators must begin to look upon art as a more important part of the curriculum, not only because it offers a means for learning about one's cultural heritage, a means of communication, and a means of creative fulfillment, but also because it offers a tool for teaching and learning. If it is a natural mode of integration for children as Read (1945) stated, then it should be linked with other disciplines in order to facilitate learning. Children generally enjoy art and readily participate in it. Integrating art with a less popular discipline, without jeopardizing the content of either, can be a successful teaching strategy. Additional lessons, other than the ones in this study, should be constructed by art and classroom teachers working together to facilitate students' learning of concepts through art.

Based on the results of this study, the strategy of using art as a vehicle for teaching selected concepts appears to be an appropriate one to use to enhance learning.

It is evident from the results of this study that the learning of concepts did transfer. Students who were taught concepts using art as a vehicle for learning were able to transfer their knowledge of the concepts to a testing situation. Even though the testing format more closely resembled the traditional teaching strategies used by the comparison teachers, students in the treatment group were able to transfer their knowledge of the concepts more readily than those students in the comparison group. Guilford (1968), Bassett (1969), Silver (1978), O'Brien (1971), Hunter (1971), Perkins and Salomon (1988), and others have emphasized the importance of teaching for transfer. When teachers guide students to see connections between subject matter and to use skills and knowledge in different contexts, transfer occurs more readily for them. Educators should plan and teach for transfer of learning to other contexts as they design and present additional integrated lessons. This strategy will enable students to remember, understand, and apply content more easily.

Classroom teachers should become more aware of the necessity for increasing their use of additional visual and kinesthetic approaches in their teaching. In this study, students as a whole, regardless of their dominant learning

modality, learned more about the selected concepts from the treatment teacher than from the comparison teachers. While the treatment teacher and comparison teachers used a similar amount of auditory instruction, the treatment teacher used more visual/visual combinations and more kinesthetic/ kinesthetic combinations. Further research is recommended in the area of modality-based instruction to determine which modalities and combinations are most effective for teaching children of various ages and abilities.

Knowing students' dominant learning modalities and teaching to those modalities is a procedure currently having wide appeal among many educators although research results have been inconclusive about its usefulness. In this study, no differences were found in the achievement of students based on the match between their dominant learning modalities and the modalities emphasized by their teachers during instruction. This finding supports the work of Tarver and Dawson (1978), who in a review of research on modality and achievement, concluded that the interaction between method of instruction and modality preference did not affect achievement. The development of auditory and visual modes of learning normally occurring as children progress through the grades may be the reason no differences were found. By the time students have reached 5th grade and have been taught by teachers who use predominantly auditory and visual methods of instruction, most have developed the ability to learn

through those modalities. If not, they will be at risk of failure. Further research of a longitudinal nature is recommended to determine the modality strength of children when they enter kindergarten and each year after as they progress through the elementary school grades. These findings should be compared to the teaching styles of their teachers to determine if the children's dominant learning modalities change based on the type of instruction they receive.

The researcher sees a need for additional research where teachers teach using controlled or "pure" auditory, visual, kinesthetic or combination methods of instruction. For example, a teacher might teach only through the lecture method without the use of any visuals or kinesthetics. Another might teach only kinesthetically by demonstrating without talking or using visuals. Others might use different combinations of modalities. Analysis would determine if there were differences in achievement based on a child's learning modality and the controlled method used by the teacher.

Another reason no difference was found in the achievement of those taught with methods matching their dominant modality and those not is that modality-based instruction may not influence learning as much as some researchers believe. There have been mixed results reported on its benefits. Many school divisions are spending money

to purchase testing materials and are using valuable instructional time to test students to ascertain their learning modalities. Further research needs to be conducted with more conclusive results obtained before additional time and money are spent on this teaching strategy. Also, in view of concern expressed by Kerr and Myers (1985), additional studies are recommended using the Swassing-Barbe Modality Index to determine its reliability and validity as a tool for assessing dominant modalities.

This study demonstrated that art lessons designed to teach specific concepts exhibited above average potential (3.86 on a five-point scale) for encouraging creative responses from children, and when children did create artwork based on these lessons their work was creative. This study confirms the findings of Silver (1978) who reported from his studies that structuring art experiences does not necessarily inhibit spontaneity. Teachers should develop more art lessons which are designed to teach specific concepts. These lessons guide children to learn designated concepts within a framework that they consider pleasant. A positive, risk-free environment appears to be conducive to creative work.

Educators should heed advice from this and other studies which indicate that students learn more efficiently in an atmosphere which has a positive feeling tone or climate. Purkey (1978), Hunter (1982), Lowenfeld and Brittain (1987), and others have reported on the importance of a pleasant

atmosphere within a classroom to the achievement of students. Teachers should attempt to make their classes as pleasant and risk-free as possible in order to help their students learn more efficiently.

Students' developed ability level did not appear to be related to their dominant learning modality. This finding coincides with that of Bonner (1981) who found that modality strength was independent of reading ability. Other researchers report mixed findings. Additional research is recommended, with larger samples, to study the association between ability level and learning modality. Dominant learning modality did not appear to be related to gender or to race. Bonner (1981) and Barbe and Milone (1981) also reported that race was independent of modality strength. Neither gender nor race were found to be related to the amount of knowledge students learned. This finding supports work by Woolfolk (1987), work cited in Burns and Reynolds, 1988), and work by Hall (1988).

REFERENCES CITED

Academic Instructional Measurement System: Test development and production guide. (1987). USA: The Psychological Corporation.

Armstrong, T. (1988). Learning differences--not disabilities. Principal, 68(1), 37-39.

Ast, C. A. (1981). Two tests for haptic-visual aptitude: A discussion for their usefulness for elementary school children. Studies in Art Education, 23(1), 47-54.

Barbe, W. B., & Milone, M. N. (1981). What we know about modality strengths. Educational Leadership, 38, 378-380.

Barbe, W. B., & Swassing, R. (1979). Teaching through modality strengths: Concepts and practices. Columbus, OH: Zaner-Bloser.

Bassett, R. (Ed.). (1969). The open eye in learning: The role of art in general education. Cambridge, MA: The Massachusetts Institute of Technology Press.

Bonner, M. (1981). A study of modality strengths among children enrolled in Butcher's School, Emporia State University, 1980-1981. Kansas: Emporia State University. (ERIC Document Reproduction Service No. ED 211 184)

Brandon, P. R. (1987). Children's mathematical achievement in Hawaii. American Educational Research Journal, 24, 437-461.

Braun, C. (1976). Teacher expectation: Sociopsychological dynamics. Review of Educational Research, 42(2), 185-213.

Brophy, J. E., & Good, T. L. (1970). Teachers' communication of differential expectations for children's performance: Some behavioral data. Journal of Education Psychology, 67, 364-374.

Broudy, H. S. (1979). Arts education: Necessary or just nice? Phi Delta Kappan, 5, 347-350.

_____. (1987). Theory and practice in aesthetic education. Studies in Art Education, 4, 198-205.

Bruno, A. (1982). Hands-on wins hands down. Early Years', 4, 53-55.

Bruner, J. S. (1961). The process of education. Cambridge, MA: Harvard University Press.

Burns, C. W., & Reynolds, C. R. (1988). Patterns of sex differences in children's information processing with and without independence from g. Journal of School Psychology, 26, 233-242.

Castenell, L. (1987, April). The mismeasurement of low-income blacks: A quagmire for counselors. Paper presented at the annual meeting of the American Educational Research Association, Washington, D. C. (ERIC Document Reproduction Service No. ED 282 932)

Cohen, H. L. (1968). Measuring the contribution of the arts in the education of disadvantaged children. Silver Spring, MD: Institute of Behavioral Research.

Cornett, C. E. (1983). What you should know about teaching and learning styles. Phi Kappa Delta Fastbacks, 191.

Dewey, J. (1931). The way out of educational confusion. Cambridge, MA: Harvard University Press.

Domino, G. (1970). Interactive effects of achievement orientation and teaching style on academic achievement. ACT Research Report, 39, 1-9.

Dunn, R., & Dunn, K. (1975). Finding the best fit - learning styles, teaching styles. NASSP Bulletin, 393 (59),38-40.

_____. (1978). Teaching students through their individual learning styles: A practical approach. Reston, VA: Reston Publishing Company.

Eaton, M. (1985, October). Living, learning, and the arts: Integrating arts into the curriculum in rural schools. (Report No. RC016156). Paper presented at the Annual National Rural Teacher Education Conference, Bellingham, WA. (ERIC Document Reproduction Service No. ED 279 481)

Eisner, E. (1987). Why the arts are basic. Instructor's 3Rs. Special Issue, Fall, 34.

Epstein, H. (1978). Growth spurts during brain development: Implications for educational policy and practice. In J. Chall & A. Mirsky (Eds.), Education and the brain. Chicago: University of Chicago Press.

Field, D. (1970). Change in art education. New York: Humanities Press.

Flanders, N. A. (1965). Teacher influence, pupil attitudes, and achievement. Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education.

Forseth, S. D. (1976). The effects of art activities on the attitudes and achievement of fourth grade children pertinent to the learning of mathematics and art. (Doctoral dissertation, University of Minnesota). Dissertation Abstracts International, 37, 12A.

Froebel, F. (1912). Froebel's chief writings on education. (S. S. F. Fletcher and J. Welton, Trans.). New York: Longmans Green & Company.

Gaitskell, C. D., & Hurwitz, A. (1975). Children and their art. New York: Harcourt Brace Jovanovich.

Gardner, H. (1973). The arts and human development. New York: John Wiley and Sons.

_____. H. (1983). Frames of mind: The theory of multiple intelligences. New York: Basic Books.

Greene, J. C., & Hasselbring, T. S. (1981). The acquisition of language concepts by hearing impaired children through selected aspects of an experimental core art curriculum. Studies in Art Education, 22(2), 32-37.

Guilford, J. P. (1968). Intelligence, creativity and their educational implications. San Diego, CA: Robert R. Knapp.

Hall, C. W., & Hoff, C. (1988). Gender differences in mathematical performance. Educational Studies in Mathematics, 19, 395-401.

Hunter, M. (1971). Teach for transfer. El Segundo, CA: TIP Publications.

_____. (1982). Mastery teaching. El Segundo, CA: TIP Publications.

_____. (1983). Increasing your teaching effectiveness. Belmont, CA: Pitman Learning.

Jensen, A. R. (1980). Bias in mental testing. New York: Free Press.

Keenan, D., & Smith, M. (1983). Sex discrimination and cerebral bias: Implications for the reading curriculum. Reading Improvement, 20, 50-53.

Kerlinger, F. (1965). Foundations of behavioral research. New York: Holt, Rinehart and Winston.

Kerr, B. A., & Myers, R. S. (1985). Swassing-Barbe Modality Index. In J. V. Mitchell, Jr. (Ed.), The Buros Institute of Mental Measurements: Ninth mental measurements yearbook (p. 1510). Lincoln, NE: The University of Nebraska-Lincoln.

Larsen, R., & Feder, D. D. (1940). Common and differential factors in reading and hearing comprehension. Journal of Educational Psychology, 31, 241-252.

Lowenfeld, V. (1945). Tests for visual and haptical aptitudes. American Journal of Psychology, 58(1), 100-111.

_____. (1952). The nature of creative activity. London: Routledge & Kegan Paul Ltd.

Lowenfeld, V., & Brittain, W. (1987). Creative and mental growth. (8th ed.) New York: Macmillan Publishing Company.

Maccoby, E. E., & Jacklin, C. N. (1974). The psychology of sex differences. Palo Alto, CA: Stanford University Press.

Madeja, S. S. (Ed.). (1978). The arts, cognition, and basic skills. St. Louis, MO: CEMREL.

McFee, J. K. (1961). Preparation for art. San Francisco, CA: Wadsworth Publishing Company.

Michael, J. A. (Ed.). The Lowenfeld lectures. University Park, PA: The Pennsylvania State University Press.

Milone, M. N., Jr. (1981). An introduction to modality-based instruction. Columbus, OH: Zaner-Bloser.

Murphy, J., & Jones, L. (1976). Research in arts education. Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education.

O'Brien, B. C. (1971). Learning to read through the arts. New York: New York City Board of Education.

Perkins, D. N., & Salomon, G. (1988). Teaching for transfer. Phi Delta Kappan, 1, 22-31.

Pfeuffer, D. B., & Kingsley, R. F. (1982). Enhancing learning for the handicapped through the arts. (Report No. EC1-431330. Kent, OH: Kent State University. (ERIC Document Reproduction Service No. ED 218 868)

Purkey, W. W. (1978). Inviting schools success. Belmont, CA: Wadsworth Publishing Company.

Read, H. (1945). Education through art. New York: Pantheon Books.

Rush, J. C. (1987). Interlocking images: The conceptual core of a discipline-based art curriculum. Studies in Art Education, 28(4), 206-220.

Roberson, E. W. (1970). Developing observation systems. Tucson, AZ: Educational Innovators Press.

Schulte, L. L. (1983). The effects of visual art experiences on spelling, reading, mathematical, and visual motor skills at the primary level (Doctoral dissertation, University of Kansas). Dissertation Abstracts International, 45, 02A.

Shade, B. J. (1982). Afro-American cognitive style: A variable in school success. Review of Educational Research, 52, 219-244.

Silver, A. R. (1978). Developing cognitive and creative skills through art. Baltimore: University Park Press.

Silvernail, D. L. (1979). Teaching styles as related to student achievement: A special report. Washington, D. C.: National Education Association.

SRA Achievement Series, Level E/Form 1. (1979). USA: Science Research Associates.

Steger, C. W. (1988). Why study the arts? Unpublished manuscript, Virginia Polytechnic Institute and State University, College of Architecture and Urban Studies, Blacksburg, VA.

Tarver, G. S., & Dawson, M. M. (1978). Modality preference and the teaching of reading: A review. Journal of Learning Disabilities, 11(1), 17-28.

Test gap believed narrowing. (1989, July 1). Roanoke Times & World News, p. 1.

Thorndike, R. L., & Hagen, E. (1986). Cognitive abilities test: Preliminary examiner's manual. Multilevel Edition, Form 4. Chicago, IL: The Riverside Publishing Company.

Torrance, E. P. (1965). Creativity. Washington, DC: National Education Association.

Trueba, H. T. (1988). Culturally based explanations of minority students' academic achievement. Anthropology & Education Quarterly, 19, 270-284.

Willett, L. V. (1987). Why no art? Unpublished manuscript, Virginia Polytechnic Institute and State University, College of Education, Blacksburg, VA.

Woolfolk, A. E. (1987). Educational Psychology. Englewood Cliffs, NJ: Prentice-Hall.

APPENDIX A. ART LESSONS

CONCEPT AREA, PERIMETER, VOLUME

SUBJECT City planning, constructing GRADE LEVEL 5

PROCESSES Determining area, perimeter, and volume of constructed shapes and forms
Constructing simulated elements of city
Employing elements of art and principles of design in city planning
Determining placement of elements of city so they are visually pleasing

SIGNIFICANT IDEA The natural and built environment affect us and our lives each day. People have control over much of the built environment and can structure it to suit their physical and aesthetic needs.

In the past, many cities have often "just grown" with little emphasis on the wise use of resources or design. Now, more often, city planners, architects, and designers employ the elements of art and principles of design when planning the construction of roads, buildings, parks, etc. within our cities. Wise planning helps preserve and conserve our resources so they are used in a more efficient and visually pleasing way.

TIME ALLOCATION 3 or 4 45 minutes lessons

SAMPLE QUESTIONING STRATEGY

- Ask learners to look closely at the photographs and art reproductions for information which depicts positive and negative components of cities.
- List and define necessary basic components of a city.
- What do you remember seeing around our city which has impressed you either positively or negatively? (Newly constructed roads, buildings, landfill, parks by river, flowers on median strips of highways, garbage-filled alleys, etc.) How do you think the site could have been improved? Encourage visual recall.
- Review elements of art and principles of design related to city planning.

- In creating a model city, how would you plan for the space you need? How would you compute the area of land you need for a school, a house, a building? How would you compute the perimeter of a yard, a parking lot, or a park you want to fence in? How much fencing will you need? How would you determine how long the road around a city block needs to be? How will you lay out the roads? How will you determine the contained space you need for your houses, school, office buildings, hospitals, etc.? How will you compute the volume of these structures?

- Encourage use of imagination in planning city design.

RESOURCES

Photographs of your city showing both positive and negative aspects

Photographs or models of plans for airport, shopping center, schools, parks, etc.

Reproductions of artwork depicting cities (examples may include Stuart Davis' Town Square, John Sloan's Backyards, Greenwich Village.

Photos of building by architects such as Frank Lloyd Wright, I.M. Pei.

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display photographs and models of components of city. Involve learners in discussion about elements of art and principles of design as they relate to city planning.

Vocabulary - natural and built environment, architect, city planning, area, perimeter, volume. Write on board and discuss.

INSTRUCTIONAL OBJECTIVE

The learner will construct a model of a city and compute area, perimeter, and volume as it relates to the use of space within the model.

Virginia Standard of Learning

Art 4.2 The student will use past experiences and simulated situations as subject matter for artwork.

Art 5.9 The student will produce artwork emphasizing one or more of the elements of design.

Art 5.10 The student will describe the contribution of artists and designers to the American heritage.

Math 6.18 The student will find the perimeter of a square and a rectangle using addition.

Math 6.19 The student will determine the number of square units in a rectangular region, given an appropriate drawing.

Math 8.18 The student will find the volume of a right rectangular solid.

EXPLANATION (approximately 7-10 minutes)

Today we are going to begin a project that will take several art periods to complete. Each period we will learn new information which will help us to create a finished model of a city. You will be allowed to work with a partner because the project is a long one and you will need additional hands and ideas other than your own to complete it. Also city planners do not work completely alone. They must work with other planners, architects, city officials, citizens, etc.

in order to design components of the city which will serve the needs of all citizens.

You will receive a plat of land (a sheet of tagboard) which encompasses a section of land within the city limits. On that land you will design the layout of the roads, blocks which contain buildings, parks, etc. which you want in your miniature city. You will compute the area you need for each city block today. Parks may need more land than a school; a school will use more land than houses, etc. We will simplify measuring by using "units" so we will not have to worry about inches, feet, miles, etc. A road is a unit wide. You will determine how many units long it needs to be. A house is a unit square. You will determine how much "yard" you need to place it on.

Teacher teaches or reviews formula for determining area (length x width - in this case using "units"). Teacher demonstrates the process. First determine the area of the plat of land using "units". Then demonstrate how to compute the area of different spaces. Example: My house is one unit square. I want a nice yard around it. I will make my yard 2 units long and 2 units wide. How much of my plat of land will that use? (2 units x 2 units = 4 square units) If I make the area of my yard 2 units by 2 units I will use 4 square units of my area of land.

Demonstrate computing area of additional blocks of land. Involve learners in computation to assess their understanding of the process. Demonstrate gluing down areas of "land" for parks, schools, houses, etc. Demonstrate gluing down construction paper strips for road.

Learners work with partners to complete the layout of their plat of land. Learners may work alone.

LEARNER SUMMARIZATION

The learners will display their layout of the plat of land and point out the land areas they have computed for the buildings, etc. which they will add at a later time.

MATERIALS

pencil
ruler with unit markings (made by teacher)
scissors
glue
construction paper
tagboard (12" x 18")

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display models of components of city. Review elements of previous lesson on city planning with learners.

INSTRUCTIONAL OBJECTIVE

Same as previous lesson. This lesson will focus on perimeter.

EXPLANATION (approximately 7-10 minutes)

Today we will continue our project on city planning. Last time you measured and computed the area of land you would need for various parts of your miniature city. Let's review how we determined that area. (Review work from last lesson.)

As your city begins to take shape, you may find that you have areas which you need to enclose for one reason or another. You may have a dog you want to keep fenced in a yard. You may have a schoolyard or a park you want to fence in to keep people and traffic separated. You may need to determine how long a road you will need to pave around your city blocks. Now we are going to learn to compute (measure) the length of fencing or roadway you will need to enclose certain parts of your construction. Imagine that the perimeter is an imaginary line which goes around a shape. Draw a rectangle on the board. Redraw around it with a different color of chalk to demonstrate "distance around".

Teacher teaches or reviews formula for determining perimeter (length + width + length + width - in this case using "units"). Teacher demonstrates the process. First determine the perimeter of a city block using "units". Then demonstrate how to compute perimeter of different spaces. Example: My house is located in a nice yard. The yard is 2 units long and 2 units wide. I need to fence in the yard for my dog. In order for my fence to go all the way around my yard, I need to compute the perimeter (distance around) my entire yard. I add the length (2) + width (2) + length (2) + width (2) = 8 units. So my fence will be 8 units long.

Demonstrate computing perimeter of additional enclosed spaces. Involve learners in computation to assess their understanding of the process.

Learners work with partners to enclose parts of the city with fences or to place roads around areas of land.

LEARNER SUMMARIZATION

The learners will display their layout of the plat of land and point out the land areas they have enclosed with fencing and roads. They will describe how they determined the perimeter of the certain spaces using the formula for computing perimeter.

MATERIALS

pencil
ruler with unit markings (made by teacher)
scissors
glue
construction paper
markers or crayons

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display models of components of city. Review elements of previous lessons on city planning with learners.

INSTRUCTIONAL OBJECTIVE

Same as previous lessons. This lesson will focus on volume.

EXPLANATION (approximately 7-10 minutes)

Today we will continue our project on city planning. In the last two lessons you measured and computed the area and perimeter of spaces that you have in your miniature city. Let's review how you determined area and perimeter. (Review work from first two lessons.)

Your city will really begin to take shape today as you add buildings (paper cubes) to your city. You will learn to construct individual paper cubes which you will combine to form different sized buildings. You will also learn to compute the volume of these forms. A house will be one cube. If you want to make a school, you will need to determine how big it needs to be. Think about how much space the school will need to contain. Do you want it to be one story high or will you make it several stories (cubes) high? Will an apartment building be smaller or larger than the school? In order to compute the enclosed space you want, you will need to use the formula for computing volume.

Teacher teaches or reviews formula for determining volume (length x width x height - in this case using "units"). Teacher demonstrates the process. First determine the volume of a house using "units". Then demonstrate how to compute the volume of different "buildings". Keep it simple. Example: My school is a small elementary school. I have decided to make it 2 cubes long, 1 cube wide, and 3 cubes high. Show example using large cubes. Demonstrate how to compute volume of structure using formula (2 x 1 x 3 = 6 cubic units). Takes cubes apart and add them to show students that formula "works."

Demonstrate other simple examples. Involve learners in computation to assess their understanding of the process.

After learners are able to compute volume, demonstrate how to construct paper cubes.

Learners work with partners to construct cubes. Learners compute volume of buildings they construct with cubes. Learners draw on buildings with markers to make houses, schools, stores, apartment buildings, office buildings, hospitals, etc. Learners glue buildings in place and add sidewalks, bushes, etc. to complete their models. (This will take more than one 45 minute lesson to complete.)

LEARNER SUMMARIZATION

The learners will display their model cities and point out the space their buildings contain (volume) and discuss how it was determined using the formula.

MATERIALS

pencil
ruler with unit markings (made by teacher)
scissors
glue
tape
construction paper
colored duplicator paper 4" x 4" for paper cubes
preconstructed cubes
markers

CONCEPT PATTERN, CONGRUENCY

SUBJECT Pattern design GRADE LEVEL 5

PROCESSES Observing patterns in the natural and man-made environment
Creating individual shapes from paper
Experimenting with arranging and organizing shapes to create a pattern

SIGNIFICANT IDEA Patterns are everywhere. They are an important part of our environment. They are found in natural and man-made forms.
Multiples of a single shape (congruent shape) may be repeated many times in nature or by an artist in an organized way to form a pattern.
Patterns are used by artists to organize space and to provide visual enrichment.

TIME ALLOCATION 45 minutes

SAMPLE QUESTIONING STRATEGY

- What makes a pattern? Where do we find them?
- What is a natural pattern?
- What is a man-made pattern?
- Name examples of natural and man-made patterns.
- Ask children to look closely around the room to locate and identify natural and man-made patterns. (Examples may include: arrangement of desks, tile on floor, bricks on wall, designs on clothing, veins on plant leaves, petals on flowers, wrapping papers, etc.)
- Why do people (artists) arrange shapes to create patterns?
- Why are patterns important in nature? (Survive or adapt to life, e.g. camouflage, identification).

RESOURCES

Clothing depicting pattern
Photographs of natural and man-made patterns

Reinhold Visuals: Organization #14
Perception #24
Teacher-made examples from single color acetate sheets displayed and manipulated on an overhead projector to demonstrate congruency of shape and pattern formation

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display and discuss examples and photographs of patterns. Demonstrate congruency by placing acetate shapes on their congruent components using the overhead projector. Organize shapes to demonstrate pattern design. Involve learners in observation and discussion.

Vocabulary - organization, congruent, order, repeat, pattern. Write on board and discuss.

INSTRUCTIONAL OBJECTIVE

The learner will create a design (using congruent shapes) which demonstrates a knowledge and understanding of organization and pattern.

Virginia Standard of Learning

Art 4.1 The student will generate creative ideas through experimentation.

Art 5.9 The student will produce artwork emphasizing one of more of the elements of design.

Math 3.3 The student will complete a sequence of ten or fewer consecutive whole numbers between 0 and 500.

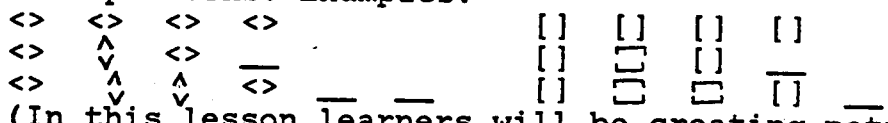
EXPLANATION (approximately 7-10 minutes)

Patterns are everywhere. We see them in nature and in man-made objects. Patterns are used by artists and designers to organize space and to provide visual enrichment.

Here are examples of patterns we see in the environment. (Show photos of animals, plants, etc.) Let's discuss reasons patterns are important in nature (e.g., camouflage, identification). Here are examples of patterns which are man-made. (Show examples of patterns in clothing, brick arrangement, etc.) Let's locate and identify other examples of patterns in our classroom.

Patterns also exist in our lives. We get up in the morning, we have breakfast, we go to school, we study math, reading, and art, etc. These things are events that take place in our lives in order, in a sequence. There are also patterns such as number patterns. These occur in order, in a sequence. I'll put some on the board to see if you can discover the

patterns. Examples: 1,2,3 1,2,3, 1,2,? What's next? 1,3,5,7 1,3,5,? What's next? We can also arrange shapes to form patterns. Examples:



(In this lesson learners will be creating patterns from congruent shapes.)

On the overhead projector, I'll show you examples of shapes which can be used to make patterns. Today we're going to use congruent shapes to make our patterns. Congruent shapes are ones which fit precisely (when superposed). They are the same size and shape. For example, here is a shape. (Place on overhead). If I place an identical shape on top of it, it fits. It's congruent. Let's try another one (repeat process). I'll demonstrate other congruent shapes. Is this shape congruent? Does it fit? (Demonstrate exemplars and non-exemplars.) Now I'll demonstrate how to create a simple pattern using congruent shapes.

Your supplies are on your table. Draw a simple shape on a sheet of paper. Stack 4 sheets of paper together with your drawing on top. Cut paper to create multiple (4), congruent shapes. Repeat process so you have many congruent shapes. (May use multiples of different shapes, if desired.) Arrange shapes to create an organized pattern which is pleasing to your eye.

Teacher demonstrates congruency and pattern-making. Teacher demonstrates how to create a simple shape and cut multiple copies of it. Teacher demonstrates how to create a pattern with paper shapes and glue them to paper background. Teacher encourages learners to create original shapes and use them in unique patterns.

LEARNER SUMMARIZATION

Learners will present work for display and critique. They will discuss and point out congruent shapes and effective organization of space to form a pattern.

MATERIALS

- construction paper
- colored duplicating paper
- pencils
- scissors
- glue

CONCEPT PATTERN

SUBJECT Printmaking GRADE LEVEL 5

PROCESSES Observing patterns in natural and man-made environment
Organizing, experimenting, and creating with print-making

SIGNIFICANT IDEA Patterns are everywhere. They are an important part of our environment. They are found in natural and man-made forms. Patterns are used by artists to organize space and to provide visual enrichment. A single shape or a sequence of shapes may be repeated many times in an organized way to form a pattern.

TIME ALLOCATION 45 minutes

SAMPLE QUESTIONING STRATEGY

- Ask children to look closely around the classroom to locate and identify natural and man-made patterns.
- Where do we find patterns?
- What makes a pattern? How is it used to organize space?
- How is it used to provide visual enrichment?
- What is a natural pattern?
- What is a man-made pattern?

RESOURCES

Clothing depicting pattern
Wallpaper sample books showing various patterns
Reinhold Visuals: Organization #1, #7, and #12
Samples of patterned wrapping paper
Photographs of natural and man-made patterns

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display and discuss examples of natural and man-made patterns. Have learners cite samples of patterns in the classroom. Demonstrate how patterns can be created using repeated shapes and numbers.

Vocabulary - pattern, organization, order, repeat, printmaking, brayer. Write on board and discuss.

INSTRUCTIONAL OBJECTIVE

The learner will produce an original print which demonstrates a knowledge and understanding of pattern.

Virginia Standard of Learning

Art 5.6 The student will create the illusion of movement or direction in a design.

Art 5.8 The student will add decorative textures to artwork.

Art 5.9 The student will produce artwork emphasizing one or more of the elements of design.

Math 3.3 The student will complete a sequence of ten or fewer consecutive whole numbers between 0 and 500.

EXPLANATION (approximately 7-10 minutes)

Review discussion of patterns from previous lesson. Reinforce idea of number patterns and shape patterns. Examples: 1,2,3 1,2,3 1,2,?; 2,4,6 2,4,6 2,4,?; @,@,#,@,@,#,@,@.?; *** + *** + *** + *** ? Remind learners that patterns in art can be made from shapes or symbols which are drawn or printed (in a repeat fashion) across a surface (paper).

Teacher demonstrates carving a design into a gum eraser with a sharp pencil. Teacher demonstrates pressing eraser into print-making ink and printing the design onto paper to create a repeat pattern. Teacher encourages learners to carve original designs in their erasers and to use their designs to print unique patterns.

LEARNER SUMMARIZATION

Learners will present hand-printed wrapping paper for critique and display. They will point out the pattern created by the organization of space of the repeated design.

MATERIALS

sharp pencil
water base printer's ink
brayer
newspapers to cover work space
gum erasers
colored tissue paper

CONCEPT SEQUENCE

SUBJECT Crafts, cultural understanding GRADE LEVEL 5

PROCESSES Observing art forms from a different culture
Gaining understanding of the importance of traditional crafts to other cultures
Following organized steps to construct a traditional craft form

SIGNIFICANT IDEA Crafts have been important to all cultures throughout history. The process for making particular forms has been passed down from generation to generation. Knowing a sequence of steps is necessary in order to produce many traditional products. Learning about and constructing a craft item by following the traditional, sequential steps can help learners understand another culture's way of life.

TIME ALLOCATION 45 minutes

SAMPLE QUESTIONING STRATEGY

- How does art reflect the culture in which it is created?
- Why is it important to learn about other cultures?
- What does the god's eye symbolize?
- What are its religious implications?
- What are the steps (sequential order) in creating a god's eye?
- What is the first step in producing a god's eye?
- What is the second step?
- What happens next?
- What is the final step?
- How do the perimeter and area change as the sequence of steps is followed?

RESOURCES

Sample god's eyes
Linderman, E., & Linderman, M. (1977). Crafts for the classroom. New York: Macmillan Publishing Company.
Other samples of Mexican crafts
Teacher-made chart showing sequence of steps

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display sample god's eyes and other Mexican craft items. Carefully observe and discuss selected items. Give learners brief background information on the Mexican culture. Explain the religious significance of the god's eye to the Mexican people.

Vocabulary - yarn, dowel rod, culture, sacred, traditional, symbol, sequence, craft. Write on board and discuss.

INSTRUCTIONAL OBJECTIVE

The learner will produce a traditional craft item (god's eye or ojo de dios) following a sequence of steps.

Virginia Standard of Learning

Art 6.8 The student will indicate how art reflects various cultures, periods, or civilizations.

Language Arts 5.3 The student will determine logical relationships found in reading selections (chronological order).

Language Arts 6.1 The student will give accurate multi-step oral directions.

EXPLANATION (approximately 7-10 minutes)

People from certain cultures often produce craft items which have great significance for them. These items have been produced in the same way and with the same materials and designs for generations. When parents teach their children how to make these things, it is important that the children learn to produce them just as they have been produced for generations. The parents teach their children to follow the traditions which have meaning for them. Just as it is important to learn the steps in working a math problem or to remember the sequence of events in a reading assignment, it is important to know the sequence or order for producing a traditional craft.

Teacher explains and demonstrates the sequence of steps necessary to complete a successful god's eye in the traditional manner.

1. Tie 2 dowel rods together so they form a cross shape.
2. Add a dot of glue to help keep sticks in place.
3. Wrap yarn back and forth over both sticks to secure them.
4. To begin process, wrap yarn over and under one arm, then move to second arm and wrap over and under. Continue in sequence (arm 1,2,3,4).
5. The yarn will begin to hold the sticks firmly in place in the cross shape.
6. On the underside of the god's eye knot a new color to the old one to change colors.
7. Make a loop knot to secure final piece of yarn.
8. Add tassels, beads, feathers, etc. to the ends of the rods for interest. (Learners use their own creativity at this point).

Before students begin, orally review the steps in the creation of a god's eye. Question them on their knowledge of the sequential order of the process. Write their correct responses on the board so they may refer to them as they work. Display a visual chart of the steps.

Review the concepts of perimeter and area from the previous lessons. Relate the concepts to the new lesson. Demonstrate how the perimeter changes as yarn is wrapped around each side of the god's eye as each step in the sequence is completed. Explain how the area of the surface of the god's eye enlarges as each sequence of steps is finished.

LEARNER SUMMARIZATION

Learners will display their god's eyes. They will discuss their new knowledge of the importance of knowing the sequential steps in order to produce a traditional Mexican craft.

MATERIALS

dowel rods or sticks
glue
yarn
scissors

CONCEPTS SEQUENCE

SUBJECT Drawing GRADE LEVEL 5

PROCESSES Observing designs created by a kaleidoscope
Creating a personal shape
Following a sequence of steps to create an original kaleidoscopic design

SIGNIFICANT IDEA Artists often follow a sequence of steps as they use the elements of design to create their art work. Even though they may follow the same "plan" or steps as others, the way they select to arrange line, shape, and color to create images is original. Their finished products are unique examples of their self expression.

TIME ALLOCATION 45 minutes

SAMPLE QUESTIONING STRATEGY

- Ask learners to look closely at designs made by the kaleidoscope.
- Encourage them to discuss radial designs, colors, shapes, etc. found in the kaleidoscopes.
- Ask learners how the overlapping designs create patterns?
- Ask learners how their artwork will be unique if they all follow the same sequence of steps.
- Ask why it is necessary to know and follow a sequence of steps (in general and in this lesson).

RESOURCES

Several kaleidoscopes
Sample kaleidoscope designs
Chart of sequential steps

MODEL LESSON DESIGN

FOCUS ACTIVITY (approximately 3-5 minutes)

Display sample kaleidoscopic designs. Pass kaleidoscopes around class for students to look through. Learners recall the importance of sequencing in math, reading, etc. prior to receiving sequential instructions.

Vocabulary - kaleidoscope, line, color, shape, design, radial design, original, sequence. Write on board and discuss.

INSTRUCTIONAL OBJECTIVE

The learner will create an original design which resembles a kaleidoscope image following a given sequence of steps.

Virginia Standard of Learning

Art 5.9	The student will produce artwork emphasizing one or more of the elements of design.
Language Arts 5.3	The student will determine logical relationships found in reading selections.
Language Arts 6.1	The student will give accurate multi-step oral directions.

EXPLANATION (approximately 7-10 minutes)

Kaleidoscopes are tube-like instruments which contain small pieces of colored plastic or glass. Mirrors are arranged inside the tube so that they reflect the bits of colored glass. As one turns or rotates the tube, symmetrical, radiating patterns or designs are created within the tube. Most people enjoy looking at the beautiful, colored images which appear as the glass moves and is reflected by the mirrors.

Today we're going to create a design which looks very similar to the patterns created in a kaleidoscope. Just as it is important to learn the steps in working a math problem or to remember the sequence of events in a reading assignment, it is important to know the sequence of steps to produce the kaleidoscopic design. In order to have the design look the way you want it, you will need to follow a certain order.

Teacher explains and demonstrates the sequence of steps necessary to complete a successful kaleidoscopic design.

1. Fold a square sheet of paper in half (6" x 6").
2. While the paper is folded, cut a simple design on the folded side (see diagram). One end of the design needs to be pointed.
3. Open design to see full shape.
4. On a square sheet of paper (12" x 12"), locate the center point. Place a dot at the center point.
5. Place original design at the top middle of the large paper with the point at the center of the paper touching the dot. Trace around the shape (see diagram for steps).
6. Place original design at the bottom middle of the large paper with the point at the center of the paper touching the dot. Trace around the shape.
7. Repeat process on the right side of the paper.
8. Repeat process on the left side of the paper.
9. Place the shape in the upper right part of the large sheet of paper (between the two tracings already completed), with its point placed at the center dot and trace around the shape again. Shapes will begin to overlap to create intricate patterns which resemble kaleidoscopic designs.
10. Repeat tracing of shapes between other completed drawing.
11. At this point, learners select colors they want to use and complete their unique designs.

Before students begin, orally review the steps in the creation of a kaleidoscopic design. Question them on their knowledge of the sequential order of the process. Write their correct responses on the board so they may refer to them as they work. Display a visual chart of the steps. Discuss the fact that all learners will follow the same sequence of steps to create their artwork. Remind learners that their products will be unique because they will decide how to use line, shape, and color in their work.

LEARNER SUMMARIZATION

Learners will display their kaleidoscopic designs. They will discuss the importance of knowing the sequential steps in order to produce the project.

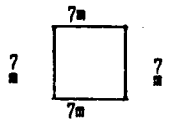
MATERIALS

sheet of paper 6" x 6"
sheet of paper 12" x 12"
scissors
pencil
colored markers, crayons, colored pencils

APPENDIX B. AIMS TEST

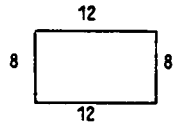
FIND THE PERIMETER.

1.



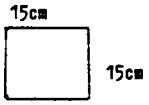
(1) 14 m
(2) 21 m
(3) 28 m
(4) 49 m

2.



(1) 20 units
(2) 40 units
(3) 64 units
(4) 96 units

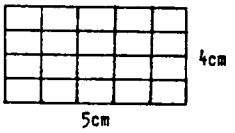
(3)



(1) 15 cm
(2) 30 cm
(3) 45 cm
(4) 60 cm

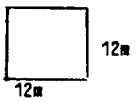
FIND THE AREA.

4.



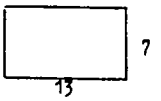
(1) 20 square cm
(2) 24 square cm
(3) 25 square cm
(4) 28 square cm

5.



(1) 24 m^2
(2) 36 m^2
(3) 48 m^2
(4) 144 m^2

6.

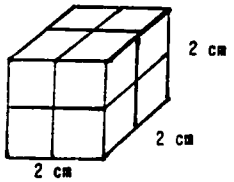


(1) 20 $units^2$
(2) 91 $units^2$
(3) 98 $units^2$
(4) 121 $units^2$

Work until you come to a STOP SIGN.

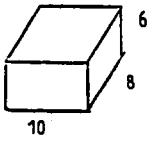
WHAT IS THE VOLUME?

7.



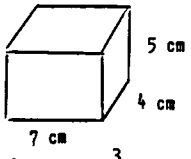
(1) 6 cubic cm
(2) 8 cubic cm
(3) 12 cubic cm
(4) 16 cubic cm

8.



(1) 24 units^3
(2) 140 units^3
(3) 480 units^3
(4) 528 units^3

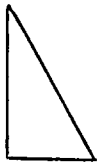
9.



(1) 16 cm^3
(2) 140 cm^3
(3) 175 cm^3
(4) 180 cm^3

WHICH SHAPE IS CONGRUENT TO EACH ONE SHOWN?

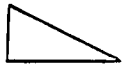
10.



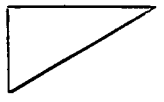
(1)

(3)

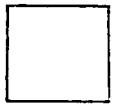
(2)



(4)

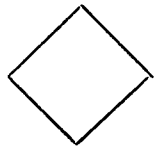


11.

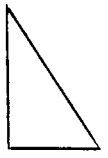


(1)

(3)



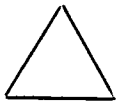
(2)



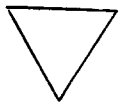
(4)

GO ON

12.



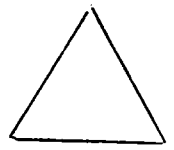
(1)



(3)

(2)

(4)

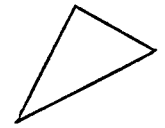


13. HOW MANY LINES OF SYMMETRY DOES THE FIGURE HAVE?

(1) 1
(2) 2
(3) 4
(4) 6

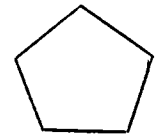
WHAT IS THE BEST NAME FOR EACH SHAPE?

14.



(1) parallelogram
(2) rectangle
(3) square
(4) triangle

15.



(1) hexagon
(2) parallelogram
(3) pentagon
(4) rectangle

GO ON

READ THE STORY. CHOOSE THE BEST ANSWER TO EACH QUESTION.

When Great Mother first looked out over the world she had created, she was unhappy. Caves, rocks, and mountains were all dusted in shades of gray because the colors were locked inside the earth. Great Mother wanted each piece of creation to look special. If only each object could be a little different from all the others. Then she thought of a plan.

I'll make paints from the earth to color all creation," said Great Mother. From out of the ground she took deep, rich browns and black. From the earth's fiery core she drew brilliant reds, oranges, and yellows. From the river running through the darkest caves, she withdrew cool blues, purples, and greens. Sun peeked around a cloud to beam down her white to the other colors. With firm strokes, Great Mother then mixed tints of pink, peach, and lime and mint greens. She blended beige, cream, gold, and ice and powder blues.

She brushed greens onto trees, browns and pinks onto mountains, and golds and oranges into deserts. She poured purples and blues into lakes. While the paints were drying, Wind spoke his pleasure. Bright silver and gold danced over trees, lakes, mountains, and meadows. Great Mother surveyed her work and decided that it was beautiful.

"Now that I'm finished, I'll wash my brushes," thought Great Mother, and she set them on the horizon. Rain sent a shower to help. As the earth spun, the paints streaked across the sky, forming a rainbow. Great Mother looked up and smiled at her accident.

16. Why were all the rocks and mountains gray at first?

    (1) All the colors were shut away inside the earth.

    (2) Great Mother was not a good artist.

    (3) Great Mother was satisfied with a gray world.

    (4) Sun and Wind didn't approve of the colors.

17. Which sentence below best states the main idea of the last paragraph?

    (1) Great Mother thought she would wash her brushes.

    (2) Rain sent a shower to help her.

    (3) The paints streaked across the sky and formed a rainbow.

    (4) Great Mother looked up and smiled.

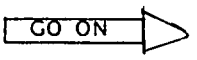
18. What happened right before the rain shower?

    (1) Great Mother decided to wash her brushes.

    (2) Great Mother painted green on the trees.

    (3) The paints formed a rainbow in the sky.

    (4) Sun peeked out and beamed down her white.



READ EACH GROUP OF SENTENCES. CHOOSE THE ANSWER THAT SHOWS HOW THE SENTENCES SHOULD BE ORDERED.

19.

1. We counted the number of cars on the train.
2. The lights by the tracks began to flash.
3. The train came into view.
4. We watched the train go out of sight.

(1) 3, 2, 4, 1
(2) 2, 3, 1, 4
(3) 4, 1, 2, 3
(4) 1, 4, 3, 2

20.

1. We found a treasure map.
2. We began to dig for the hidden treasure.
3. We found the buried gold.
4. The map led us to a dark cave.

(1) 2, 3, 4, 1
(2) 4, 1, 3, 2
(3) 1, 4, 2, 3
(4) 3, 2, 1, 4

21.

1. The fire truck roared around the corner.
2. The firemen ran toward the house.
3. I called the fire department.
4. I saw flames shooting out of my neighbor's house.

(1) 4, 3, 1, 2
(2) 1, 4, 2, 3
(3) 3, 2, 4, 1
(4) 2, 1, 3, 4

CHOOSE THE WORD THAT BELONGS IN THE SENTENCE.

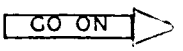
22. The artist made charcoal _____ of old farmhouses.

(1) sketch
(2) sketches
(3) sketchies
(4) sketchs

CHOOSE THE ANSWER TO THE QUESTION.

23. Jeff bought some model paint for $13.60. Each jar of paint cost $.80. How many jars of paint did Jeff buy?

(1) 17
(2) 18
(3) 19
(4) 20



CHOOSE THE WORD THAT CORRECTLY COMPLETES THE SENTENCE.

24. Alfredo has _____ the entire song with no mistakes!

(1) sang (2) sung

25. The whistle had ____ to warn us of the danger.

(1) blew (2) blown

CHOOSE THE MEANING OF THE UNDERLINED WORD.

26. As the door opened, a beam of light fell into the room. In this sentence, beam means _____.

(1) a happy smile
(2) a ray of sunshine
(3) a board that runs across a ceiling

27. I'll have just a bit more chowder, please. In this sentence, bit means _____.

(1) a small amount
(2) part of a horse bridle
(3) to bite with the teeth

COMPLETE THE PATTERN.

28. 2, __, 6, 8, 10

(1) 1
(2) 3
(3) 4
(4) 5

29. 0 * 0 * ____

(1) *
(2) #
(3) +
(4) 0

30. 5, 5, 3, ___, 1, 1

(1) 1
(2) 3
(3) 4
(4) 7

STOP!

APPENDIX C. INFORMATION ABOUT SELECTED STUDENTS DURING ADMINISTRATION OF THE SWASSING-BARBE MODALITY INDEX

Information About Selected Students During the Administration of the Swassing-Barbe Modality Index

Several of the children were quite interesting to observe during the administration of the Index. This is an appropriate point for the researcher to give brief anecdotes about some of the students to enrich the collected data. Numbers alone do not tell the complete story.

Students in Mrs. D.'s class

Mrs. D. would normally select a new student to come with me after I had taken a student back to her room. The children would raise their hands to be selected. I noticed that some who previously had been tested would still raise their hands. They seemed to think that they could go again (or at least they thought they would try). I wondered if they wanted to be tested again or if they just wanted to leave class for a few minutes. Even though the Index was fun to do, I think some of the children were looking for an excuse to leave class for awhile. I joked with some of them about volunteering to go with me when they did not even know what I was going to do with them. I guess I looked harmless. They were fun to work with.

There was a lot of student talking and moving about most of the times I went to the classroom. Mrs. D. fussed at the children and tried to get them to be quieter than they were.

They did not seem to listen to her very well. Sometimes I felt she seemed frustrated that they were noisier than she would have liked them to be and that her admonishments did not seem to have much of an effect on their behavior. They were a lively group. Mrs. D. seemed to enjoy teaching and the children liked her as their teacher.

R. M. who appeared mature for his age was as an interesting young man to work with. I remembered seeing his artwork in the art class and asked if he liked art. He said a very definite YES. When he was tested, he showed a dominant kinesthetic learning style (51%) which seems appropriate for someone who is very interested in art. When asked how he was able to remember the shapes from the Index when he saw them, he said that he remembered the way they looked and made the shapes with his hands in the air in order to recall them. He also used his hands to form the shapes that were called out to him on the auditory portion of the Index. On the kinesthetic part of the Index he said he was able to recall the shapes by saying them to himself, by seeing pictures of them in his mind, and by working out a pattern. He squeezed and rubbed his hands all over the shapes as he tried to learn them. On the last sequence he reproduced on the kinesthetic part of the Index he made the pattern by working from right to left. I noticed that several of the children did this throughout the Index. I do not know why.

A. B. subvocalized on each part of the Index and his score indicated that his dominant learning style was auditory (53.13%).

K. M. worked some of the patterns from left to right and others from right to left. During all three phases of the Index, she said that she saw pictures of the shapes in her mind. She would close her eyes and reproduce the sequence of shapes she saw in her mind. Her dominant learning style was visual (45%).

A. H. was a fascinating child to work with. His score on the Index indicated that he was a dominant auditory learner (42%), but as I observed him I found that he had many traits of a visual and kinesthetic learner. When asked how he remembered the sequence of shapes

when he heard them, he demonstrated his elaborate method of counting. He placed his fingers under the edge of the table. As a shape was said he "marked" it on a certain finger. He said, "My mother is blind and she has to use her hands a lot to learn things. I think I learned this by watching her." The aide said later that his mother also is hearing impaired. I wanted to spend more time with A. H. I really learned a great deal from him in just a few minutes. I am classifying him as an auditory/kinesthetic learner even though his "score" is more auditory. His methods of recalling definitely have kinesthetic qualities. I believe his innate style is auditory, but that he has learned to learn through his tactile sense also, probably from observing his mother.

M. H. was jittery and easily distracted during the administration of the Index. She appeared to be in a great hurry to move through the testing. I told her she could spend more time looking at the visual model, but she would only glance at it briefly. When the sequence became longer, she still spent only a few seconds studying the sequence and nodded and said "okay" (for me to remove the model). When I showed her the sequence of six, she groaned and said, "I can't do it." I asked her to try. She did, but was not very successful. She recalled only three shapes and two of them were in reverse order. Throughout the testing, she would look at me each time she completed a sequence for verification that she did well. She was a very interesting child to work with and I am eager to learn more about her from her teacher. She was able only to recall slightly more than one-third of the shapes from the total number and her dominant modality was auditory (43.5%).

T. M. was extremely intense and appeared to concentrate deeply on each portion of the Index. He wanted extra time on most sequences, especially the kinesthetic ones, but I told him I had to give everyone the same amount of time so that my results would be accurate. He understood. He was able to recall almost two thirds of the shapes and his dominant modality was mixed between visual/kinesthetic (39.5%) each.

J. J. was confused by this whole process. He was unsuccessful in recalling many of the shapes but did best in the visual part where he was able to score 24 correctly out of a possible 45. He did very poorly in the kinesthetic portion, remembering only 6 from a

possible 45. That was one of the lowest scores received by anyone on the entire Index.

R. C. appeared jumpy during the inventory. He was ill-at-ease in spite of my attempts to establish rapport. He seemed easily distracted, did not look at the shapes carefully, and was not able to concentrate for very long. He was able to recall less than one-third of the total number of shapes. He made four reversals in the sequences of shapes. His dominant learning mode was mixed between auditory and visual.

L. D., one of the few left-handed students, had a very difficult time concentrating on the Index. I told her she could use more time, but she still rushed through each sequence. Her total score on the test was only 28 correct from a total of 135. She was able to recall only three shapes from the kinesthetic sequence. Her dominant learning modality was auditory, but even on this section she correctly identified only thirteen shapes from a possible forty-five.

K. M. said that she was able to recall the sequence of shapes by putting them in groups of two. She often worked from right to left. She "saw" the shapes in her mind. Her dominant modality was visual (42.5%).

M. M. also worked from right to left on occasion. She used her hands to mark the shapes as if she were counting. She said that she "put pictures in my mind" and tried to repeat the shapes to herself in the same order that I gave them to her.

M. G. also worked from the right instead of the left for most of the sequences. She said she was able to recall the order of the shapes by repeating them to herself. Interestingly, her auditory score was her lowest. Her total score indicates that she learns best by visual/kinesthetic modes.

F. S. subvocalized a great deal while he was working with the shapes. He told me that he thought he learned best by listening, but in fact, he recalled almost twice as many shapes when he felt them as he did when I called them out to him. His kinesthetic score was 47% of his total.

Students in Mrs. B.'s class

On the days that I tested Mrs. B.'s class, I stopped by her room in the morning as school was beginning. She always had a student lead the pledge of allegiance, another lead in singing "America, the Beautiful," and still another call the role. The morning began in a calm and organized manner. The students knew what was expected of them, were very well-behaved, and appeared relaxed with the structure of the class. Mrs. B. would call on a student to come with me. The others did not raise their hands.

After I had finished testing a student, that student would return to class and Mrs. B. would select another person. The student who had just been tested would bring the new student to the conference room. I was able to compute the score and make notes while I waited. Having the student come to me saved time, but I was not able to observe as often in the classroom.

L. J. was a very small boy who said that he was almost thirteen years old. Most of the children in the fifth grade were about ten years old. L. J. worked through all of the patterns very rapidly. I suggested that he take a little more time to study the sequences, but he did not. He recalled 18 or 19 shapes from each sequence of 45 and had three reversals. His total score was evenly spaced between visual (19), auditory (19), and kinesthetic (18).

A. W. said he saw the shapes in his mind as he tried to recall them. He also subvocalized during the auditory and kinesthetic parts of the Index. He recalled the shapes that he touched best and was able to assemble sequences through part of line eight for a 33 of 45 correct.

M. B. made 5 reversals which according to Barbe and Swassing may indicate a learning disability if other signs are also present. M. B. said that he was able to recall the names of the shapes by repeating them to himself, but his lowest score was on the auditory portion of the Index. He was able to reproduce only 12 of 45 shapes when they were called out to him. He did repeat the names of the shapes to himself to help in recalling the visual and kinesthetic portions of the Index.

D. W. had trouble recalling the shapes and scored only 32 from a possible 135. He made reversals and also left out quite a few shapes within different sequences. An interesting occurrence was that he called a square a box and called a triangle a pyramid. He asked if it would be "okay" to call them different names. I allowed him to call them what he wanted.

S. M. was a right-handed boy who used his left hand to create all the patterns. He said he was able to recall the shapes by saying them to himself, but he remembered 26 of the visual shapes and only 13 of the auditory ones.

C. P. received an evenly spaced score between visual, auditory, and kinesthetic. He said that he was able to recall the shapes by seeing pictures in his mind and by saying the names of the shapes to himself. He made 5 reversals and included several shapes that were not in the sequences. His total score was only 36.

M. R. was the only child who seemed not to want to do the Index. When I went to his room to get him, he got up slowly and seemed to be totally disinterested. As we went down the hall, he walked behind me very slowly. When I stopped for him to catch up, he would stop. I tried to talk with him and to establish rapport. He never smiled and would only respond very briefly. He participated in the inventory, but with no real interest. He seemed angry or disgusted about something. I did not find out what the problem was. Later when I would see him in his class or in the art room, he was very friendly. Maybe he was just in a bad mood the day we did the Index.

A. B. said he "saw" each shape in his mind when he tried to remember it. His final score was 41% visual.

K. T. said she was right-handed, but she used her left hand almost entirely to reproduce the patterns. She moved very slowly as she completed each pattern. I do not know if she is always a slow moving person or whether her concentration on the inventory slowed her down.

R. C. was the opposite of K. T. in speed. She moved very fast. I told her she could take more time but she did not. She even went fast on the kinesthetic portion of the inventory. She barely touched the shapes. I am not sure how she was able to identify any of them, but she did. Her dominant modality was kinesthetic (40%).

S. T. was another fast moving person. She rushed through every sequence. She said she remembered the shapes by saying them to herself. She also used her hand to "count" the shapes. She made several shape reversals and also reversed whole sequences.

J. B. was a tiny little girl who really seemed to enjoy working on the inventory. She frequently changed shapes around after she had completed the sequence. She made several reversals and also added several extra shapes which were not part of the given sequence.

T. A. was also a tiny, thin, little girl who was more the size of a 3rd grader than a 5th grader. She was dressed in clean clothes which were mismatched and much too large for her. She had trouble with each sequence and it took several explanations for her to catch on to the process.

R. W. was a delightful young girl who was full of personality. She was very much at ease working with the inventory. She said that she has always wanted to be a teacher. I think she will be a good one. Her dominant learning modality was mixed between kinesthetic and auditory.

W. H. was an interesting child to work with. He said that he had pictures in his mind of the shapes and also felt as if he had a tape recorder in his ear repeating what I had said.

Students in Mrs. A.'s class

Mrs. A.'s class always seemed very relaxed and free-flowing. Children were always involved in reading, playing games, doing group work, making friendship bracelets, and quietly talking. When Mrs. A. was conducting directed teaching during math and reading while I observed, the children were always very attentive and seemed to be involved in the lesson. They seemed to respond well to her teaching style. She always seemed to be glad to have me in her room and would often chat a little as she prepared for her lessons.

I would always go to her room to get the next child to test. The children would raise their hands and she would pick one to go with me. It took a little more time to do it that way, but I did get to be in the classroom more often.

T. F. was able to recall the visual sequences fairly well. She said she looked at the shapes, said their names, and then got a picture in her head. When we worked on the kinesthetic part, T. F. seemed to go into slow motion and moved very cautiously. She appeared to have difficulty in recalling the shapes that she felt. She recalled twice as many of the shapes in the visual sequences as she did in the kinesthetic sequences. Her dominant learning modality was visual.

J. B. subvocalized throughout all parts of the inventory. As he looked, listened, and felt the shapes, he said their names quietly. As he arranged the shapes, he also repeated their names. He said he was able to recall the shapes by looking at where they were placed on the table as I called them out. He was able to recall 35 of 45 on the visual test.

M. R. was very interested in doing well on the inventory. He looked at it as a competitive challenge.

He would ask how well he had done after almost every sequence. He said that he was able to recall the shapes by looking at them on the table and by picturing them in his mind. He also used his fingers to "mark" the shapes. In addition he said that he repeated the names of the shapes in groups. He made four reversals and added extra shapes which were not part of the original sequences. The Index revealed that his dominant modality for learning was mixed between visual and auditory.

J. F. was a very quiet girl who appeared to be fairly dull. After working with her for a few minutes, I realized that she was quite bright. She said that she repeated the names of the shapes in her mind on the visual and kinesthetic parts and grouped the shapes by twos in her mind in order to recall them. She told me that she needs to see things in order to learn about them.

She told me that she almost always made the honor roll except for one time and that was because of her handwriting. She said her handwriting was bad. She was able to recall 89 of 135 shapes and her dominant learning modality was visual (47%).

A. E. reminded me of Tom Sawyer or Huckleberry Finn. He had long red hair, freckles, was small but strong. He was nervous and chewed the neck of his tee shirt or his fingernails the whole time we worked together. He was friendly and seemed to enjoy trying to remember the patterns I presented to him. Some part of him was in perpetual motion. He seemed to "count" the shapes with his whole body. He used his fingers to tap on the table and subvocalized while he concentrated. He told me that he said the names of the shapes over and over until he could memorize them and that he sorted the shapes out in groups. He did very well recalling the sequence of shapes especially in the visual test where he only missed the last shape. His dominant modality was visual. He correctly identified 97 of the 135 shapes.

K. A. also has a dominant visual learning modality. She said that she tried to make up a pattern in her mind when she saw or heard the shapes. She would mark the shapes with her hand.

P. Y. had a great deal of difficulty with most of the sequences, but did best on the auditory part where she was able to recall 21 of the shapes. She kept her eyes

shut all the way through the auditory part and said the names of the shapes aloud. She rocked in her chair throughout the inventory. P. Y. was able to reproduce only 8 shapes in the visual category and made several reversals. She had the most difficulty with the kinesthetic section correctly identifying only 3 shapes. She reconstructed several of the lines of shapes in reverse order.

R. T. was interesting to work with in that he said he remembered the order of the patterns by saying the visual and kinesthetic sequences backwards to himself. He told me that the ones I called out to him were the hardest to remember and in fact his score was lowest on the auditory part of the test. He subvocalized some as the sequence of shapes became longer. R. T. often looked into space as he tried to recall the shapes. This is typical of visual learners according to Barbe and Swassing. His final score indicated that his dominant learning modality was visual (42%).

W. C. was a very quiet boy whose visual mode of learning was dominant. He said that he looked at the shapes on the table and tried to group the shapes by 3's in order to remember them.

N. H. was a visual/kinesthetic learner who appeared very quiet and thoughtful. He said that he tried to remember the shapes in groups of three when he looked at them. When he was attempting to identify the shapes by touch he subvocalized and used both hands to feel them. He said he could memorize the shapes by feeling them in patterns.

D. T. was interesting to work with as she whispered her thoughts as she worked through the problems. For example, she said, "No, that's not right. The heart goes before the square. Yeah, that's where it goes and the triangle goes next . . ." She said she remembered where each shape was located and she appeared to work out a pattern of shapes to help her recall.

Students in Mrs. C.'s class

If teacher burn-out exists, I think Mrs. C. suffers from it. On occasion when we talked I felt that she really cared

about her students and wanted them to do well and to be successful. She told me about buying a book bag for one child who did not have one and about getting another child a haircut. But when she taught she seemed to become disgusted if the students did not catch on immediately. She said the children were not as smart as they used to be and that so many could not and did not want to learn. She sometimes said these things where the children could hear her. I do not think she doubted her own teaching ability, but rather she felt that the children were at fault for not learning what she presented to them. She rarely laughed or joked in class and when she did it was at someone else's expense. She was very hard on several boys in the room. I was uncomfortable in her class on occasion and felt sorry for the children she humiliated. The atmosphere in the classroom was not very pleasant. She was often berating some child for something he had done or had not done to her satisfaction. She said she was trying to get them to "do right for their own good."

I usually went to her room to get each child for testing. Although she said the right things and was always polite to me I sensed she would rather be left alone to do and say what she wanted to without any audience except for the students. She often seemed to have difficulty deciding who would go with me next and it seemed to take a long time for her to select someone. She would sometimes select one

student, change her mind, and choose another. It was time-consuming and disorganized. The other teachers just did it and it seemed to take only a second or two.

I helped her out when I could by staying with her class several times when she needed to go to the office for something. I also arranged for one of my college students to tutor two of her students each week. She seemed to appreciate that.

J. S. was a student identified as an auditory learner in Mrs. C.'s class whom I got to know while observing in the classroom during math and reading instruction. On my first observation, I noticed that J. S. just sat at his desk and looked around the room while the other children were involved in a math lesson. He had no book, no paper and pencil, and paid no attention. After class I asked Mrs. C. about him. She responded, "Oh, he's L.D. and goes to the L.D. resource teacher for math and reading. He doesn't do math with my class." The next time I was in the room observing, the desk next to J. S. was empty so I sat down by him. At one point the teacher asked the children to make up math questions for each other to work on during class. I asked J. S. to make up a question for me to answer. He smiled and began working on it. He became involved and seemed to like the chance to do something other than sit and stare at the wall. I made up questions for him to answer. He got them all right and smiled a big smile. Thereafter whenever I went into the room during math, he was working problems, raising his hand, going to the board, and doing math right along with the rest of the class. He seemed to be pretty good at it too. I was glad to see him using his time to work on math because he needed the reinforcement. Just sitting there was a waste of his time. Mrs. C. later commented to me that he was keeping up fairly well with the fifth grade math she was teaching and thanked me for getting J. S. involved and interested. I do not think anyone had ever asked him to become involved or had shown an interest in his ability for math.

A. S. was a kinesthetic learner. When asked how she was able to remember the shapes, she said that she

counted the shapes and also said them to herself. She said she "saw" the shapes in her mind. I noted that she frequently stared into space--a characteristic of visual learners. She really "shined" when we got to the kinesthetic part of the Index. It was obvious that this was her mode. Not only did she score highest on this part, she "drew" the shapes she was trying to remember with her fingers. She was fascinating to watch.

C. B. was a child about whom I became very concerned during my observations at the school. I sat next to him on two occasions when I visited his class. C. B. seemed to be in another world during class. He paid almost no attention. As a consequence, he was never on the right page and never at the right problem. Mrs. C. seemed to call on him to answer the toughest problems. When she called on him, he would just sit there and never say a word. Even the way she called on him had a negative tone to it. For example, "Well, let's see if C. B. knows where we are? C. B., take the next one." Of course he would not know the answer. He would not even be on the right page. His teacher knew it. Several times I did see him raise his hand to answer, but Mrs. C. never called on him when his hand was up. He was ignored. On one occasion when I was there, Mrs. C. had changed the seating of the class. There was no longer an empty seat next to C. B. Instead, a "smarter" girl was seated next to him. I hoped it was to help him stay with the group. Mrs. C. called on C. B. to answer and said, "Is he even on the right page?" The girl said, "Yes, ma'am, he's on the right page, but the wrong problem." The teacher sighed a big sigh.

When I gave C. B. the Index, I noticed a red mark on his arm near his elbow. It looked as if someone had rubbed baking soda on it. I wondered if it were a burn. Also there was a bruise near his wrist. When he left, I said "Happy Holidays" because it was the day before Christmas break. He said, "Merry Christmas" and smiled, but he seemed sad.

I spoke with the principal about my concern for this child. She said that a year ago, he and A. H. from Mrs. A.'s room had seen a program on television where they learned to make a bomb from an aerosol can. It exploded and C. B. was covered in paint and burned. He had spent several days in the hospital and had undergone counseling. She said that he had been a different child since that incident, but felt that he was taken care of by his family and that I should not

be too concerned about his well-being. I continue to be concerned about him.

His score on the modality index indicated that he was a predominantly auditory learner, but he continuously played with the shapes in front of him. I think he has some kinesthetic tendencies also.

M. R. was another child in whom I became very interested. He appeared to be extremely bright but was not doing very well in his studies according to Mrs. C. She said he would not do his work. He was a visual learner according to the Index and recalled 44 from 45 on the visual portion of the test. When I asked him how he remembered the shapes, he said that he made himself a little song and beat the rhythm out with his fingers. Fascinating.

One day when I was in his class, Mrs. C. announced aloud that since I was working on my doctorate that I should take M. R. aside and explain to him how important it was to get an education. I think M. R. and I were both a little embarrassed by Mrs. C.'s announcement. I did take M. R. into a conference room and we talked for a little while. Mrs. C. had been talking about patterns in class before she asked me to talk with M. R. When he and I entered the conference room, he said, "I think I am in a pattern. I failed the 2nd grade and three years later I am going to fail the 5th grade." I asked him if he knew what his problem was with school. He told me that he did not have any place to study at home. He said he lived in an apartment with his mother and his sisters and brothers and with his stepfather. He said his stepfather's children came and stayed in the apartment on the week-ends. He said it was always noisy and there was a lot of confusion in the house. I asked him if he wanted a college student to come to the school a couple of afternoons a week to help him get his homework done. He said that he would like that. I arranged for one of my education students to work with him two afternoons a week. Mrs. C. made arrangements with M. R.'s mother to pick him up after school on the days the tutor was there. Later on, I learned that Mrs. C. had assigned the tutor to another student because M. R. was not keeping up with his classroom assignments.

I. S. was another boy who received special attention from Mrs. C. but in a more positive way than M. R. She repeatedly said how smart I. S. was and how he could do the work if he would try harder. She gave him a great deal of encouragement and extra help many of the

times when I was in the classroom. The Index indicated that he was a kinesthetic learner. He did well on recalling the shapes overall, but not nearly as well as M. R.

S. T. was another boy who was able to recall a great number of shapes during the inventory. He was strongest in the kinesthetic modality. He was interesting to work with because he counted the number of shapes as he tried to remember them.

B. J. was a girl who was able to recall a large number of shapes in each category. She was especially able in the kinesthetic modality recalling all 45 shapes with only one reversal. She told me that she was a good student and usually made the honor roll. She also said that she likes to cook and plays the clarinet and piano a little. She seems to enjoy doing things with her hands and is able to learn a lot through that mode.

R. R. was a boy who received negative feedback from Mrs. C. When I first observed in the class I had imagined that R. R. was of lower ability. He never participated. He just sat there quietly. He seemed bright when I worked with him. He was a personable young man and was very easy to talk with. (He has a large, terrible burn scar all over his neck. It was visible with the type of shirts he wore. I do not know how extensive the scar was or how he received it.) I do feel that the "scar" he was receiving in his classroom could possibly have more lasting negative effects on him than the burn scar.

As I entered the class one day to get a student for testing, Mrs. C. called on one student, changed her mind, called on another, for four or five students. She asked L. T. to go with me. We were almost out the door when she said, "No wait! Take R. R. L. T. wants to learn. We're doing outlines and she wants to know how. Take R. R. It won't matter. He's going to fail 5th grade anyway. He doesn't want to learn anything."

R. R. got up and practically ran out the door. I stood dumbfounded for a moment and then followed R. R. In the hall I put my arm around his shoulder and went straight into my friendly spiel about the inventory, how it was like a game, and how it helped to determine how people learned best, etc. I did not know what else to do. I gave R. R. the Index.

After we finished the inventory, I asked R. R. if he was having trouble with the 5th grade. He said he was. I asked him if he knew what might be causing him

trouble. He said, "The teacher!" (I could relate to that.) He went on to say that last year he had been involved in chess, but that he had quit because Mrs. C. was the sponsor and was so mean to some of the kids (and to him) that he couldn't stand it. "And then I got her for a teacher."

I told him that he was a strong, smart boy and not to let one person get him down. We talked a little more. I could have cried. I can only imagine how a ten year old might feel . . . worse than crying, I guess. I hated to take him back to class.

APPENDIX D. TEACHER BEHAVIOR AND CREATIVITY ASSESSMENT INSTRUMENTS

TEACHER BEHAVIOR CHECKLIST

1 Observer_____ 2 Date_____ 3 Time_____
4 Teacher_____5 Subject_____6 Number of students____

Every minute record auditory mode (A), visual mode (V), kinesthetic mode (K), or combinations (AV, AK, VK, or AVK) used by teacher. In addition record positive (+), neutral (0), or negative (-) feeling tone exhibited by teacher.

	A, V, or K	+, 0, or -		A, V, or K	+, 0, or -
minute 1			24		
2			25		
3			26		
4			27		
5			28		
6			29		
7			30		
8			31		
9			32		
10			33		
11			34		
12			35		
13			36		
14			37		
15			38		
16			39		
17			40		
18			41		
19			42		
20			43		
21			44		
22			45		
23					

Frequency count A [ ] V [ ] K [ ] + [ ] - [ ] 0 [ ]
AV [ ] AK [ ] VK [ ]
AVK [ ]

CREATIVITY ASSESSMENT OF STUDENT PRODUCTS

Please indicate a creativity score for each of the 50 art products on exhibit. As you will be observing only the finished product of the student artists and not the process by which they completed their work, limit your judgment of "creativity" to originality and elaboration. Circle your choice using the numbers below.

	not very creative				very creative		not very creative				very creative
	1	2	3	4	5		1	2	3	4	5
1.	1	2	3	4	5	26.	1	2	3	4	5
2.	1	2	3	4	5	27.	1	2	3	4	5
3.	1	2	3	4	5	28.	1	2	3	4	5
4.	1	2	3	4	5	29.	1	2	3	4	5
5.	1	2	3	4	5	30.	1	2	3	4	5
6.	1	2	3	4	5	31.	1	2	3	4	5
7.	1	2	3	4	5	32.	1	2	3	4	5
8.	1	2	3	4	5	33.	1	2	3	4	5
9.	1	2	3	4	5	34.	1	2	3	3	5
10.	1	2	3	4	5	35.	1	2	3	4	5
11.	1	2	3	4	5	36.	1	2	3	4	5
12.	1	2	3	4	5	37.	1	2	3	4	5
13.	1	2	3	4	5	38.	1	2	3	4	5
14.	1	2	3	4	5	39.	1	2	3	4	5
15.	1	2	3	4	5	40.	1	2	3	4	5
16.	1	2	3	4	5	41.	1	2	3	4	5
17.	1	2	3	4	5	42.	1	2	3	4	5
18.	1	2	3	4	5	43.	1	2	3	4	5
19.	1	2	3	4	5	44.	1	2	3	4	5
20.	1	2	3	4	5	45.	1	2	3	4	5
21.	1	2	3	4	5	46.	1	2	3	4	5
22.	1	2	3	4	5	47.	1	2	3	4	5
23.	1	2	3	4	5	48.	1	2	3	4	4
24.	1	2	3	4	5	49.	1	2	3	4	5
25.	1	2	3	4	5	50.	1	2	3	4	5

CREATIVITY ASSESSMENT OF ART LESSONS

After reading each of the following lesson plans for art, indicate your assessment of their potential for eliciting creative products from fifth grade students. Circle your choice.

		not very creative				very creative
		1	2	3	4	5
lesson	1.	1	2	3	4	5
	2.	1	2	3	4	5
	3.	1	2	3	4	5
	4.	1	2	3	4	5
	5.	1	2	3	4	5
	6.	1	2	3	4	5
	7.	1	2	3	4	5

APPENDIX E. DESCRIPTION OF CLASSROOM OBSERVATION

Description of Classroom Observation

The researcher observed in the art room each Monday and each Thursday from 10:00 to 10:45 a.m. for a period of seven weeks when the treatment classes were having their regularly scheduled art period. Mrs. D.'s class had art on Monday and Mrs. B.'s class had art on Thursday. These two classes comprised the treatment group.

The researcher entered the artroom between classes. Mrs. W. would be scurrying around the room setting out materials needed for the next class. The students were brought to the art room from their classroom by the classroom teacher. Mrs. W. greeted the students and their teacher at the door and invited the students to come in and to take a seat. She smiled frequently and seemed glad to see the children each time they came for art. During her presentations Mrs. W. was located at the front of her classroom. She had reproductions of artwork displayed on an easel next to her. On numerous occasions she pointed out and discussed pertinent elements in the reproductions. A chalkboard was located on the wall near where she stood. Frequently she wrote and drew on the board to illustrate a point she was making during her presentation of the lesson. At times, she would demonstrate a concept using her arms or hands and she would gesture to indicate length, depth, and so forth. There was a great deal of action and enthusiasm in her teaching.

The children were seated at work tables with five or six students per table. The art teacher usually allowed the children to choose their own seats. If more than six situated themselves at one table she would have a child move to another table so they would have space to do their work. She would first ask someone to move. If no one moved, then she would tell one child to move to a different table. It did not seem to cause any problem and generally it only took a few minutes for everyone to become settled and ready to listen. She gave positive reinforcement to the class as a whole saying such things as, "I know you will enjoy making these cities." "Do your best work." "Look how nicely this is turning out." "You are doing a good job," etc. As she explained how to do the projects, she would talk in a peppy voice. She was constantly showing visuals and describing how to do the project. She moved around the room and brought examples up close for the children to see. She seemed to enjoy what she was doing. After she had completed her instructions, she called for helpers to pass out the supplies. All materials had been previously prepared by the teacher. The helpers distributed them to the students in just a few minutes. The children began to work as soon as they received their supplies. The students seemed eager to work and to make the art project. On the city planning lesson, some of the children worked with a partner, but most of them worked independently. On the other lessons, all the

students worked alone. As they worked, Mrs. W. allowed them to talk quietly to the other children at their table. They were allowed to get up for scissors, pencils, and other supplies they needed without asking permission. The teacher walked around the tables commenting on the work the students were doing as they made their projects.

On occasion the students became louder than Mrs. W. wanted them to be. She reprimanded them by telling them they were "too loud" and to "get quiet." They became quiet, but slowly began talking too loudly again and she would tell them to be quiet. During those times, the feeling tone in the class became negative for a minute or so. Soon Mrs. W. said something positive again to reestablish a positive tone in the art room.

When I observed in Mrs. C.'s class, I went once a week during the math period which was conducted at 8:30 a.m. We planned beforehand that I would observe on Thursday mornings and she would teach the designated concepts, one a week, during the 45 minute block of time I was in her room. On two occasions, when I arrived to observe, a conflict had occurred and we had to reschedule my observation for another day. One of the mornings, she had been scheduled by her principal to attend a Child Study Committee meeting. An aide had been assigned to monitor her class while she attended the meeting. The aide did not arrive, so she asked me to stay with the students. She had given them an assignment to work on while

she was gone. They were extremely well-behaved while I was there. Several students raised their hands and I helped them with their questions. Another time when I arrived at the school to check in at the office as I did each day, the secretary told me that Mrs. C. had called in sick and was not at school. She said that she and Mrs. C. had tried to reach me at home but that I had already left. I used the time for administering an additional Swassing-Barbe Modality Index. Each of the two times that it was necessary to reschedule, we did so within a very few days.

On the mornings when I arrived to observe, Mrs. C. had checked roll and was getting ready for the lesson. On most occasions, the feeling tone was already negative before the lesson began. The teacher berated a child for not having completed an assignment, for not being on task, or for any number of other minor misbehaviors. Various times when I passed by the classroom going to another room, Mrs. C. was heard loudly chastising a child or the class as a whole. I wondered if the class were actually more positive during the times I was there to observe.

The children sat in individual desks which were arranged in groups of three or four and faced the chalkboard. I noticed on my first visit that several students were isolated from the rest of the students. Their desks were placed away from most of the class and close to the side or back walls. Later I found out from the teacher that these were the

"troublemakers" or the ones "who did not care to learn." They were all boys and were the ones who were fussed at for not completing work, for not knowing what page the class was on, or for numerous other infractions. I was very uncomfortable with the attitude of the teacher toward particular students and with some of the comments she would make to me that children could hear. On one of my first visits, as I was preparing to leave and the teacher and I were at the back of the room but within hearing distance of the children in the rear of the class, she said, "These children aren't like the ones I used to have here. These don't want to learn. They're dumb."

Her room did not appear to be a happy place. On each occasion when I was there, negative incidences occurred. One day C. B. handed a paper in to her. She smiled at him and said, "Well, thanks C., for turning in your homework paper." I was delighted that C. was getting a positive comment, but I thought he looked as if someone were going to hit him. I found out why. The teacher immediately followed the comment with a loud, angry, "It was due an hour ago." C. B. quietly crept back to his desk with a look of despair on his face. Several of the other children laughed a little. Other incidences which occurred in Mrs. C.'s class are found on pp. 180-186.

Mrs. C. taught from the front of her room near the chalkboard. She verbally explained the concept that she was

teaching. She also spent a few minutes writing problems on the board. Generally she worked a sample problem or two, verbalizing the steps in the process of solving the problem as she went through the steps. She worked a few more problems without talking very much. Then she put four or five additional problems on the board evenly spaced across its width. As many students as there were problems would go to the board to work the problems simultaneously when she called on them. As this occurred, the other students worked the same problems on paper at their seats. After a few minutes, she asked individual students at their seats if they got the same answers as the children at the board. The children appeared to enjoy this part of the lesson. They raised their hands to be selected. They seemed to like the opportunity to get out of their seats and to work at the board. Other than this there was very little student movement in this classroom.

When Mrs. C. taught the concept of volume, she picked up a book and a box from her desk. She used a ruler to measure the length, width, and height of each as she told the students how to compute the volume of each one. She handed the students in the front row a box, a book, or another three-dimensional shape and asked them to compute the volume of the shape they had. They appeared involved as they measured their shape. Students located in the back half of the room were unable to see how the students with the

three-dimensional shapes were measuring, or how they were computing answers. They either tried to watch, began looking at papers or books, or day-dreamed. The only students who seemed to benefit from the hands-on experience were the five or six students on the front row.

After the introductory and explanation part of the lesson, the children were asked to work problems from their books or from worksheets. Mrs. C. walked around the room and monitored their work. Very few raised their hands for assistance. On occasion she stopped at someone's desk to ask him how he (it was never a girl while I was there) obtained a certain result. I felt sorry for students who had not gotten the right answers. Mrs. C. sighed loudly enough for the other students to hear and asked the student if he had not listened, or said that the problem was easy, or in some other way made him appear dumb. During the time I observed, the same few boys were always given negative feedback or no feedback on their work. A few students were given some individual praise, but there was a paucity of positive comment from Mrs. C. for her class.

Very little talking occurred among students. Mrs. C. rarely said anything about the noise level in her class as it was generally quiet. On the few occasions when she did indicate that she wanted the class quieter, she usually reprimanded a single student for talking. All students then became quiet and stayed that way for a long time. I would

hesitate to talk in her room, too. Outside of class she talked freely to me and appeared to want to develop a friendship.

I had lunch in the cafeteria with the teachers in my study on the days I was at school. All the 5th grade had their lunch period at the same time so after I finished observing, I joined them in the cafeteria. Having lunch together was a good time to become better acquainted. Teachers were required to spend their lunch period in the cafeteria, but aides took care of student needs. The faculty table where we sat was located near the stage. Some of the teachers sat with their backs to the stage and faced their class because they said they wanted to keep an eye on behavior. Others sat on the other side of the table so that they faced away from the students. They said that they did not want to have to watch the children while they ate. They said the aides were hired to take care of the children during lunch.

Mrs. A. was one of the teachers who said that she "didn't want to look at their faces while I eat. I don't want indigestion." From some of the things she said at the lunch table such as that, I thought that she did not care for her students. In her classroom, I saw a different picture. I observed in her room once a week for seven weeks during math class which was conducted at 10:30 a.m. As with Mrs. C., we scheduled beforehand when I would observe (on Wednesdays) and

that she would teach the designated concept during the time I was in her classroom. Each week when I arrived, the students were preparing to change classes and return to homebase for the next lesson of the day. There seemed to be several minutes of unstructured time between the end of one lesson, the changing of groups of students from one room to another, and the beginning of a new lesson. There was usually a lot of talk and movement among students but they were not out of control. Oftentimes Mrs. A. would be at her desk or at her bookcase getting materials ready for the lesson. She and her students appeared to respect and enjoy each other. Mrs. A. had developed a rapport with the students which allowed her to joke with them and to have a fairly casual atmosphere in the class. She usually began the lesson by turning on the overhead projector to focus student attention. It usually worked well. If they did not settle down right away she would say, "Well, I see you're having your P.E. time now so we won't need to go to the gym" or "I guess you want to have this for homework tonight." It was said in a friendly way and the children responded immediately by getting ready for the lesson.

Mrs. A. used the overhead projector frequently during her lessons. She wrote directly on the acetate sheets most of the time. Several times she used transparencies she had prepared from books. Mrs. A. taught by verbalizing about a concept and then demonstrating how to work problems step by

step using the overhead projector. She had her students solve problems on scratch paper at their desks after she had demonstrated. During this time she would circulate about the room answering questions and checking student progress. After all the students had solved a problem, Mrs. A. called on someone who volunteered by raising a hand to come to the overhead and demonstrate the steps in solving the problem. The students seemed to enjoy going to the overhead and writing on the acetate sheets. At other times Mrs. A. would call out an answer to a problem or ask a student to do it. She asked students who got the same answer to stand. On occasion she called out wrong answers and asked those who had obtained the same answer to stand. They looked around to see if anyone stood. The children appeared to enjoy the movement and action of this way of answering questions. When she taught volume, she constructed a cube from a paper pattern. After she completed her demonstration, she handed out printed patterns to each child who also constructed a cube. The students participated readily and appeared to be involved in this project.

Periodically Mrs. A. praised a child or the class but it did not happen very frequently. She, on occasion, used sarcasm to control behavior, but it did not happen often. The students did not appear to be bothered by it. They really seemed to like this teacher and to be willing to work for her. They appeared to focus in on the lessons and to stay involved

throughout. It should be noted that her class was the smallest of the four classes in the study with only 17 students in it.

APPENDIX F. DESCRIPTION OF TEACHING MODALITIES

Description of Teaching Modalities

Mrs. A., a comparison group teacher, tended to use the overhead projector when teaching visually. Most of her transparencies were reproduced from a text or workbook. Several times she wrote problems for her students to solve directly on clear acetate sheets placed on the overhead projector. From observation, it appeared that her students focused in on the projected images and that they were able to see clearly. On occasion she would write problems on the chalkboard. She did not use the bulletin board, pictures, or other visuals as teaching aids. Very rarely did Mrs. A. show objects related to the concept being taught.

Mrs. C., the other comparison group teacher, almost always used the chalkboard when she instructed visually. She did not use the overhead projector or the bulletin board at any time. A few times she showed her students an example of the concept being taught. For instance, she held up a book and a box when discussing how to compute the volume of an object.

The treatment teacher, Mrs. W., tended to show reproductions of artwork, photographs, and charts which she displayed on an easel or on the bulletin board. She also exhibited examples of finished art products of the "city planning" lesson for the concepts of area, volume, and perimeter. In illustrating the concept of congruency, she used the overhead projector. She placed acetate shapes on

the screen then placed congruent shapes on top to demonstrate exact fit.

When teaching auditorially, the comparison teachers tended to talk without combining their words with demonstrations or with visuals whereas the treatment teacher was more likely to be pointing out examples or demonstrating while she spoke. It appeared that when the teachers did show examples and/or demonstrate rather than using speech alone, the students focused more on the instruction. When a teacher simply lectured, the researcher observed that several children within a class might be staring into space, fidgeting with a book, looking in a desk, or engaged in other behavior of this nature.

The comparison teachers used a very small portion of their instructional time involved in kinesthetic teaching. They rarely demonstrated by drawing or manipulating materials. They seldom used gestures or other body movements to illustrate a point. Although Mrs. A. tended to teach from the front of the class, she did move to students to answer questions and to offer help while they were working on their assignments. Mrs. C. taught from the front of her class near her desk and the chalkboard. She rarely left that area of the room. In contrast, the treatment teacher often drew examples to show what she meant; measured shapes and then computed answers to clarify her point; walked across the room to illustrate the idea of length and width; demonstrated the

order or sequence of steps needed to create a project; and used other gestures and physical movements to help students understand. As she presented information, she moved around the class so that she was in close proximity to all students at some time during her instruction. In addition, while the students were engaged in class assignments, Mrs. W. was constantly moving about the classroom offering assistance where needed.

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